AN INVESTIGATION INTO FACTORS AFFECTING THE COMMUNICATION OF EVENTS THROUGH DRAWING

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Abstract

It has been proposed that although drawing and language are fundamentally separate modes of communication evidence exists for a shared conceptual process (Van Sommers 1989). Empirical and theoretical research has provided a body of evidence on the influence of *language* in shaping event conceptualisation for communication (Dipper et al 2005, Black & Chiat 2003, Zacks & Tversky 2001). The temporal order of words in a sentence and the choice of verb are all features of language that can alert the listener to the perspective and attentional focus of the speaker. Studies of non-linguistic communication have shown that foregrounding and ordering of semantic elements also occurs (Gershkoff-Stowe & Goldin-Meadow 2002, Sacchett 2005) and that these are shaped by different features of the input and output modalities. The study by Sacchett (2005) required participants to form conceptualisations of caused change of location events from visual input and used drawing as a means of communication. The results demonstrated that differences in foregrounding and temporal ordering of entities are affected by a complex interaction of conceptual and perceptual factors and the constraints of a graphic output modality. This current project has added to this body of evidence for control participants and investigated whether the manipulation of conceptual and perceptual factors increased the salience and consequently foregrounding of the Cause entity. The results have shown that significant primary foregrounding of the Cause entity occurs. However, the extent to which this happens is influenced by a complex interaction of top-down conceptual, bottom-up perceptual variables and the physical and spatial constraints of drawing to communicate.

1.   Introduction

Communication is the process by which one person can convey

information and meaning to another.   Whilst language is the

predominant method for communication between individuals in everyday

situations, visual images, whether produced by hand, electronically,

digitally or by some other means, can act as signs and may also be

used to convey meaning.   When the language system is damaged as

occurs in aphasia, drawing is a medium sometimes employed by speech

and language therapists to enhance communication for these individuals

and supplement residual language (Lyon 1995).   This study will explore

the use of drawing in a communicative context.

1.1   Events

Events are dynamic, relational situations.   An event has been described

as "a segment of time at a given location that is conceived by an

observer as having a beginning and an end" p17 (Zacks & Tversky

2001).   Events have a temporal structure (Levelt 1999).   This

differentiates them from states, which remain the same over a given

period of time.   The temporal order in which events occur is a key

aspect that must be conveyed when communicating them to others

(Black & Chiat 2003).

1.2   Event conceptualisation and perception

Unlike object perception, event perception is not well understood (Hard

et al 2006).   Because of the complex nature of event conceptualisation

and perception they will not be discussed in great detail here. However, a brief outline of the underlying processes will be provided which are essential to help understand how the components of an event are communicated.

Zacks & Tversky (2001) have proposed that when observing events, top-down conceptual factors compete and combine with bottom up perceptual factors to help observers make sense of what they see. This process utilizes the cognitive 'top-down' processes of; forming conceptualisations; relating these to stored knowledge and; creating event schemata. These schemata then provide a framework from which observers can relate 'bottom-up', incoming perceptual information and attempt to make sense of it.

Croft (1998) proposed that because events are dynamic, observers can not deal with their full complexity at once and need to segment the perceived information in order to extract meaning from it. Further research by Zacks et al (2001) and Hard et al (2006) has lent support to this idea, that events are perceived and understood as segments or individual units of meaning which they describe as 'partonomic structures'. These units have their own internal structure but they also function as part of the overall structure of the event. During on-line segmentation of events these partonomic units are organised into hierarchies based on relevant conceptual event schemata. The extent to which events are subdivided depends on the knowledge or goals of

the observer. How events are perceived and understood is therefore relevant to deciding what aspects are considered important and how these can be communicated to convey meaning to others. Conversely, intent to communicate about an event can also affect how it is perceived (Zacks et al 2001) which will be discussed further in Section 1.3.1.

1.3 Foregrounding

When observing an event in order to communicate it to another person, attention is not equally spread amongst all aspects of the scene (Black & Chiat 2003). Because events have a temporal order, and output modalities of speaking and drawing for communication are also constructed and heard /seen in time, what is spoken or drawn first can indicate prominence for that entity. Assigning prominence or foregrounding some entities over others is a process that is guided by the communicator's attentional focus and can be used to show the perspective from which an event is being observed and to which the listener should attend.

1.3.1 Factors that affect foregrounding

Language

In order to communicate conceptual representations of events through language, meanings have to be systematically organised and pared down but still retain sufficient information to allow them to be interpreted accurately by someone else. Much research has centred on how the linguistic forms available to a speaker shape and constrain perspective

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when using language to describe events (Dean & Black 2005, Marshall et al 1993), a process Slobin (1996) termed 'thinking for speaking'.

It is widely accepted that foregrounding of participants when describing an event using language is evidenced through the choice of verb, word order and the privileged position given to the Subject in sentences (Black & Chiat 2003, Marshall et al 1999, Gershkoff-Stowe & Goldin-Meadow 2002). The meaning of the verb determines the number of participants that can be foregrounded in order to communicate its meaning to others. Word order allows speakers and listeners to identify who does what to whom and is essential in conveying information effectively to another person, especially in reversible sentences where order is the only way of extracting information (Black & Chiat 2003). In English, the privileged position in the sentence is usually given to the Subject. The Subject precedes the verb and has the position of primary prominence (Black & Chiat 2003). It is a starting point to which other information is added and provides the perspective from which a situation can be understood. By foregrounding that subject/participant we are instructing others with whom we are communicating to attend to that aspect first.

Intent to communicate

The influence of 'intent to communicate' on foregrounding entities has been evidenced by a number of studies (Gershkoff-Stowe & Goldin-Meadow 2002, Zacks et al 2001). These have shown that different

entities are foregrounded when participants are asked to carry out the same activity in both communicative and non-communicative conditions.

Zacks et al (2001) asked participants to view and segment videos of everyday events into large and small units. They found that when participants were asked to give a verbal commentary as they segmented, segmentation was more hierarchical than when segmentation occurred without verbal output. They attributed this to the way in which the stored event schemata provide the inferential information for constructing a linguistic description of an event.

The effect of communicative intent is also supported in a study by Griffin and Bock (2000). They observed the eye movements of participants whilst they described simple events and compared them with the eye movements of participants performing a non-verbal event comprehension task. They concluded there was a temporal linkage between eye movements and the content of spoken utterances. In non-communicative conditions, eye movements were directed toward the patient, or the entity was acted upon, whereas in communicative tasks, participants eye movements tended to focus on the initiator. This would indicate that the intention to communicate increases focal importance of the agent and may lead to foregrounding of this entity when speaking or drawing.

Causality

Causality is perceived at the moment of interaction between two objects and as Zacks & Tversky (2001) state perception of causality is a key feature in defining event structure and foregrounding participant entities. As previously discussed, the visually perceived aspects of causal events (i.e. the interaction that occurs between the entities) provides information on 'bottom-up' processing of event structure which is then linked to stored conceptual information on goals and intentions. Because event conceptualisation is potentially similar regardless of output medium it may therefore be assumed that causality will be a key factor in affecting foregrounding regardless of method of output. Sacchett (2005) identified causality as an influential conceptual factor in affecting foregrounding when co-referential with the other variables in her study. Her results showed that the Cause entity was drawn first most often, replicating its foregrounded position in linguistic descriptions.

In this project causality is anticipated to be an important factor in influencing foregrounding. This is due to the increased salience of the Cause as the 'initiator' of change combined with the fact that moving entities attract greater attentional prominence (Tomlin 1997). A greater incidence of foregrounding of the Cause entity is therefore predicted over other entities, as it is not only the initiator of the act but also the only moving entity in the scene.

Foregrounding in non-linguistic communication

Although drawing and language are fundamentally separate modes of communication some evidence points to a shared conceptual process (Van Sommers 1989). Consequently, the act of communicating may affect which aspects of the event are foregrounded regardless of the output medium.

In drawing, or other non linguistic systems, the method of indicating the perspective or focus taken on an event may be evidenced and reflected by the order in which participants draw, or select, entities. By drawing one entity first it is placed in a position of prominence and this can cue the interpreter to the perspective taken by the drawer.

An extensive study by Gershkoff-Stowe & Goldin-Meadow (2002) set out to determine whether a natural order for describing events occurs in situations when no language is used. One aspect of the study compared the ordering of entities in 'crossing space' events between verbal and non-linguistic conditions. Participants viewed an event such as a doll jumping into a hoop and were asked to sequence three pictorial depictions of the event entities (the Stationary entity (S), the Moving entity (M) and the Action (A)). In half of the pictures (M) was portrayed in initial state whilst in the other half in the final state of the event. The participants were assigned into one of three groups (1) non-communicative 'self' condition, (2) 'Other' condition - construct a sequence for another to subsequently view and understand, or (3)

'Verbal' condition describing whilst sequencing the pictures. Results showed that there was a consistent order (SMA) for both of the non-linguistic communication conditions (1) and (2) for pictures depicting initial state. This differed from the linguistic condition (3) where predictably an MAS order predominated, following the normal linguistic output.   However the order of pictures in final state showed divergent results for the non linguistic conditions (1) and (2). In condition (1) the ordering of entities was the same as for initial state, SMA, whereas in condition (2) the order was predominantly SAM. These results tend to indicate that not only does non-linguistic communication lead to a different foregrounding of entities than linguistic, but that within non-linguistic output the act of communicating can also affect foregrounding of different entities. However these results cannot be reliably extrapolated to the current investigation as this project is looking solely at primary foregrounding in *caused* change of location events which were not the focus of the Gershkoff-Stowe study and the use of drawing rather than sequencing of entities.

1.4   <u>Caused change of location (CCL) events</u>

In order to communicate about CCL events information about three, essentially separate but, linked factors must be conveyed

i)   The participant entities involved

ii)   The roles they play in the event.

The labels that will be used in this investigation are:

The Cause – the initiator of the Act (often called the Actor)

The Theme – the entity that moves

The Source - the start position of the Theme

The Goal – the end position of the Theme

iii)   The temporal structure of the event.

To show a change has taken place, three sub-situations would need to be identified by the communicator: The ACT (initiation of change by the Actor, in this study referred to as the Cause); the PROCESS (the movement or path of the Theme); and the STATE (the final position or Goal of the changed location)

In language this would be conveyed in a sentence such as

The boy put	the book onto	the table
ACT	PROCESS	STATE

Within a CCL event the Cause takes an additional role depending on the starting position and direction of movement of the Theme. In *put/give* events the Cause has the additional role of Source, whereas in *take/pick* events the Cause is also the Goal. For the stimuli used in this study, the Cause is always the initiator of the act and consequently the only entity that moves.

When language is used to report on CCL events, the initiator (Cause) is usually foregrounded and the scene is presented from this perspective. To place the Goal or Theme more prominently, passive sentences have to be constructed and this is a cognitively more complex task.

1.5 Factors affecting foregrounding when communicating CCL events through drawing

A study by Sacchett (2005) explored the temporal ordering of entities in CCL events by adults with aphasia and controls when communicating through a graphic output medium. One aspect of her results revealed that patterns of ordering entities were affected by a complex interaction of conceptual factors, perceptual factors related to visual input, and constraints of the graphic output medium. This project will attempt to explore the interaction of the same factors and their effect on *primary* foregrounding of the Cause entity in CCL events.

Animacy

Animacy is a key conceptual factor that will be explored in this study. It is linked to causality in that events where animate and non-animate entities are present the animate entity is most likely to be the Actor (Cause). Consequently perspective is taken from this entity and it is more likely to be foregrounded.

Previous studies have demonstrated that when language is used to communicate about events, there is a natural preference for assigning the subject position in sentences to animate entities (Sridhar 1988, Langacker 1998) even if they are not the Actors. For example, in a sentence such as "The woman was run over by the train" although 'the woman' is the Patient she takes primary position in the sentence over the inanimate Agent 'the train'. One explanation of this is that animate entities are more conceptually accessible.

However the effect of animacy in foregrounding is somewhat less convincing in studies of non-linguistic communication. The Gershkoff-Stowe and Goldin-Meadow (2002) study discussed above, found that the stationary object, which was also usually the inanimate one, was generally ordered first. This may indicate that perspective-taking in graphic and visually based communication systems may be influenced by a different interaction of factors than those in language. However, as stated above their study did not depict caused change of location events nor did they use drawing as a method of communication, as will be used in this study and these factors may potentially produce different results.

This study will explore whether there is difference in foregrounding of the Cause between events where the only animate entity present is also the Cause (position change events) with events where two animate entities are present (possession change events), of which one is the Cause and the other is the Source or Goal. Sacchett's (2005) study did show an effect of animacy. She found that the Cause was more likely to be foregrounded in position change events than possession change events. She attributed this to the fact that conceptual cues to causality/ agentivity are less straightforward in possession change events when it could potentially be described from the perspective of either animate entity. In this situation she found foregrounding choices depended on

the degree of congruence between the two perceptual factors which will now be explored.

Perceptual factors

The visual nature of the stimuli used in this study throw up a number of potential perceptual factors which may influence foregrounding. Sacchett (2005) compared the drawing task with participants in both verbal and visual input modalities. Her results showed the Cause was drawn first 85% of the time in the verbal input compared to only 65% for the visual input. It therefore seems likely that in non-linguistic input other factors affect foregrounding. The interactions of Screen position and the start position of the Theme with other factors, including the output modality, will be explored here.

Screen position

When using language to communicate about visually perceived scenes, observers are most likely to start descriptions with the entity appearing on the left (Flores d'Arcais 1987).

The interaction of the variables of animacy and left/right position of agent and patient was explored by Hartsuiker & Kolk (1998) and showed additive effects of these variables. Their study demonstrated that when participants were shown a picture of an event with the agent on the left and asked to describe it, they were more likely to produce active sentences, i.e. the agent is given Subject position and consequently foregrounded. If the agent appeared on the right of the screen, the entity

on the left (the Patient) was given Subject position. This was especially significant if that entity was also animate. This may indicate that spatial characteristics of an event can influence the linguistic structure used to describe it. Sacchett (2005) also found that the position in which the event entities appear on the screen can influence foregrounding.

Start position of the Theme

An interaction of Screen position, directionality and causality was shown to influence foregrounding in Chatterjee et al's (1999) study. Participants responded more quickly to identify the agent when the Theme was moving away from the agent i.e. in *put* rather than *pull* events and particularly so when the agent was on the left of the screen. It would therefore be expected that the Cause entity is be more likely to be foregrounded when it also has the role of Source than when it is the Goal.

Graphic Output modality

The discussion, so far, has mostly looked at factors related to the visual input modality, but in this study an important factor that may affect foregrounding is the interaction of input with the output modality. In linguistic output, as discussed, foregrounding of some words over others is dependent on the language used and the rules that govern the permissible order which can convey meaning. In drawing the constraints are different.

Studies have shown in communication through drawing it is likely that perceptual and conceptual factors will interact with the constraints of the output modality and an entity that appears on the left of the screen is more likely to be given prominence and consequently drawn first. Chatterjee et al (1995) attributed this largely to a motor bias whereby right-handed people tend to start drawings on the left side of the page. A further study by Altman et al (2006) also looked at a potential bias for drawing agents on the left of a picture and compared the effect of orthographic directionality of the native language of two groups of participants, English-speaking (left to right) and Arabic-speaking (right to left)) . The results concluded that when no movement was detected in the event, agents were drawn on the right regardless of native language. However, when movement occurs, illustrations progressed from left to right, a factor Altman and colleagues attributed to asymmetrical hemispheric activation induced by language processing.

The interaction of these perceptual factors - left side prominence, combined with left-to-right direction of movement and an output motor bias would be expected to affect the temporal order of drawing. Therefore, when the moving Cause entity is on the left of the screen, it is predicted it will be foregrounded significantly more frequently than when it appears on the right.

1.6   Summary

This study will explore effect of perceptual and conceptual factors on the foregrounding of entities in caused change of location events using a

graphic output medium. Previous research has highlighted how event perception and conceptualisation can affect foregrounding in both linguistic and non-linguistic communication and how these variables can interact with a graphic output modality to increase the salience and consequently foregrounding of some entities over others.

2. **Methodology**

2.1 Aims of the Study

The main aims of the study were to:

i)   investigate whether primary foregrounding of the Cause entity occurs when visual input and graphic output modalities are employed to communicate a single, caused, change of location event.   It is anticipated that primary foregrounding of the Cause is likely to occur as it does in language due to its prominent role in the event.

ii)   investigate the extent to which primary foregrounding of the cause is influenced by perceptual and conceptual factors of the visual input stimulus.

iii)   investigate whether there was a greater tendency to foreground the Cause in scenes where a number of these variables acted together to increase its prominence.

The three variable factors being explored here are:

2.1.1 Screen Position: specifically whether the Cause appears on the right or left hand side of the screen in the video clips shown to participants. It is predicted that, in combination with the natural tendency to start a drawing on the left (van Sommers 1989), primary foregrounding of the Cause is likely to be enhanced when it appears on the left of the screen.

2.1.2 Event Type: either change of position of the Theme (where the Cause is the only animate entity present) or change of

possession of the Theme (where two animate entities are present). It is predicted that differences in foregrounding of the Cause between these two event types would occur. Where the Cause is the only animate object in the scene it is more likely to be foregrounded than other entities (Sacchett 2005, Hartsuiker & Kolk 1998).

2.1.3 Cause Role. The investigation will compare foregrounding choices when the Cause is the Source of the theme, as represented in *give/put-type* events, or the Goal of the theme, as is the case in *take/pick-type* events. It is predicted that the Cause is most likely to be foregrounded in *give/put-type* events.

It was also predicted that when a number of these factors converged together the Cause would be drawn first significantly more often than other entities.

2.2 Design

The study used a between-participants design to investigate whether primary foregrounding of the Cause was evident over all conditions. Significance was tested using a paired-samples t-test. Further analysis was undertaken to test for significant effects of the three variable factors. This was carried out using an items-as-subjects univariate ANOVA on an SPSS software programme.

2.3 Participants

A total of twenty-two adult participants took part in the study.

They were all native monolingual English speakers and were volunteers drawn from the investigator's acquaintances. The participants were from a range of educational and occupational backgrounds.

The volunteers included 9 men whose ages ranged from 28 -76 years and 13 women whose ages ranged from 22-73 years.

There were no reported incidences of neurological disorder, brain damage, mental health problems or depression within the selected volunteers.

To reduce the potential influence of confounding variables two stipulations of taking part in the study were that the participants should:

i)   be right-handed

ii)   not have undertaken any formal artistic training.

Written informed consent was obtained from each participant.

2.4   The Stimuli

The stimuli consisted of 32 digitised, animated video clips of 1-3 seconds duration. Each clip depicted a number of caused, change of location events that were originally created and used for a PhD thesis (Sacchett 2005). See Appendix 1 for a full list of stimuli. The video clips were completely silent with no auditory commentary or dialogue.

The three conceptual and perceptual factors being investigated were carefully controlled and evenly matched throughout the videos as follows:

- Screen Position: the Cause appeared on the left of the screen for 16 out the 32 videos and was counter-balanced across both Event type and Cause-role scenes.

- Event-type: of the 32 video clips 16 depicted a change in position of the Theme between the Source and the Goal with only one human participant and 16 showed a change of possession of the Theme between the Source and Goal with two human participants.

- Cause-role: within the two possible change of location events the role of the cause was also manipulated. 16 of the videos depicted *put/give-type* events in which the Cause was the Source. In the remaining 16 the Cause took the role as the Goal in *take/pick-type* events.

Each video clip could therefore include interacting conceptual factors as shown in Table 2.1 below

		Cause Role			
		Put/give-type events (Cause=Source)		Pick/take-type events (Cause=Goal)	
Event Type	Position change	Boy puts box on chair		Girl picks flower from vase	
		4 videos	4 videos	4 videos	4 videos
	Possession change	Boy gives vase to girl		Girl takes book from boy	
		4 videos	4 videos	4 videos	4 videos
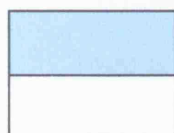
Cause appears on left

Cause appears on right

Table 2.1 - Interaction of Screen Position, Event Type and Cause Role in video clips.

The 32 clips were randomly ordered and were shown in the same sequence to all participants. (See Appendix 2 for order of stimuli) To avoid and reduce confounding visual/perceptual influences, extraneous visual factors were also controlled for, as far as possible, in the following ways:

i)   The same boy and girl were used in all the video clips. They were clearly identifiable as 'boy' and girl' by their clothing and hairstyles. This was to ensure no confusion could arise when participants were drawing change of possession scenes where both were present.

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ii) The gender of the Cause was balanced between the three variables, of Screen Position, Event type and Cause role

iii) All objects representing theme and Source/Goal in change of position events were selected to be readily recognisable and easy to draw e.g. table, vase, book.

iv) Only the entities participating in the event were included in the video i.e. the Cause, Theme and Source/Goal. The only exceptions to this were videos depicting *buy* and *sell* where a number of items were laid out in order to visually represent a choice of items within a shop/stall.

v) The Cause, Theme and Source/Goal were all fully visible throughout the clips.

vi) To ensure the Cause was easily identifiable, the action within the video clip was always initiated by the Cause whilst the Source/Goal entity was static or passive.

2.5 Apparatus

The clips were shown to participants on a 14" colour screen portable computer (Toshiba Equium A100-147).

Each participant was provided with 32 sheets of A5 paper, numbered to correspond with each video clip and with a reference number to identify each participant. A black fibre-tipped pen was supplied for participants to create their drawings.

2.6 Procedure

The investigator did not explain the purpose of the study to participants before they undertook the drawing tasks so as to avoid potentially influencing their performance.

The participants were provided with verbal instructions to "draw the main thing that they see happening in the video, as if trying to communicate it to another person". It was stressed that the drawings did not need to be of high artistic quality and that stick drawings should be used to represent the human participants in the video. The need to differentiate gender in their drawings was emphasised in order to enable the investigator to clearly identify the temporal order in which the Cause was being drawn.

The participants were also provided with a written instruction sheet (see Appendix 3) to give an example of the style of drawing required.

The consent form was signed at this stage and participants were given the opportunity to request further clarification or explanation if required. The participants watched the 32 video clips independently in quiet surroundings with minimal distractions. Participants were allowed to request repetitions of the video clip an unlimited number of times before drawing started but were not allowed any further repetitions after drawing had commenced.

The order in which entities were drawn was recorded by the investigator on a pre-prepared form.

2.7   Analysis of the data

Two different analyses of the data were carried out. The first calculated the total number of times the participants had drawn the Cause first using Microsoft Excel spreadsheet. The second investigated how the interaction of the three variables affected foregrounding of the Cause using an SPSS software programme.

3. **Results**

The Results are presented in two parts, the first the outlining the main results of primary foregrounding, the second detailing the effects of perceptual and conceptual factors and their interactions.

3.1 Primary Foregrounding

The results showed that the Cause was drawn first 398 times out of a possible 704 (56% of the time). Means totals showed that on average each participant drew the Cause first 18.07 out of a possible 32 times and therefore slightly more frequently than they drew either the Theme or Source/Goal first. To determine whether this difference was significant the data was entered into SPSS and a paired samples t-test was carried out. The results showed that the difference was significant (t= 2.25, df 21, p<0.05). This would support the hypothesis that primary foregrounding of the Cause occurs when visual input and graphic output modalities are employed to communicate caused change of location events.

3.2 Effects of perceptual and conceptual factors

Calculations showing the number of times the Cause was drawn first for each of the three variables; Screen position of the Cause (right vs. left); Event type (position change vs. possession change) and; Cause-role (Source vs. Goal) are detailed in Figure 3.1.
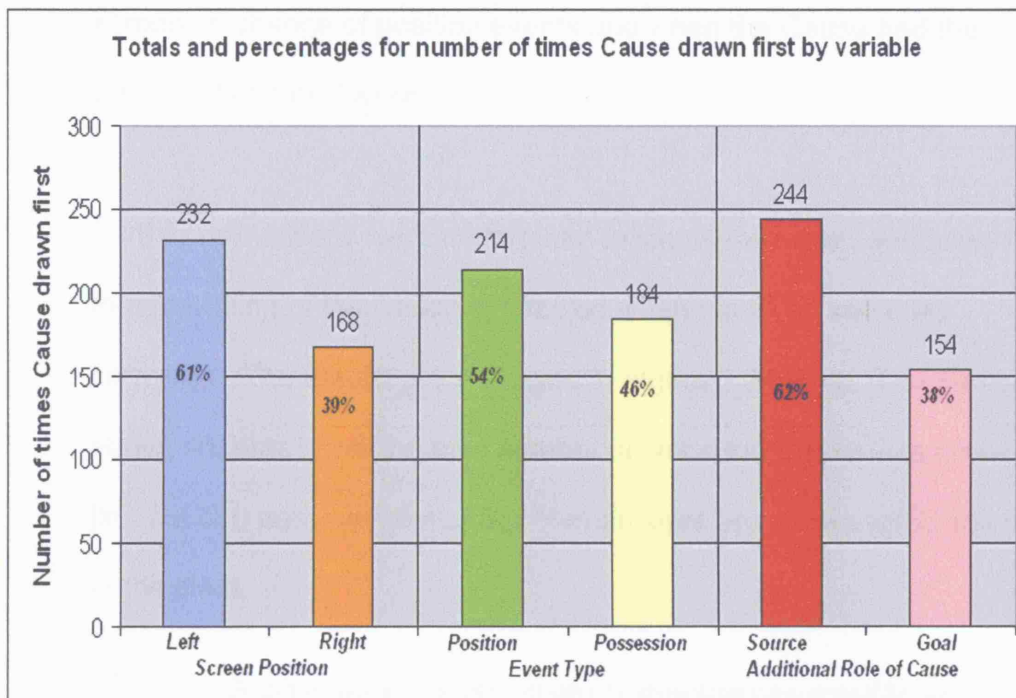
Figure 3.1   Totals and percentages for number of times the Cause was
drawn first across all variables

Using SSPS means and standard deviations were calculated for the

number of times the Cause was drawn first. (See Table 3.1)

Variables	Conditions	Means (SD)
Screen Position of the Cause	Left	10.55 (2.56)
	Right	7.59 (2.75)
Event type	Change of position	9.73 (3.38)
	Change of possession	8.18 (2.20)
Additional role of Cause	Source (give/put events)	11.09 (2.34)
	Goal (take/pick)	7.00 (2.76)

Table 3.1. Means for number of times cause drawn first with standard
deviations in brackets.

As is clear from Table 3.1, for each of the three variables, the Cause

was drawn first most frequently when it appeared on the left of the

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screen, in change of position events and when the Cause had the additional role of Source.

Further calculations were undertaken to identify whether, and how, foregrounding of the Cause is affected when the three variables converge. The results are displayed in Figure 3.2 below. The numbers above the bars show the total number of times the Cause was drawn first out of a possible total of 88. Percentages are shown within the bars of the chart.

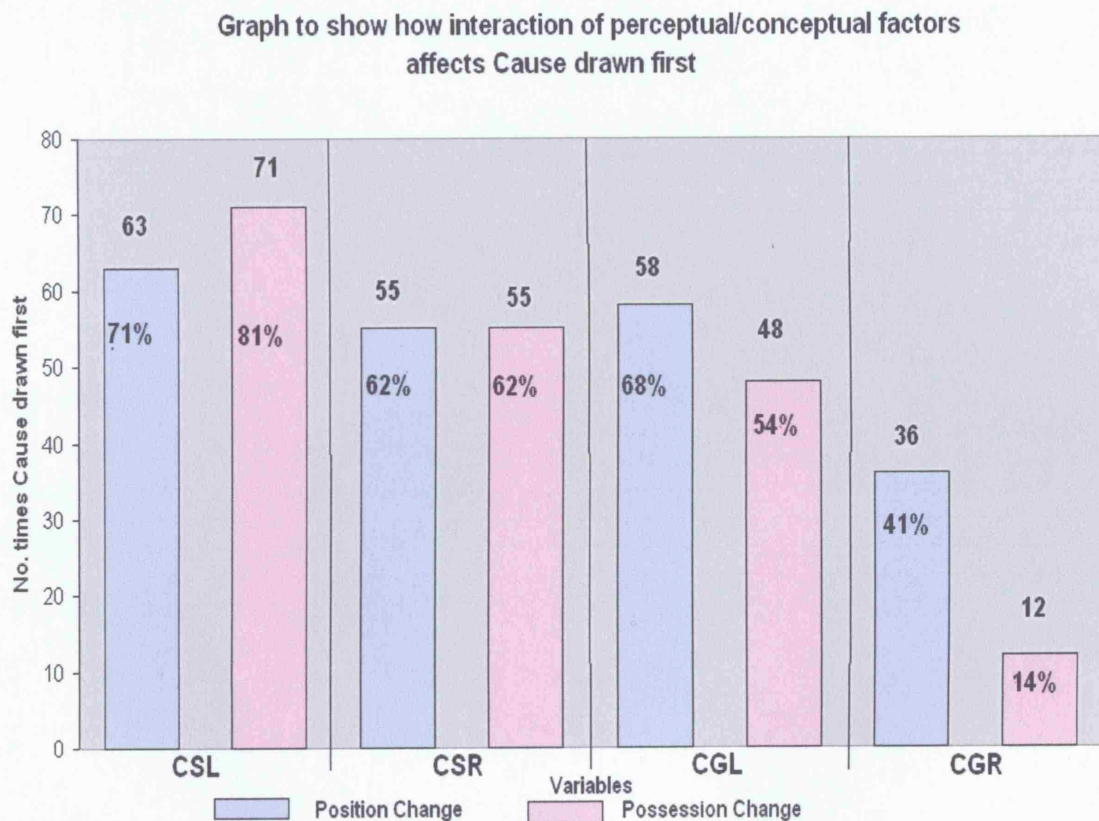**Graph to show how interaction of perceptual/conceptual factors affects Cause drawn first**

Figure 3.2

Key to Variables
CSL - Cause = Source, Screen Position Left
CSR - Cause = Source, Screen Position Right
CGL - Cause = Goal, Screen Position Left
CGR - Cause = Goal, Screen Position Right

To investigate the effect of the three variables in more detail an items-as-subjects univariate ANOVA was carried out with three between subjects factors: Screen Position (Cause on left vs. Cause on right), Event Type (position change vs. possession change) and Cause-role (Cause=Source vs. Cause=Goal). The dependent variable was the number of times the Cause was drawn first.

The results showed there were highly significant main effects for Screen Position ($F=16.99$, df=1, 32, $P<0.001$) and Cause-role ($F=23.07$ df= 1, 32, $P<0.001$). However no significant main effect was found for Event-type ($t=1.81$, df 21, ns).

There were also significant interactions between Screen Position and Cause-role ($F=4.47$ df=1, 24, $P<0.05$) and between the Cause-role and Event-type ($F=5.26$, df= 1.32 $p<0.05$).

The results of the main effects confirm the predictions that, independently, left screen position and the role of the Cause in *give/put-type* events (when Cause=Source) will lead to an increased incidence of Cause drawn first responses. However for this study the prediction that the number of animate entities will affect drawing of the Cause first has not been upheld.

3.2.1 Interaction of two variables

To understand the interactions between Screen Position and Cause-role, an interaction plot was produced. (see Figure 3.3).
The interaction plot shows that the Cause was foregrounded most frequently when Cause=Source and was on the left of the screen (CSL). The Cause was least likely to be foregrounded when it appeared on the right hand side of the screen and had the additional role Goal (CGR).

Estimated Marginal Means of cause_1st
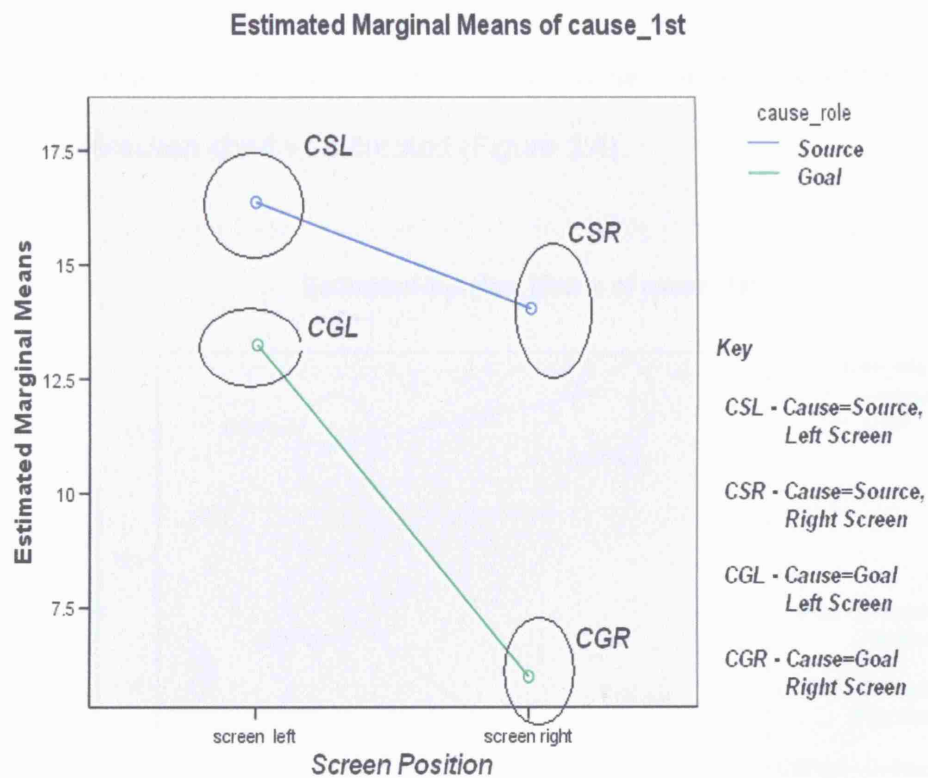
Figure 3.3

Post-hoc t-tests showed that there were significant interactions between CGL vs. CGR (t=4.29, df 7, p<.005), CSR vs. CGR (t=2.99, df 7, p<.05)

and CSL vs. CGL (t=7.00, df 7, p< 0.001. The interaction between CSL vs. CSR was not significant.

These results would indicate that when the Cause is also the Source it is most likely to be drawn first, *regardless* of whether it appears on the left or right of the screen.

However when the Cause is also the Goal it is <u>only</u> drawn first when it appears on the left of the screen and less likely to be drawn first when it appears on the right of the screen

To examine the interaction between Cause-role and Event-type another interaction chart was created (Figure 3.4).

Figure 3.4

This shows that the Cause is most likely to be drawn first when it is also the Source regardless of event type. When the Cause is the Goal it is more likely to be drawn first in position change than in possession change events.
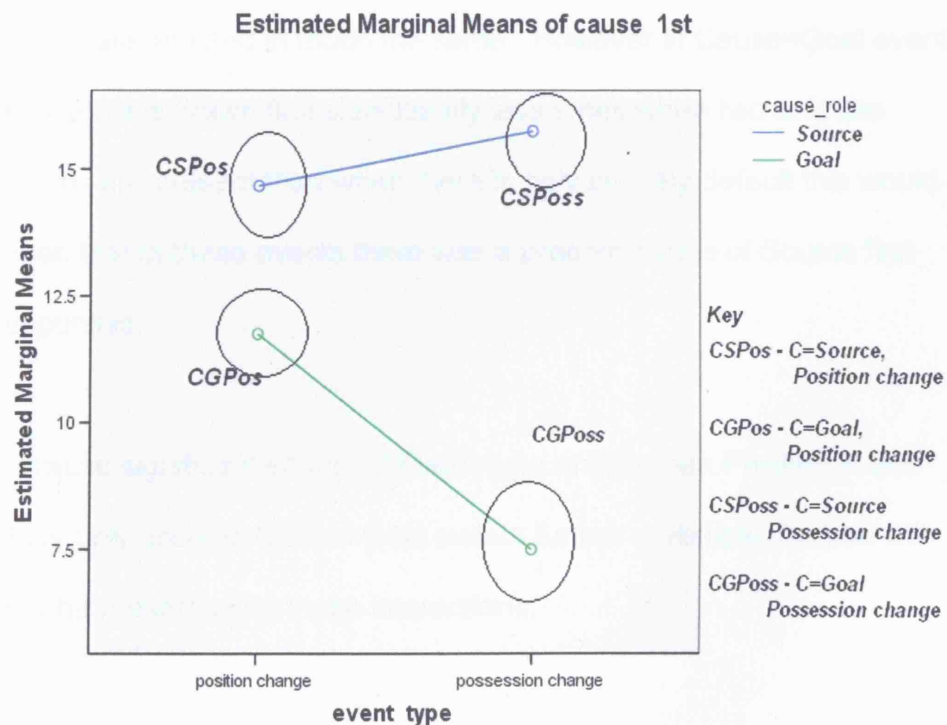
Post hoc t-tests showed that the only significant interaction occurred between CSPoss vs. CGPoss (t=3.15, df 7, p<.01). Other interactions CSPos vs. CSPoss, CGPos vs. CGPoss and CSPos vs. CGPos were not significant. Indicating that only in possession change events does the Cause role significantly affect Cause drawn first responses.

In Cause=Source events position change and possession change events are affected in much the same. However in Cause=Goal events the Cause is drawn first significantly less times when two animate entities are present than when there is only one. By default this would mean that in these events there was a predominance of Source first responses.

Because significant effects of Event-type and Screen Position in this study only occur in Cause=Goal events further statistical analysis will only be presented on these interactions.

3.2.2 Interaction of three variables

Post hoc t-tests showed that the effect of left Screen Position was only significant in Cause=Goal Possession-change events CGLPoss vs. CGRPoss ($t=3.44$, df3 $p<0.05$.). In other words when two animate entities are present the perceptual factor of left screen position makes the Cause entity more salient in CGLPoss events than in CGRPoss events.

Post-hoc tests for the effect of Event type revealed that this was only significant in Cause=Goal events when the Cause was on the right of the screen. CGRPos vs. GCRPoss. ($t= 3.28$, df 3 $p<0.05$).This would indicate that the number of animate entities is only an influential factor in heightening the salience of the Cause when perceptual factors of screen position and start position of the Theme conflict with the position and role of the Cause.

An explanation and interpretation of the results will now be presented.

4.   Discussion

This study set out to investigate whether consistent foregrounding of a specific participant entity in caused change of location events occurs, when communicating these events through drawing. The hypotheses, based on previous empirical and theoretical evidence, predicted that participants would be more likely to foreground the Cause entity or the Actor, in much the same way as occurs in language, due to shared conceptual processes. An integration of conceptual and perceptual factors was also predicted to increase causal prominence and promote foregrounding of the Cause in some events more than others.

4.1   Foregrounding of the Cause entity

As previously discussed (see Section 1.3), when viewing events for the purpose of communication, the tendency is to identify the actor or Cause and convey information about the event from their perspective. This provides a "viewpoint" or perspective from which potential interpreters can understand the event (Zacks & Tversky 2001, Griffin & Bock 2000, Black & Chiat 2003).

When visual input and graphic output modalities are employed, a temporal order in which the Cause is drawn first could signify such foregrounding and allocation of the position of primary importance to the Cause. The results of this study showed that overall the Cause was drawn first more frequently than the other participant entities in the scene and that this difference was significant.

This would tentatively support the hypothesis that a temporal order for non-linguistic communication may exist, (as proposed by Gershkoff-Stowe & Goldin-Meadow (2002) for non-caused change of location events) as, in over half the responses, primary prominence is allocated to the Cause entity. Thus graphic foregrounding of the Cause entity can be seen as a way of directing attention to the initiating Act component of these events, indicating an appreciation of their causal structure.

However, although primary foregrounding of the Cause was significant, it is clear that it is not foregrounded to the extent it would be if language was involved in either input or output, as Sacchett's (2005) results showed. It seems likely, therefore, that other factors affect the perception and salience of the Cause and consequently it's likelihood, or not, of being foregrounded over other entities.

4.2   Influence of Conceptual and Perceptual Factors on foregrounding

As previously discussed, communicating about caused change of location events will rely, to some extent, on a number of perceptual and conceptual factors (Zacks & Tversky 2001, Sacchett 2005, van Sommers 1989, Chatterjee 1995). It was therefore hypothesized that foregrounding of the Cause will be affected by an interaction of these factors.

The factors predicted to promote primary foregrounding were identified as:

a) Screen position: foregrounding the entity on the left (Altman 2006, Chatterjee 1995, 1999)

b) The initiator of the act: foregrounding the Cause.

c) The number of animate entities: effect of Event type.

d) The start position of the Theme: foregrounding the Source.

4.2.1. Analysis of Main results

The results showed that individually, as predicted, more Cause-first responses were produced individually for both left Screen Position (a) and start position of the Theme (d). However, contrary to the predictions and previous research (Sacchett 2005, Hartsuiker & Kolk 1998) the number of animate entities (c) did not independently affect the foregrounding of the Cause.

The main findings suggest that the start position of the theme (d) has the strongest influence on foregrounding the Cause entity. The results showed that when the Theme's start position is with the Cause (d) (Cause=Source), the Cause is most likely to be drawn first regardless of either the number of animate entities present (c) or left Screen position (a).

When the two factors of Screen position (a) and start position of the Theme (d) coincide with the conceptual factor of initiator (b), the entity they direct attention to is most likely to be drawn first. This was evidenced in CSL events, (see figure 4.1 below), where a high incidence (76%) of Cause-first responses occurred in both position change and possession change events.
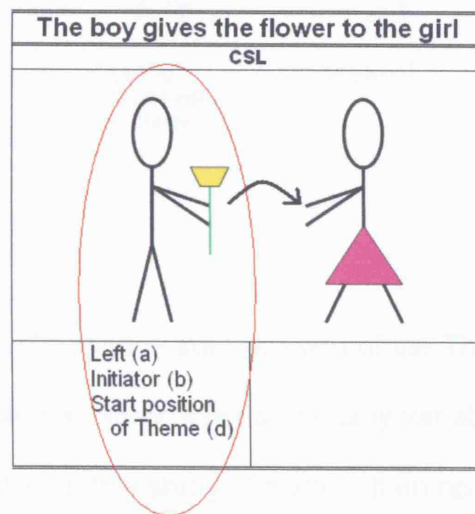
Figure 4.1

However when none of the variables coincide with initiator (e.g. in CGR events – see figure 4.2), a small number of Cause first responses occurs for both position and possession change events. By default this would imply a high number of Source first responses occurred and post-hoc examination of the data confirmed that it was very rare for participants to draw the Theme first.

It would therefore appear that when the conceptual factor of initiator (b) conflicts with the perceptual factors of left Screen Position (a) and start

position of the Theme (d) participants rely on these perceptual factors to focus attention and take a particular perspective on an event.

The boy takes the flower from the girl
CGR

Left (a)
Start position
of Theme (d)

Initiator(b)
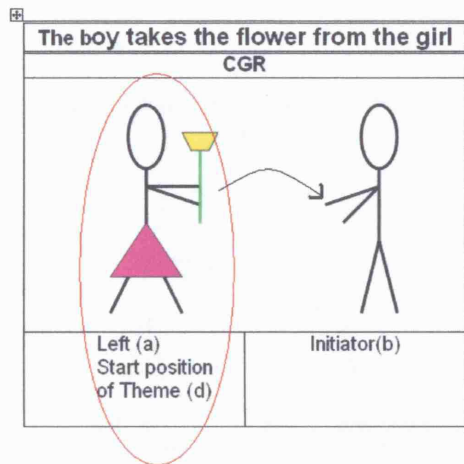
Figure 4.2

However, although the start position of the Theme appears to be a highly influential factor, it is not the only variable that affects foregrounding in this study. If it were, then no instances of Cause-first responses would be recorded at all in Cause=Goal events. This was clearly not the case. In fact the Cause was drawn first 44% of the time in Cause=Goal events and analysis of the results highlights the role of other factors that appear to influence foregrounding of the Cause.

Screen Position

In Cause=Goal events, Screen position (a) was clearly influential, with 60% of Cause first responses when the Cause was on the left compared to only 27% when the Cause was on the right. However further analysis

showed this was *only* significant in change of possession events when two animate objects were present.
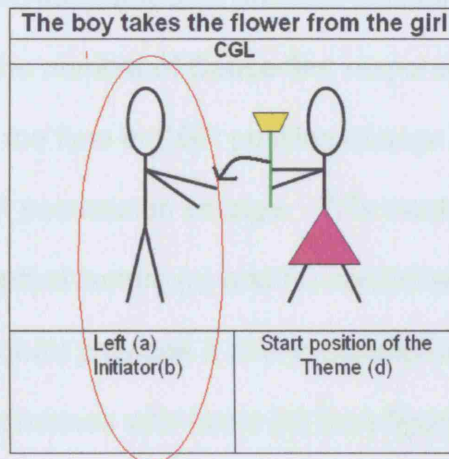
Figure 4.3

This would therefore indicate that when *two* animate entities are present, and the role of initiator (b) and screen position (a) coincide, the entity that they both direct attention to, is more likely to be drawn first than the Source. In other words, the interaction of factors (a) and (b) result in a predominance of Cause-first responses in change of possession events. So when there is potentially more than one perspective, as occurs when two animate participants are present, the role of the initiator does have some influence in directing foregrounding. This tentatively provides support for the claim that, when viewing an event in order to communicate it to another, the communicator's attention tends to be drawn to potential causes and the event is presented from that perspective (Griffin & Bock 2000, Zacks & Tversky 2001).

<u>Event type</u>

In Cause=Goal events when the Cause appears on the right-hand side of the screen, the number of animate entities is a significant factor in increasing the number of Cause-first responses. The Cause was drawn first 41% of the time in CGR position change events compared to only 14% in CGR possession change. This would support the claim that when perceptual factors (a) and (d) conflict with the position of the Cause, factor (c) provides a strong conceptual clue to agentivity. When this factor combines with factor (b) (see figure 4.4) it increases the attentional salience of the Cause entity, resulting in it being foregrounded more often than when two animate entities are present.

The boy takes the case off the chair

CGR

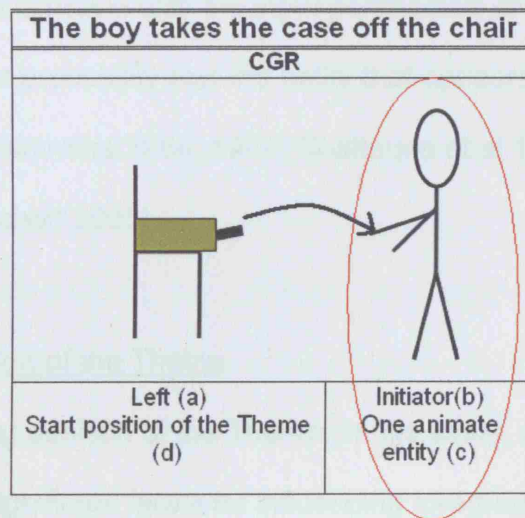| Left (a) Start position of the Theme (d) | Initiator(b) One animate entity (c) |

Figure 4.4

When the Cause (b) is not in a perceptually salient position (i.e. factors (a) and (d) are converging against it) the conceptual factor of animacy

may be a key variable which contributes to primary foregrounding of the Cause. This supports the results of the study by Sacchett (2005).

4.3 Explanation of Results

4.3.1. Influence of screen position

The influence of factor (a), screen position, illustrates the way in which the visual input modality interacts with the graphic output modality. As discussed in section 1.5 , there are potentially two aspects of the visual input/graphic output medium that interact to influence and constrain graphic output in English speaking, right-handed participants. These are; 'to graphically reproduce the same spatial positions of entities as they appear in the video' and 'to start drawing on the left'. When these two factors combine with the input perspective of screen position, there is a greater probability that the entity that appears on the left is drawn first (van Sommers 1984, 1989; Chatterjee et al 1995, Altman et al 2006, Sacchett 2005).

4.3.2. Start position of the Theme

The starting position of the Theme, in this study, appeared overall to be the most significant factor for influencing foregrounding decisions. More Source first responses were recorded regardless of the presence of other conceptual and perceptual factors as discussed above. This is most likely attributable to the complex interaction of the temporal

structure of events, a greater focus of attention on the ACT component of the event and the constraints of the graphic output modality.

It has been proposed that when communicating about dynamic events, perceptually more stable entities or "reference objects" (Talmy (1983) cited in Sacchett 2005), such as the Source or Goal, provide an anchor for the moving object, the Theme. The temporal order in which graphic communication occurs dictates that the 'reference object' is more likely to be drawn before the moving entity. (This was a key finding of the Gershkoff-Stowe & Goldin-Meadow study (2002) cited in the literature review for non-caused change of location events). Post-hoc inspection of data on the temporal order the three participant entities were drawn, shows that the Theme was never drawn first. This would confirm that drawing the 'reference object' first is a key factor in influencing foregrounding when using drawing to communicate.

The nature of caused change of location events means that the Theme entity moves and may be located with either of the *two* potential 'reference objects'. The decision of which 'reference object' the observer chooses to locate the Theme with, either the Source or Goal, is dependent on their perspective of the event. When this perspective is then constrained by the act of drawing cited above, observers have to make a choice to draw the Theme in either its start position (ACT) or end position (STATE) or somewhere between the two. Post-hoc

analysis of participant's drawings from this study indicated that the Theme was significantly more likely to be drawn at or near its start position than its end position (χ^2 = 71.46, df 1 p>.001.)

Therefore, by locating the Theme with the Source more often than with the Goal, participants in this study are focussing on the ACT component of the event and selecting the Source as the main 'reference object'. Consequently this entity is drawn first more frequently than any other.

4.4 Evaluation

There are, potentially, a few factors that may have inadvertently affected or biased the results of this investigation.

Firstly, twenty-two participants is a relatively small sample size for a study relying on statistical analyses. Consequently there is always the potential that if one or two participants have wildly different results from the others, their scores may skew the overall results. Individual participant's results were not subjected to rigorous analysis in this study, as statistical analysis used an items-as-subjects design with the perceptual and conceptual factors as variables, therefore identification of idiosyncratic results may have been overlooked.

Secondly, there were no trial items for participants to practice the process of conceptualisation and drawing. It was apparent from the tester's observations and notes, that for all participants, the process became faster and less repetitions were requested. This would indicate

the presence of a learning effect. This may be significant for the results because out of the first 16 videos, 10 featured the Cause as Goal (a factor that the results showed to be significant in making the Cause less likely to be drawn first).

Finally, observed reactions of participants also indicated that the video clips produced for the *buy/sell* events were possibly too complex and harder to conceptualise and communicate in drawing than other events. Participants appeared to spend a great deal of time drawing the 'items for sale' and consequently appeared to then have difficulty remembering the roles of the two participant entities. However, paring down the on-screen information to enable easier conceptualisation may make it harder to identify the events as *buy/sell* transactions.

4.5   Further investigations

This study has only looked very specifically at drawing CCL events in a communicative context which as, shown by Gershkoff-Stowe & Goldin-Meadow's (2002) research can produce different temporal ordering of entities than drawing in a non-communicative context. When drawing to communicate, temporal order and foregrounding is important to alert the observer to the perspective being taken but this would not be as important non-communicative situation. It may be that in non-communicative drawing or drawing in non-CCL events the position of

the Theme in either start position, end position or in transit between the two may differ from the results in this study.

This investigation has also only looked at the interaction of perceptual effects of screen position with right handed participants. It may be useful to observe if similar effects occur when left handed participants are asked to communicate through drawing. This may be relevant to clinical work with clients with aphasia as damage to the language centres in the left hemisphere of the brain can also affect right motor output. This with mean that many clients with aphasia who may use drawing to enhance communication will often need to use their left (non-dominant hand).

4.6   Clinical relevance

As previously mentioned drawing can be a useful communication tool for adults with aphasia (Lyon 1995, Sacchett et al 1999, 2002). In aphasia although spoken and written forms of language may be affected, visuo-conceptual forms of thinking may be retained and can be used to drive communication through drawing (Van Sommers 1989 cited in Lyon 1995). When using drawing as a mode of communication to compensate for reduced linguistic abilities, training both patient and communication partners is integral to a successful outcome (Sacchett et al 1999). As this study demonstrated, in cause change of location events control participants tended to draw the most salient aspect of an

event first. Whilst this may sometimes be the main instigator of change

this was not always be the case. Because drawings do not have verbs,

to alert others to the describer's perspective, relying on primary

foregrounding of a key entity when using drawing interactively could

provide important clues to perspective and assist in transmission of

information about potentially complex events. It could therefore be a

useful strategy to teach both parties that by drawing the most important

item first it can guide the attention of the observer to take the same

perspective on an event that the drawer is taking.

The results have shown that visually perceived input of activities in an

event combines with stored conceptual factors to make some entities

more salient than others. It has been suggested that some people with

aphasia may have problems with event perception in addition to

language problems (Black & Chiat 2000, Dipper et al 2005) Because

aphasia can affect individuals in different ways some individuals with

aphasia may have a greater impairment in accessing aspects of

meaning related to event structure and would consequently show an

increased reliance on bottom up perceptual factors when trying to make

sense of visual depictions of events (Sacchett 2005). This may have

implications for location of objects and participants on visual stimuli used

by therapists in clinical settings, both for testing and therapy tasks. For

example an object on the left of a picture or screen may be better

recalled than if it appeared on the right.

Additionally, as noted earlier in the discussion, the increased reliance on perceptual factors was shown to be particularly important in possession change events where roles are potentially reversible. As Dipper et al (2005) proposed 'paring down' of pictures/stimuli to limit the range and number of perspectives that need to be viewed in order to understand an event may help clients when communicating about visually perceived information.

4.7 Conclusion

This study has attempted to demonstrate that when top-down conceptual processes interact with bottom-up perceptual factors and the physical constraints of a non-linguistic output modality, the effects can increase the salience and foregrounding of particular entities. The temporal order in which the entities are drawn may therefore provide some indication about the drawer's focus or perspective on the event. A clearer understanding of the interaction between these factors is relevant to clinical practice when working with individuals with aphasia, particularly in view of the prevalence of picture-based tasks in assessment and therapy.

Word Count 8612

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APPENDIX 1

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

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Order video stimuli presented

1. Boy takes book out of box	CG	R	pos
2. Boy lifts box off table	CG	L	pos
3. Girls sells apple to boy	CS	R	poss
4. Girl gives cup to boy	CS	L	poss
5. Girl takes book from boy	CG	L	poss
6. Girl puts book on table	CS	R	pos
7. Boy picks case from chair	CG	R	pos
8. Boy puts box on chair	CS	L	pos
9. Boy buys book from girl	CG	R	poss
10. Girl takes ball out of box	CG	L	pos
11. Boy takes cushion off chair	CG	L	pos
12. Girl takes flower from boy	CG	R	poss
13. Boy sells book to girl	CS	L	poss
14. Girl picks apple from bowl	CG	L	pos
15. Girl puts vase on table	CS	L	pos
16. Boy takes apple from girl	CG	L	poss
17. Boy throws ball into bucket	CS	L	pos
18. Girl grabs case from boy	CG	R	poss
19. Girl takes flower from vase	CG	R	pos
20. Boy gives vase to girl	CS	L	poss
21. Boy takes box from girl	CG	R	poss

|			
22. Girl drops flower into bucket	CS	R	pos
23. Girl throws ball to boy	CS	L	poss
24. Boy grabs cushion from girl	CG	L	poss
25. Girl gives flower to boy	CS	L	poss
26. Boy drops ball into box	CS	R	pos
27. Boy throws ball to girl	CS	R	poss
28. Boy gives cup to girl	CS	R	poss
29. Girl picks vase from table	CG	R	pos
30. Boy puts cup on table	CS	R	pos
31. Girl buys apple from boy	CG	L	poss
32. Girl throws ball into box	CS	L	pos

INSTRUCTIONS

<u>What do I have to do?</u>

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

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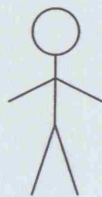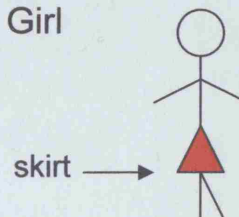
You can use arrows and other symbols, e.g. £, but **no written words.**