THE RELATIONSHIP BETWEEN VISUAL EVENT PERCEPTION, DISHABITUATION OF NEURAL MODELS AND PROGRESSIVE ASPECT IN ENGLISH

by

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Progressive aspect has traditionally been linked to notions of speaker viewpoint on conceptual structure - specifically, whether the speaker perceives an event as bounded or unbounded. The following research examines the cognitive structures of the mental representation that might underlay these conceptual notions, recasting viewpoint in cognitive terms. A cognitive model of information processing is presented, explaining processes of information parsing, message formulation and linguistic encoding as carried out by a functional grammar. In particular, we examine how the grammar uses the habituated or dishabituated states of neural models formed from sensory or memorial inputs in determining progressive or non-progressive message encoding. Hypotheses are tested by experiments based upon a paradigm in which

speakers describe visual stimuli while simultaneously watching them on a screen. This online paradigm allows us to approximate the speaker's mental representation, providing text-independent measures to compare against linguistic output.

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DEDICATION

To the Lord, Jesus Christ for His amazing and complex creations. I can only stand in awe. "Since the creation of the world, God's invisible qualities - his eternal power and divine nature - have been clearly seen, being understood from what has been made" (Romans 1:20). "We are fearfully and wonderfully made; your works are wonderful" (Psalm 139:14).

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CHAPTER I

MOVING TOWARDS A COGNITIVE DEFINITION OF PROGRESSIVE ASPECT

The following paper examines the distinction between progressive and non-progressive forms of the verb in English clauses. Classically, the clause has been viewed as the articulation of a speaker's basic conceptual structure at a given time. The use or non-use of progressive aspect has been linked to notions of speaker viewpoint on that conceptual structure - specifically, whether the speaker perceives an event as bounded or unbounded (Chafe, 1971; Comrie, 1976; Holt, 1943). The trend in recent linguistic research has been to provide cognitive explanations of the clause and its related phenomena. This is accomplished by appealing, not only to conceptual notions, but to the cognitive *structures* of the mental representation that give rise to the conceptual notions. The idea of "speaker viewpoint" provides a semantic-conceptual definition of progressive aspect. The ever-expanding bridge between linguistics and psychology provides the linguist with much greater access to the possible cognitive motivations behind linguistic form. The objective of this paper is to recast viewpoint in terms of a more specific cognitive definition that explains when the progressive is used and why it has the form that it does in English (copular auxiliary + present participle). Specifically, my goal is to demonstrate that the habituated or dishabituated states of neural models formed from sensory or memorial inputs provide a means for formalizing a concrete definition of aspect. This definition provides predictions that can be tested experimentally. The latter half of this paper provides empirical data from different types of analyses to support the definition. The experiments use the manipulation of visual stimuli on a computer screen to influence the construction of mental representations. These representations will be the basis for linguistic utterances using progressive or non-progressive forms. By understanding how the mental representation is built from the stimuli, we can better understand the relationship between mental representation and linguistic utterance.

Questions persistently arose while examining the data in Table 1. These questions formed the impetus of the following research.

TABLE 1. On-line Production of Subjects A and B While Watching "The Chicken Story"

Subject A	Subject B
I see a man in a field with trees.	The man walks in with shovels and a hoe
He has tools	
laying them against a tree	leans them up against a tree.
and one fell down	They fall,
and he picked it up.	He picks them back up.
Put it against a tree again,	He straightens things against the tree.
and bent over.	
And picked up --	
picking --	
he's *picking* up the wood	And picks up the hatchet.
and *carrying* the axe, to another location,	and walks over to the woodpile.
where there's a pile of, wood.	
He's pick-	
he's *picking* up the wood	Pulls out some wood,
and *chopping* it against another piece of wood,	and starts *chopping* at it ...
and *placing* those pieces in a pile next to him.	
He's *chopping* another piece.	He chops at the wood
And *continuing* laying it --	and s--tosses it aside
laying them next to him.	as he's done ...
He's *stopping*	
and *turning* around,	He turns around,
and sees a woman	to see a woman
walking towards him.	coming --coming to -- near him, to him.
And they're *talking* to each other.	She speaks, to him.
	He answers,
	apparently showing what he's done.
Total Number of clauses = 22	Total Number of clauses = 18
No. of present progressives = 12	No. of present progressives = 1
No. of simple present = 3	No. of simple present = 13

This data was taken from two different subjects who described the same film while watching it. As one can see, the subjects parsed the visual information in different ways, subject A using more clauses than subject B, with a substantial number of those clauses being progressive for A, but not for B. The questions that arise include: i. How does the speaker parse the incoming information in the first place? ii. How is this parsed information represented? iii. What relationship exists between the parsed information (the mental representation) and the clause? and iv. What relationship exists between the parsed information and the aspectual form of the verb? The answers to the first and second questions will provide the general theoretical framework by which the third and fourth questions can be answered.

1.1 The Need for a Cognitive Information Processing Model

The above questions appeal for an information processing model based on cognitive principles. Already, various researchers have taken broad cognitive approaches in explaining how clauses are formed, answering Osgood's (1971) question "Where do sentences come from?". Chafe (1977) discusses the *subchunking* of information - breaking down information using a schema as a guide. Eventually the chunks of information are propositionalized and articulated. Croft

(1991) refers to *causal chains* as a basic unit for clause structure. Clauses encode the underlying relationships between cause and changes of state. Osgood and Bock (1977) describe clauses as articulations of underlying *tripartite cognitions* made up of two entities (coded as subject and object) and the stative or active relationship between them (later encoded as the verb phrase). Miller and Johnson-Laird (1976) describe clauses as articulations of *events* and events are the types of changes that speakers talk about. Van Voorst (1988) states that clauses are verbal representations of events. Events are defined by *objects* in space-time that initiate and terminate the event. Fillmore (1968) looks at clauses as expressions of *relationship* between various *thematic roles*. Common to all of these approaches are two general assumptions: 1. the clause is a verbal representation of some mental representation or underlying structure existing at the time of utterance formulation and 2. the mental representation or underlying structure is an interpretation of real world information. Many of these approaches construe the characteristics of the mental representation from the linguistic utterance itself. However, it would appear that if the mental representation is an interpretation of reality, the place to start is with reality itself and how we process it.

1.2 Requirements of a Linguistic Production Model

Levelt (1989) outlines the requirements of a linguistic production model beginning from "reality." In the experiments of this research, "reality" is determined by the visual stimuli of the computer screen. From this reality, our model must be able to explicate the following three stages (Figure 1):

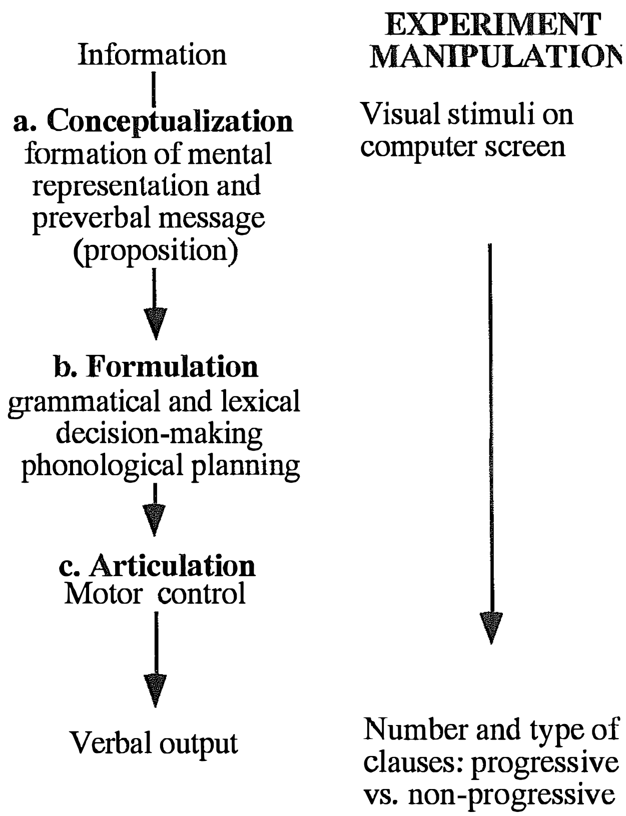


FIGURE 1. Components of a linguistic production model (Levelt, 1988).

A speaker utilizes the information at hand, forming a mental representation and preverbal message from that representation. The speaker then selects the linguistic forms that will be used to communicate the message. These selections are then verbally articulated by muscular manipulation of the oral tract (Note: I will deal only with the first two stages and the verbal output while ignoring the physiological details of verbal articulation). For example, from the data of subjects A and B above (in Table 1), I am interested in specifying how those subjects approached the real world information and how they formed their mental representations from that information. It is these mental representations that are used to form the preverbal message that will eventually be articulated. The differences between "He's *chopping* another piece" or "He *chops* at the wood" must exist in the mental representations (assuming that they speak the "same" language). The different *form* represents a different *function* in articulating a difference between mental representations. It is not just a correlation between a particular form and a particular mental representation. Rather, the mental representation determines what form will be used. The model must therefore formalize the deterministic relationships that exist between mental and verbal representations.

Because the verbal output is ultimately built from a particular mental representation existing at a particular time of formulation, the model must provide a localistic explanation. Such an explanation assumes mental representations are dynamic. The deterministic relationships operate upon the formulation of each specific utterance from a specific mental representation at a specific time.

1.3 Inferring the Mental Representation Using Visual Information

Defining deterministic relationships between mental representation and linguistic clause requires "getting at" the mental representation of the speaker. To rely only on the linguistic data would constrain us to infer the mental representation on a non-objective basis. As Osgood and Bock (1977) point out, it is for this very reason that few studies have addressed the question of "where do sentences come from."

> The difficulty has been primarily methodological - to devise controlled experimental procedures that maximize linguistic production variables and minimize linguistic comprehension variables, that is, to "force" subjects into Speaker rather than Listener roles. But if the subject is to be in a natural Speaker role, how is the investigator to exercise any control over what he is to speak about [that is exercise any control over the mental representation]? ... there are naturalistic methods by which the ideas to be expressed can be constrained across speakers without using linguistic inputs. One of these has been dubbed "Simply Describing" (Osgood, 1971) ... in which what is comprehended (and

> hence constrains what is to be expressed) is entered via non linguistic, perceptual channels.
>
> (Osgood and Bock, 1977:89)

A few researchers, including Osgood and Bock, have used the "Simply Describing" procedure employing the non-linguistic perceptual channel of vision. This research also employs the visual channel. The experimental paradigm requires that subjects simultaneously describe an animated film as they watch it (online production). Controlling the information in the animated film allows us to infer the information being used to build the mental representation - *not* from the linguistic description but from the animation itself. The online task reduces further processing of the visual information unlike a postview description which would allow the subject to rely on a further processed memorial representation. The animation medium permits the experimenter to manipulate different aspects of the stimuli such as temporal sequencing and availability, direction and speed of animation characters. The model of information processing (based on Tomlin, 1991) used in this experiment hypothesizes that the manipulation of these variables will govern the cognitive state of perceptual receptors (habituated or dishabituated) and the allocation of focal attention. Receptor state and attention allocation are then utilized in forming a mental representation of the real world. This mental representation is subsequently reflected in the clausal description thereby revealing its relationship to the mental representation of the animation. In this particular research, the manipulation of the visual stimuli is used to produce progressive or non-progressive forms.

1.4 Summary

The following pages will expand upon each of the stages found between the raw sensory information and the verbal output. We will begin with the cognitive characteristics of the sensory receptors and the perceptual system, examining the nature of the information that will be used to form a mental representation. From the mental representation, we will examine how information is extracted to form a proposition that will eventually be verbally articulated. Ultimately, the model will be used to explain what motivates the progressive/non-progressive aspectual distinction.

Chapter 2 presents the information processing model and explains how sensory information is parsed and organized to form a mental representation. Chapter 3 examines how the constructed mental representation is used to form a preverbal message that will eventually be articulated. Chapter 4 reviews current ideas concerning aspectual distinction and how the model is able to account for these ideas.

Chapter 5 explains the design of the films used to test the model and presents the results of the experiments.

Chapter 6 discusses the relevance of the results to the hypotheses presented in the previous chapter and cognitively recasts a number of present ideas concerning aspectual distinction. In addition, a brief summary of this research is presented.

CHAPTER II

THE PARSING OF INFORMATION

> The world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds -- and this means largely the linguistic systems in our minds. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it this way -- an agreement that holds throughout our speech community and is codified in the patterns of our language.
> (Whorf, 1956:213)

We use language to talk about what's around us or to communicate the abstract ideas from our minds. Thus, subjects A and B of chapter 1 used language to describe the film that they were watching. It is important to note that their description is not a description of the film but of what *they saw* in the film - their perceptions of the film. Thus language holds direct relationship to mental representation - not "reality." Mental representation, on the other hand, holds a more direct relationship to reality. This reality consists of the continuous flow of information that bombards our sensory receptors. I, as an experimenter, only have *direct access* to reality and the linguistic utterances that describe the interpretation of reality. In order to understand how verbal aspect is related to mental representation, I must also understand how we organize reality in order to produce a coherent mental representation - how we "cut nature up." By placing boundaries on the continuous flow of information, speakers are able to manipulate discrete units of information. In the following section, we will examine various proposals that describe how speakers might go about placing these boundaries. The last proposal is cognitive in nature, providing the cognitive means by which a mental representation is formed. In chapter 3, we will examine how this cognitively derived mental representation affects aspect.

2.1 Previous Ideas Concerning the Parsing of Information

2.1.1 Clark and Clark (1977): Experiential Chunking

A few linguists refer to the "cutting" process as "chunking." Clark and Clark (1977) refer to *experiential chunking* in which speakers propositionalize the flow of information. The "cut points" for the proposition are determined largely by *conceptual salience*, *verbalizability* and *pertinence*. Conceptual salience is defined in terms of the different

> 'joints', points of rapid change from one state to another, and 'intervals' in between those joints. . . people are also aware of states that continue with no change at all.. . . What gets turned into propositions

> are the joints, intervals and states that people experience. (p.238)

Verbalizability refers to whether or not the above joints, intervals or states "correspond to propositions that can be expressed in the language." Whether or not a chunk is pertinent depends on the task of the speaker. Together, these determine whether or not an experiential chunk will be propositionalized and eventually linguistically encoded.

2.1.2 Miller and Johnson-Laird: Change and Events

Miller and Johnson-Laird (1976) also link "change" to the conceptualization of an event. "Change" denotes "the perception that the pattern of stimulation at some particular moment is different from the pattern of stimulation at a preceding moment" (p.79). Events are the kind of changes that people talk about. They point out that all events consist of a change but not all changes are encoded as events.

2.1.3. Chafe (1977): Subchunking

Chafe (1977:215-246) refers to *subchunking* in which larger chunks of information are broken down into progressively smaller chunks until "some stopping point is reached." Chafe briefly refers to "salience" as a criteria for subchunking. He points out that salience is a complex phenomenon, involving unexpectedness, relevance, and other phenomena requiring further investigation. He also refers to subchunking as a process influenced by previously learned *schemata* or "stereotyped patterns." These schema provide the organizational structure for the incoming information and determine what is and what is not relevant. For example, the schema of "going to a restaurant" might include subchunks of "picking up your date, driving to the restaurant, checking in coats, waiting to be seated, ordering meals, etc." Once a speaker has arrived at an optimal level of subchunking, these subchunks can be propositionalized. The optimal level is determined by the schema itself. Thus, one would not subchunk the driving process in the above restaurant paradigm (one would not talk about "pushing the clutch in, letting off the gas pedal, etc." in a description of going to a restaurant).

2.1.4 Tomlin (1991): Series of Events

Tomlin (1991) suggests that speakers must first "bring order to the flow of activity before him by organizing into a network of events" (p.68). He defines *event* in traditional Gibsonian[1] terms - an event is a minimal change of some specified type wrought over an object or object-complex within a determinate region of space-time (Shaw and Pittenger, 1978).

The above approaches to the organization of information all appear to use *change* for slicing information. Newtson (Newtson, 1973; Newtson and Engquist, 1976) refers to these changes as "break points" - they break up the continual flow of information. Imagine a boy, a ball and a window. Imagine the boy walking up to the ball, bending over, picking up the ball and throwing it. Imagine the ball flying through the air and hitting a window. In this imagined scenario, large changes take place when:

(1) a. the boy changes from standing to bending
b. the ball changes location from on the ground to in the boy's hand
c. the boy's arm position changes from at rest to in throwing motion
d. the ball changes from being in the boy's hand to flying through the air
e. the state of the window changes from intact to broken

The perception of these changes is then used to chunk experience. Of course, we could attune ourselves to finer degrees of change as in:

(2) a. the boy changes from standing to bending
a1. the boy's knees change from straight to bent
a2. the boy's back changes from straight to bent
a3. the boy's arm goes from rest to reaching down

We might attune ourselves to these finer changes in slow motion replay or if asked to describe all body movements. Our cognitive model of information processing requires a mechanism whereby changes can be recognized and utilized in building a mental representation. It also requires a component in which only those changes that are "significant" are used in propositionalizing the mental representation construction. Such a model is presented in the following pages.

2.2 A Cognitive Model of Information Processing

A cognitive model that explains the relationship between language and mental representation must incorporate the entire process - from the presentation of the stimuli and detection of changes therein, to the task of the linguistic producer (whereby the degree of changes to be noticed is determined), to the formation of the linguistic utterance. Tomlin (1991) has formulated such a model adapting Cowan's (1988) model of information processing. The adaptation applies a condensed version of Cowan's model to the specific task of linguistic production. In the model presented here (Figure 2), I have taken the task-specific components of Tomlin and re-integrated them into an unabridged version of Cowan's model.

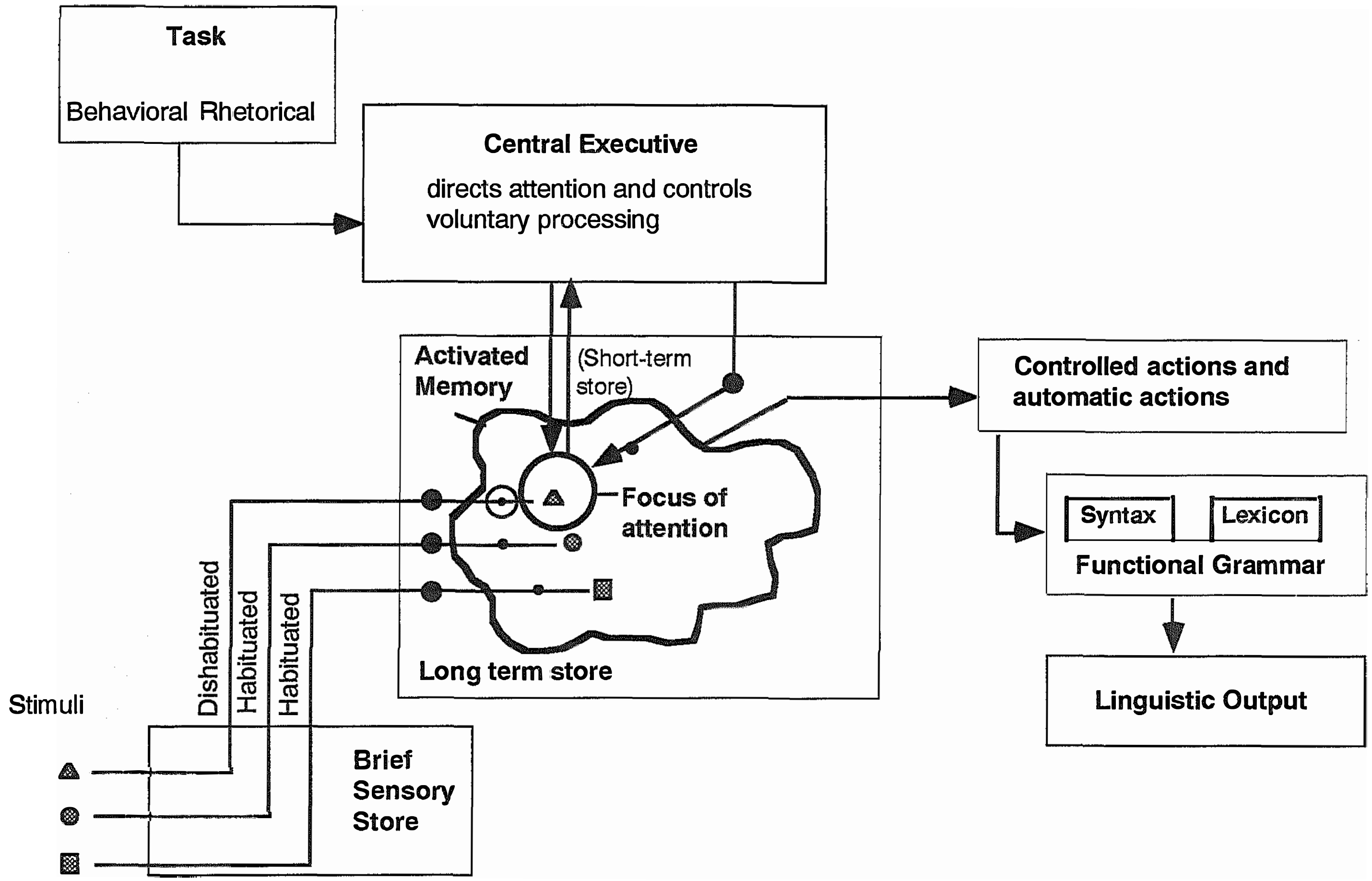


FIGURE 2. A cognitive model of information processing for linguistic production.

Here, I will briefly describe the different components of the model in terms of the experiment of this research. I will then provide a detailed explanation of the working of each component of the model.

2.2.1 A Brief Overview of the Model

Subjects are asked to describe animations while watching them on a computer screen. The animations are simple everyday occurrences such as: a man walking from his home to a restaurant, a bicyclist going by a tree and stopping at a light, an airplane flying through the sky, a boy throwing a ball at a window, and many others. The task of the subject consists of two components: behavioral and rhetorical. The behavioral task is to watch what is happening on the screen. The rhetorical task is to *describe* what they *see* occurring on the computer screen. It is the task that determines the degree of change that should be noted. The central executive takes the requirements of this task and allocates cognitive faculties accordingly. In the case of the experiment, it directs visual attention to the stimuli within the field of the computer screen (orienting the eyes towards the computer screen, foveating stimuli that are of interest). These stimuli are perceived by the sensory receptors which send the information to a very brief sensory store. Information is briefly processed here and then sent on to short term memory

- an "activated" subset of long-term memory. The central executive allocates focal attention to those stimuli that are most relevant to the task. Focal attention is the cognitive capacity which allows an organism to selectively process some information while not processing other information. This capacity enables an organism to respond to its environment and avoid "information overload." Because our task is quite general, most subjects reported only changes to "characters" (people, objects) on the screen and not the components of which they were made up (i.e. arms, legs, etc.). It is the task that instructed the central executive to attend to stimuli only to the level of "character." Focal attention is normally allocated to information coming from dishabituated receptors (changing and hence most "interesting and relevant") while unchanging stimuli do not receive the same degree of processing due to the habituation of their receptors. Thus, at the moment of a boy throwing a ball, the changing or dishabituated boy and ball will receive focal attention while the static or habituated window will not. The mental representation consists of this information (state of receptors, focal attention) that is in activated (or short-term) memory. From this information, a propositional representation or preverbal message is formed. The central executive directs this representation to the formulator where the rules of the functional grammar determine what lexical and grammatical forms will be used to verbally communicate the message. With respect to this research, it is at this stage that either the progressive or non-progressive form will be selected. These forms will then undergo verbal articulation - a controlled muscular action governed by rules that are phonological and biomechanical in nature.

2.2.2 The Importance of the Task

Because the verbal expression of progressives or non-progressives is dependent upon the earlier stages of the model, it is crucial that the task, one of the first stages, be clearly communicated to the subject in the experimentation of this research. It is the task which helps the central executive of the subject determine what information is and is not relevant. It is also the behavioral task that instructs the subject to describe online - to not rely on a processed memorial representation. If the subject does not describe while online, our knowledge of the structure of a particular mental representation is severely limited. This, in turn, limits our ability to determine any relationships between mental representation and aspectual form.

The influence of *task* on information parsing captures the ideas of Chafe (1977) and Clark and Clark (1977). Chafe notes that the salient information is allocated the most attention. *Salience*, Chafe states, is partially based on the speaker's preconceptions as to what is important and what is trivial while Clark and Clark note the importance of *pertinence* in experiential chunking. That information which is pertinent is often used to establish "cut points." The general task of "describe what you see" deems minute changes as non pertinent and trivial. Such changes will not be used in parsing the flow of information.

2.2.3 Granularity

Chafe's "optimal level" of subchunking is also determined by the task in that the task determines the *schema* with which the speaker approaches the information. For example, a sports announcer approaches instant replay with a different schema than "real-time" announcing. The schema of instant replay requires attention to a much finer level of detail and hence the description is typically much more detailed. Speakers can shift the process of conceptualization from a course-grained level of *granularity* to a fine-grained level *if finer details and distinctions become relevant* (Hobbs, 1985; Croft, 1991:163-4). These levels are partly determined by what the speaker wishes to talk about. What the speaker wishes to talk about is defined by the task. Thus the task itself helps the central executive determine what level of detail should be attended to. This in turn, affects which changes are and are not noticed - the changes that are used to parse the information.

Although not a part of this investigation, note that the model allows for a task that directs attention to long-term memories rather than to the perception of stimuli. The model provides the basis upon which both abstract thought and perceptual information can be linguistically encoded (Figure 3).

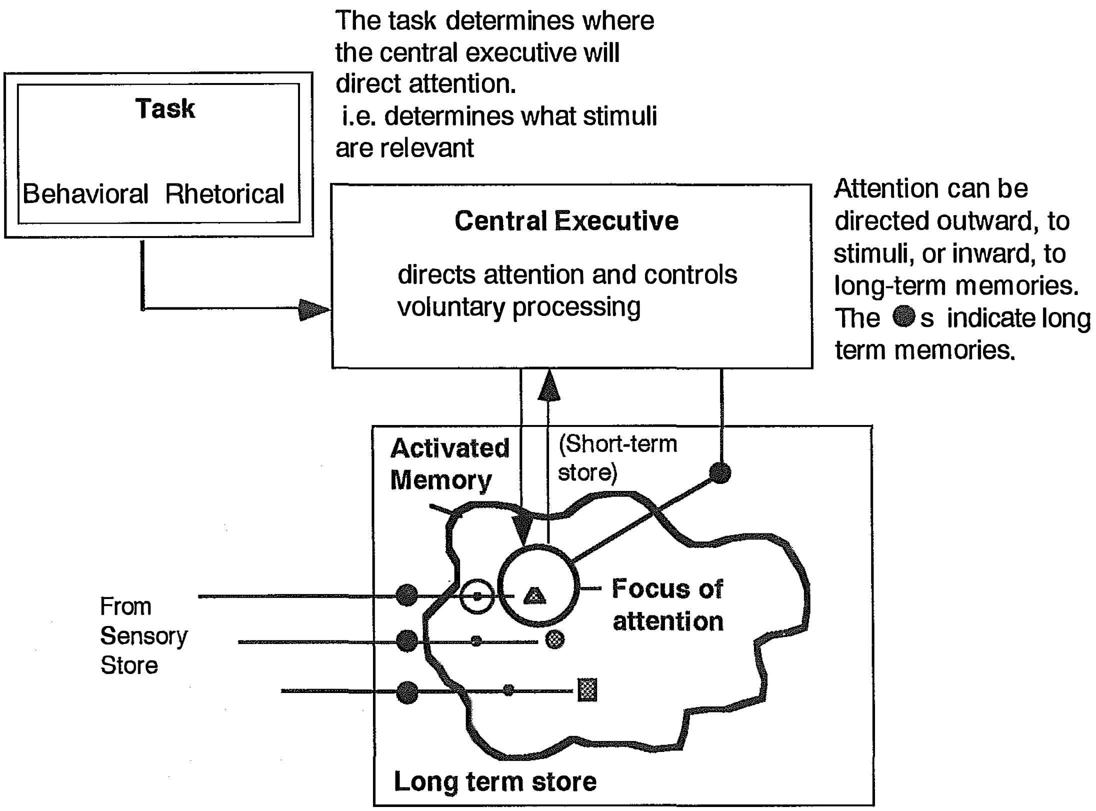


FIGURE 3. Summary of the interaction between the task component and the central executive.

2.3 The Nature of Sensory Information

2.3.1 Functioning of the Perceptual System

Once the task has been identified to the central executive, attention can be directed to the relevant stimuli. This is done by directing the necessary sensory receptors towards, in this case, the computer screen and the objects and occurrences taking place on it. The perception of the stimuli is accomplished by the receptors and therefore any information concerning the stimuli is in the form given by the receptors. Our model must be able to explain how changes in this information are recognized (i.e. how is the change from boy standing to boy bending recognized?) so that parsing can occur.

The following quote from Miller and Johnson-Laird (1976) briefly explains the underlying assumptions of much of the research being done in the area of sensory perception:

> . . . the perceptual system is designed to preserve information and discard redundancy. Things that change take priority over things that remain constant; constancy is expected, the perceptual system tries to minimize surprise; wherever possible, sensory changes are relegated to predictable states, so that the amount of unpredictable information that must be processed will not overload the conceptual system. Once the state of the world has been conceptually established, the perceptual system needs to report only the information required to update it, only the information about significant changes. (p.88)

2.3.2 Updating Information: Comparison Against Existing Neural Models of Predictable States

In accounting for these characteristics of the perceptual system, Cowan's model (1988) uses Sokolov's mechanism for updating information. Essentially, Sokolov states that unchanging stimuli are relegated to a predictable state (Sokolov, 1963). A neural model is produced with the unchanging receptor information. When changes occur, the organism *orients* itself to the changes to update the model. The orienting response is made up of both neural and physiological changes that respond to the detection of a novel stimulus (Ohman, 1979; Posner & Rothbart, 1980; Rohrbaugh, 1984; Sokolov, 1963). It directs focal attention to the changing stimuli and habituates to those stimuli that do not change or are insignificant to the organism.

> Sokolov suggested that the primary mechanism behind the orienting response involves the subject's neural model of the physical characteristics of the environment as the subject habituates to the stimulus. The incoming stimulation is compared to the already established neural model. If there is a discrepancy between the two, an orienting response to the discrepant stimulus is elicited. Any physical change in the unattended stimulation would produce a mismatch with the description in memory, which would result in orienting (dishabituation) to this stimulus channel.
>
> (Cowan, 1988:178)

2.3.1 Characteristics of the Orienting Response and Habituation

Pavlov labelled the orienting response as the "What is it?" reflex and believed it was responsible for the orientation of sensory receptors towards novel eliciting stimuli. By so doing, the receptors increase their sensitivity to the stimuli (Turpin, 1973:3; Pavlov, 1927).

Posner and Petersen (1990) have confirmed these early Pavlovian ideas. Visual orientation results in the foveation of stimuli - i.e. the eyes move in order that the stimuli of orientation are registered by the fovea. This results in faster response times (in reaction time experiments), greater electrical activity and reports of stimuli at lower thresholds. Orientation allows increased and more efficient processing to occur and is produced under one of these three conditions: (a) when there is a change in the physical characteristics of unattended stimuli, (b) when there is a stimulus of long-standing significance to the subject, and (c) when the unattended channel contains information that has been primed by recent context (Cowan, 1988:178). The result of orientation is the dishabituation of the sensory receptors. In the account of verbal aspect presented here, it is precisely *this* information that will determine the selection of progressive or non-progressive aspect. Specifically, reference to an established habituated neural model will be encoded with the progressive while relating the dishabituations to changes between models will be encoded by the non-progressive punctual form of a verb.

Present technology already provides objective methods by which to measure states of habituation and dishabituation: (a) vasomotor measures in which pulse measures or blood content and/or volume measures are made at different sites on the organism (typically the finger or the forehead); (b) electrodermal measures in which skin conductance is measured and most recently (c) event-related brain potential measurement in which electrical activity of the brain is measured using EEG caps or electrodes on the skull (Turpin, 1983; Rohrbaugh et al, 1990). A state of habituation is demonstrated by little electrical activity and "normal" volume or content measures. Changes in stimulation produce increased electrical activity and changes in the volume/content measures. Subsequent unchanging stimulation will result in decreased activity and shifts toward the "normal." The orienting response declines in amplitude and probability as a function of repeated presentations of the eliciting unchanging stimulus (Stephenson and Siddle, 1983:183). This lowering of sensitivity is habituation. Although not used in the experiments of this research, these electrical and vaso-cardial measures could be used to help us determine the state of information in the mind and their correlations with progressive or non-progressive aspect.

These measures would provide a more direct procedure of determining the nature of the mental representation than from the stimuli themselves.

Figure 4 below portrays the relationship between the stimulus change and dishabituation of the orienting response and sensory receptors. When a change in stimulation occurs, the orienting response dishabituates (represented by the white areas in the bar representation and peaks in the line graph of electrical activity). If no further change in stimulation occurs, the receptors habituate to the stimulation, forming a new model of the information. (The habituated state is represented by the black areas in the bar representation). If a number of rapid and different changes do occur, no new model is formed (as shown by C and D).

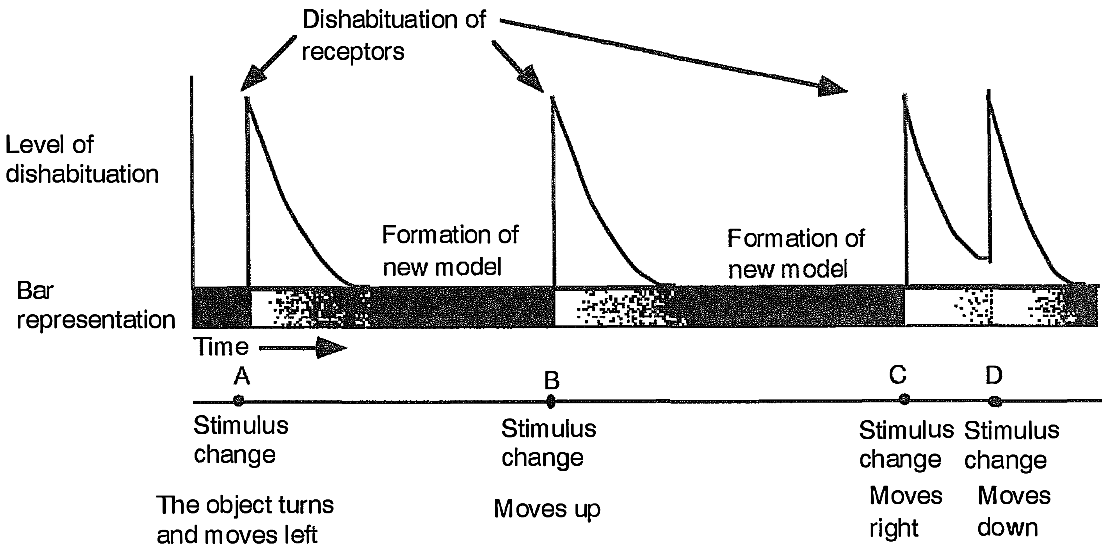


FIGURE 4. Stimulus change and its relationship to dishabituation/habituation of the sensory receptors.

From the results of previous research, we know that greater change in relation to previous stimulation produces increased amplitude in the resulting orientation response (Stephenson and Siddle, 1983:224). We also know that patterned stimulation (i.e. a light blinks three times and then stops; it blinks four times and then stops; repeat the pattern three blinks-pause-four blinks-pause over and over) is habituated much faster if the period of time between patterns is shorter. This time period is called the interstimulus interval (ISI). Stephenson and Siddle (1983:212) state that "short ISIs produce more rapid habituation in the short term since there is less opportunity for stimulus representation to decay from [the short term store] between stimuli." Figure 5 below is a representation of the level of dishabituation/ habituation existing during the perception of an object moving across a screen with patterned stimulation (zigzag movement).

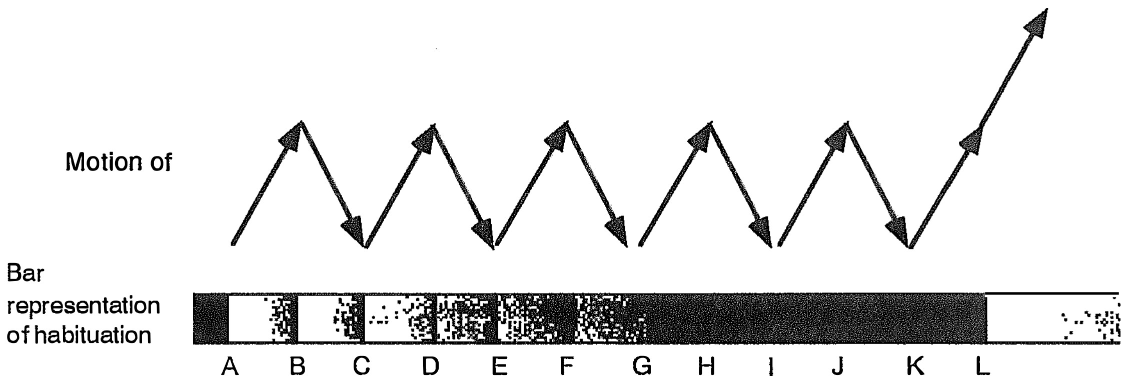


FIGURE 5. The relationship between patterned stimulation and levels of habituation.

At point A, a change is clearly apparent: that of now moving upwards to the right. At B there is clearly another change: that of now moving downwards to the right. However, as this pattern repeats itself, we find the receptors habituating to the movement. By points E-L, the receptors are completely habituated to the motion and the change in direction no longer causes dishabituation. Changes are therefore recognized only at A, B, C, and possibly D. At point L, a change is also recognized in that a discrepancy occurs when the pattern of the existing receptor model is broken. We see this occur often in everyday life and in the films used in the experiment. A person walking has many changes in it - the changes between one leg moving forward, as another one moves back and then the reverse of that. We quickly habituate to the walking motion due to our previous experience with "walking" and the regularity of the motion. A steady-state model of walking activity is quickly formed. One often habituates to incessant "background" noise only to dishabituate and attend to it when the noise disappears - when the pattern is broken.

In summary, given the formation of a model of stimulation, changes in stimulation will result in the dishabituation of the orienting response (characterized by greater receptor sensitivity and increased activity of the autonomic nervous system). Subsequent non-change will result in an updated model and habituation of the orienting response. Ideally, we could determine when a given speaker has recognized a change in stimuli by measuring the increased electrical activity due to the orienting response. We could then compare the presence of these dishabituations with the linguistic data and determine what relationships exist. Unfortunately, the equipment and the know-how to obtain and analyze EEG samplings of brain states are unavailable for this present research. In my experiment, I infer the dishabituation state of the receptors by referring to the pattern or change in pattern of stimulation itself.

2.4 Parts of the Mental Representation that Might be Linguistically Encoded

On the basis of the above functioning of the perceptual system, we see that the mental representation is made up of the interrelated parts in (3) (also shown within the amoeboid "activated memory" in Figure 6 below):

(3) a. Stimuli in activated memory: those stimuli that have been processed by receiving attention.
b. Focally attended stimuli: those stimuli that are receiving maximal processing due to orientation towards those stimuli
c. Neural model of stimuli: the model which is continually updated and embodies:
  i. the predictable states of the stimuli
  ii. the relationship between stimuli.
d. The dishabituations between neural models.

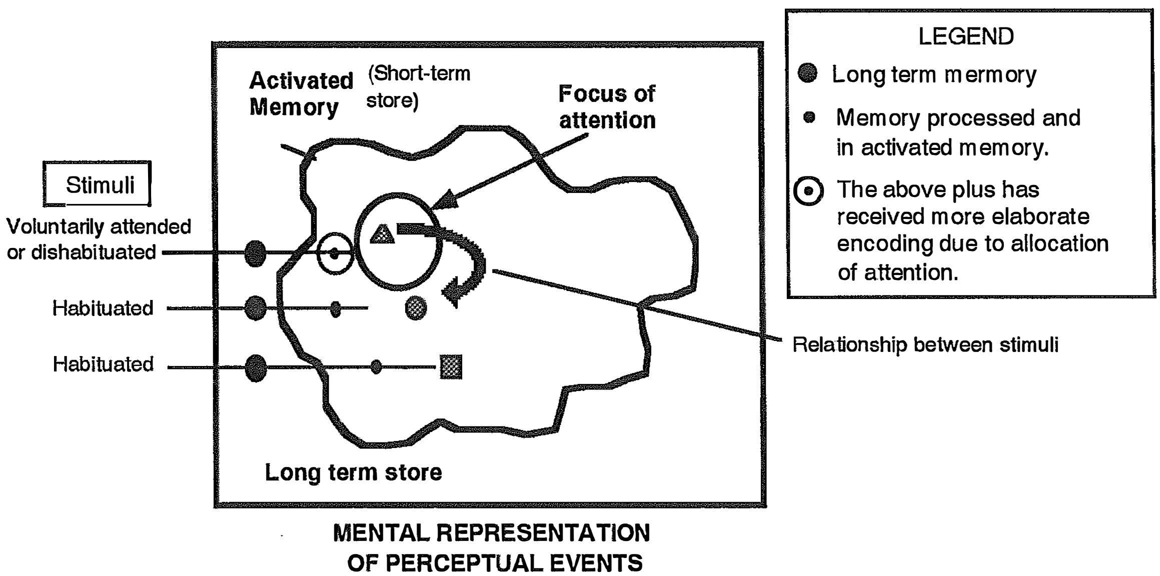


FIGURE 6. Components of the mental representation open to encoding in a language.

From the neural models and the dishabituations between these models, the speaker will extract information that can be propositionalized and linguistically encoded. The next chapter examines how these parts of the mental representation are propositionalized. The following chapter describes how propositional structures are then encoded - giving rise to progressive or non-progressive forms.

Notes

1. In this Gibsonian framework, perceptual changes delineate events, providing units in the flow of information (Shaw et. al, 1978; Warren and Shaw, 1985).

CHAPTER III

FROM NEURAL MODEL TO PROPOSITIONAL REPRESENTATION TO LINGUISTIC ARTICULATION

3.1 Production of Neural Models by the Perceptual System

The previous chapter described how information is processed by the perceptual system. The system, as noted, processes information coming from sensory receptors, forming a neural model on the basis of those stimuli in predictable states. The system recognizes model discrepancies and orients to those discrepancies so that the source of change can be more efficiently processed and the discrepancies more efficiently relegated to a predictable state or model. Thus, at any particular time that the brain is processing perceptual information, there exists a model of the stimuli in short term or activated memory. A portion of the information in this model is in focal attention, receiving maximal processing.

The actual forming of the model depends not only upon the stimuli, but also upon past experience and the task at hand. As noted before, the task helps determine which stimuli should be processed and at what level of granularity. Previous experience with similar stimuli will also affect model formation. A speaker introduced to a situation in which he/she has had no previous experience will have greater difficulty assigning the novel information to a predictable state. Previous experience facilitates relegation of information to a predictable state - to a particular neural model.

Stimulus information is thus perceptually parsed into a contiguous series of neural models separated by discrepancies to those models. For example, in the man picking up the axe scenario found in Table 1, we might find the following contiguous series of models (Figure 7):

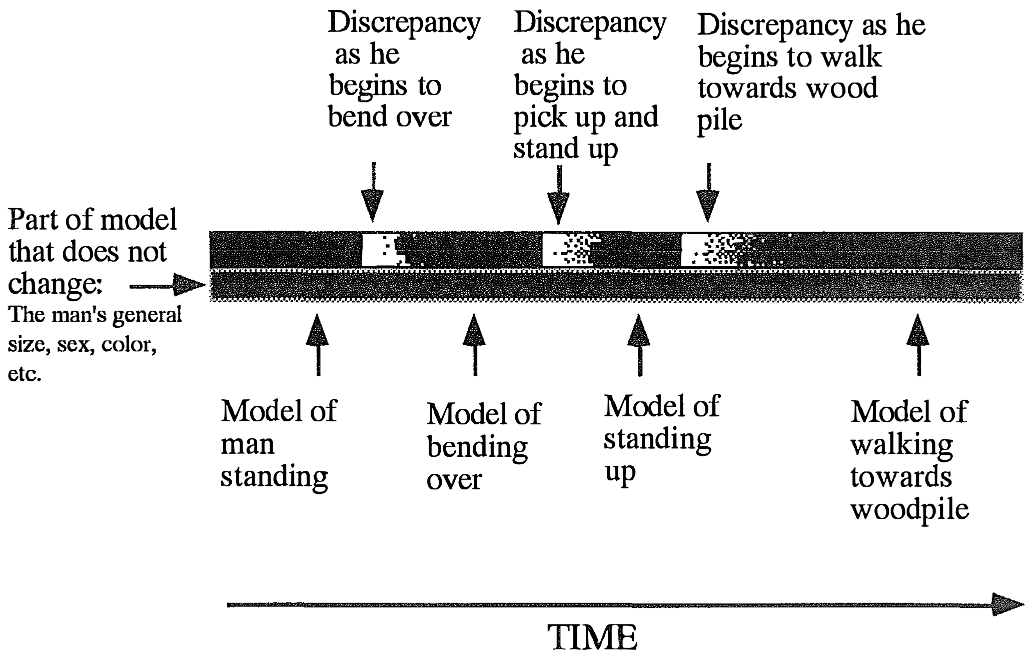


FIGURE 7. Contiguous series of neural models and dishabituations produced while watching a man pick up an axe and walk to a woodpile.

As one can see, this representation divides incoming information into a contiguous series of models separated by discrepancies with previous models. These models and discrepancies will provide the boundaries and chunks of information from which preverbal messages or propositions will be formed. The way in which the speaker propositionalizes the models and discrepancies will determine the eventual lexical/grammatical selection of progressive or non-progressive forms. The question now arises, "How does the speaker propositionalize these models?"

3.2 Propositionalizing Available Information

3.2.1 Chafe: Propositionalizing Objects, Events and Situations

Linguistically identifiable information must be extracted from these models. In order to do this, the information must undergo what Chafe (1977:215-246) calls propositionalizing. In this process, "objects" are differentiated from "events" and "situations." "Objects" are particular in space but not in time (time-stable) while "events" and "situations" are particular to both space and time (transitory).

With respect to the neural models mentioned above, "objects" are those stimuli that remain *essentially* the same - even through the dishabituations. "Events" are the changes that occur to those stimuli and "situations" are the neural models that exist at particular points in time. In Chafe's propositionalizing, the speaker decides on a propositional structure that will assign various roles to the objects involved in the situations and events. Eventually, appropriate words or phrases will be found to communicate the ideas of these objects, events and situations in a process that Chafe labels "categorizing."

3.2.2 Osgood and Bock: Event Cognitions

Osgood and Bock (1977) similarly capture the differences between objects, events and situations and how they are related propositionally in what they call an "event cognition." This cognition is defined

> as the representation in the OPERATOR of a perceptual event or linguistic sequence [as a listener] involving a single action or a stative relation between two perceived entities.(p.91)

The OPERATOR is what gives structure to the states, events and entities in the cognition. Schematically, they represent the event cognition as shown in Figure 8.

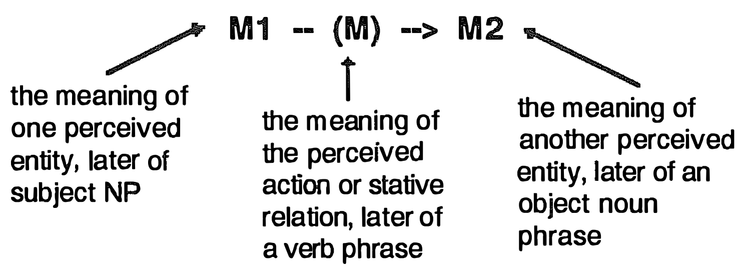


FIGURE 8. Event cognitions as represented by Osgood and Bock (1977:92).

Van Voorst (1988) uses a very similar representation for events, also grounding them in *objects of initiation* and *objects of termination* (Figure 9).

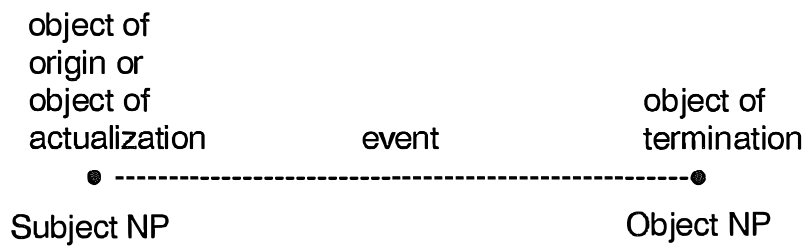


FIGURE 9. Event representation of Van Voorst (1988:10).

3.2.3 Tomlin: Forming EVENT Representations From Parameters and Change

Tomlin (1991) labels Chafe's "objects" and Osgood and Bock's "entities" as *parameters* - "the stable conceptual units with the *field*." The field is "the conceptual arena in which activity or change occurs" (p.68). In the experiment of this research, the field is the stage of the computer screen while the parameters are the objects or entities presented on the screen. *Actions* are those changes that occur to the parameters. As noted in chapter 2, Tomlin defines "event" as the change *wrought-over* one or more parameters. These changes and the relationships between parameters are identified by an arc between parameters, such as in Figure 6 above.

3.3 Cognitive Definitions of EVENT, PROCESS and STATE

Using the representation in Figure 4, we can cognitively recast the different propositional structures presented by the above researchers. In the next chapter, we will examine how these propositional structures or preverbal messages are then translated into linguistic utterances.

Objects, entities and parameters are defined by those units of the model that are relatively stable. Their stability is defined by their lack of change through dishabituations or model discrepancies. Thus, in the model of the man carrying the hatchet, the stimuli of man and hatchet form relatively stable units in the neural model - i.e. the man continues to have the same size body, head, etc.

Events and actions are defined similarly to the events of Tomlin. Uppercase letters are used to distinguish the formal definition presented here. An EVENT occurs when there has been a change of *state* wrought over one or more parameters. These changes are identified by the dishabituations caused by discrepancies with existing neural models. Tomlin (1987) uses attentional shifts to define episode boundaries. In this case, the dishabituations of the orienting response act as boundaries for the EVENT. Thus EVENT is defined as follows:

(4) EVENT: the conceptualized change that brings about the change of state between *any* two neural models (N_1 and N_2). Such a conceptualized change is always bounded by an initial dishabituation to model N_1 and a terminal dishabituation preceding model N_2. In some cases the initial and terminal dishabituation may be the same.

Note the emphasis of *any* in the definition. Thus, in Figure 10 below, a speaker may construe the activity during A, B or C as an EVENT.

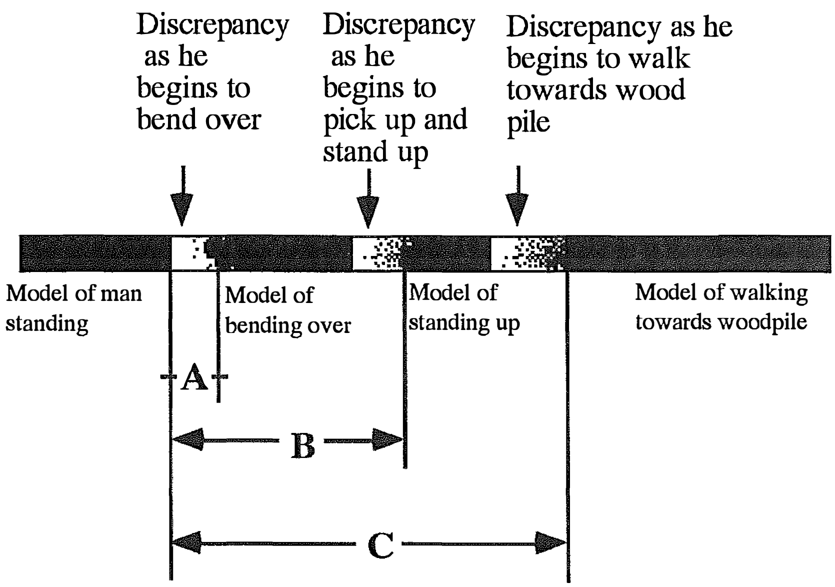


FIGURE 10. Possible EVENT conceptualizations.

There is a very quick change of state that occurs in A between the "standing" model and the "bending" model (i.e. "He bends"). The dishabituation which terminates the standing model is the same dishabituation which begins the bending model. The EVENT spans only one dishabituation. This is characteristic of those EVENTS that are truly "punctual"(e.g. "The twig snaps."). However, EVENTS can also be construed over more than one dishabituation as in B and C. In B, the change conceptualized in the EVENT involves the change of state from the standing model (N_1) to the point at which the new standing model (N_2) begins ("He bends over."). In C, the change conceptualized in the EVENT involves the change of state from the standing model (N_1) to the point at which the walking model (N_2) begins (i.e. "He picks something up." - involves bending, grasping, and standing back up). Which EVENT is chosen by the speaker is dependent upon the requirements of the task and the degree of change. It the task requires a greater degree of granularity, the speaker will construe each change as more significant (refer to previous section 2.2.3).

A speaker may also encode a particular neural model (represented by black) existing at any particular point in time. The conditions that prompt such coding will be discussed in chapter 4. There are two types of these models: temporary and time-stable models. As shown in Figure 7, time-stable models embody the time-stable aspects of the stimuli. For the character of the man in the film, these include his height, his sex, his shoe size, etc. The time-stability of these models is partially determined by previous experience.

In real time, a model in activated memory must begin at a certain time. It does not exist infinitely backwards and forwards in time. Experience captured by memory, however, extrapolates the beginning and endpoints of the model. For example, my previous experience with humans allows me to recognize that height, shoe size, etc. are traits that do not change quickly.

Temporary models represent the temporary situations (cf. Chafe's "situations"; refer to section 3.2.1) in which the man finds himself - the situation of standing, the situation of bending, etc. Models do not represent EVENTS. Rather, I propose the following definitions:

(5) a. PROCESS: a temporary representation (model) of a situation existing at particular point in time.

b. STATE: a relatively static and ongoing representation (model) of enduring states.

In propositionalizing the information, the speaker can refer to the change between models, or the models themselves, each being encoded by different verbal and aspectual forms.

CHAPTER IV

FROM PROPOSITION TO LINGUISTIC UTTERANCE

4.1 The Relationship Between Aspect, EVENT, PROCESS and STATE

EVENTS, PROCESSES, and STATES have cognitively definable structure and these structures have different verbal representations. In English, EVENTS are encoded by punctual verbs, while PROCESSES are encoded with the progressive form of the verb and STATES are encoded with stative verbs, in particular the copula. To be more precise, punctual verbs encode the action that brings about the change between two neural models; progressives encode the particular state of a temporary neural model at a particular time and statives, such as the verb "to be," encode states of relatively permanent models. The following sections below demonstrate how traditional ideas of aspect can be recast in the cognitive terms described above.

4.2 A Cognitive Recast of Existing Ideas Concerning Aspect

4.2.1 Chafe: Progressive Signals Lack of Known Endpoint

Like others, Chafe (1971) identifies the use of the progressive when the representation consists of an event or series of events that "are spread out over a period of time." These events are understood to be in progress with respect to the time axis indicated by the utterance (i.e. present: "He's picking up the wood"; past "He was picking up the wood"). More importantly, Chafe notes that:

> this period is not unlimited in extent but *is understood* to be subject to *eventual termination*. (Emphasis mine; p.175).

Thus, subject A, in using the form "he's picking up the wood" (Table 1), has a representation that conceptualizes the man as in PROCESS of picking up wood and that this process will eventually end. Subject B, on the other hand, has conceptualized the entire time-spanned event involving the picking up of wood. The event is no longer in progress - it has already terminated. Thus subject B uses the form "Pulls out some wood."

4.2.2 Comrie: Progressive Encodes Internal Structure Versus External Structure.

Comrie (1976:16) points out that the non-progressive form, "indicates the view of [the] situation as a whole" while progressive forms pay attention to the "internal structure" of the situation. The representation of subject A in "He's picking up some wood" refers to a specific point in time and space - the internal structure of the *situation* at hand. Subject B ("Pulls out some wood") has a representation that encompasses a span of time. The time-span is delimited by boundaries on both ends - it has external structure. A physical analogy might be a situation in which one is looking at red object very close up, so close that one can only see red and not its shape. From such a perspective, a person might only conceptualize the object's redness. Upon looking at it from a distance, the conceptualization may capture the identity of the object. The former looks only at the internal attributes of the object while the latter identifies the external boundaries of the object and hence the object itself.

4.2.3 Givón: Boundedness, Unboundedness of Activity

Givón (1984) similarly approaches the contrast between progressive and non-progressive forms. He states that progressive/durative/continuous aspect

> construes an event as having no initial or terminal boundaries. In contrast, the punctual aspect construes an event as having such boundaries.(p.274)

4.2.4 The Cognitive Recast

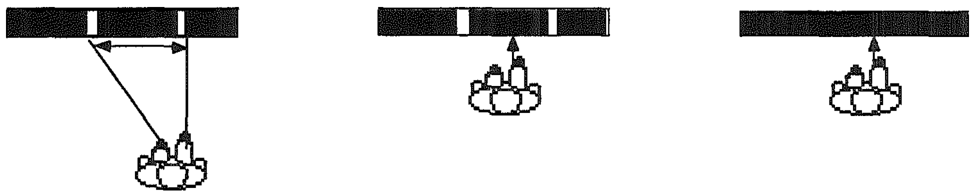
The three views above provide a general summary of the semantic notions believed to be a part of viewpoint and how they affect aspect. These ideas are summarized in Table 2 below:

TABLE 2. Summary: Characteristics of Progressive and Punctual Aspect

Punctual aspect	Progressive aspect
Complete, whole unit	In progress but eventual termination
External	Internal
Encompasses span of time	Refers to a point in time.
Bounded by initial and terminal boundaries	Unbounded

The perspective of this paper links the general semantic notions of the above to specific cognitive structures. Punctual aspect *is* bounded and those boundaries are provided for by model discrepancies/dishabituations. The viewpoint is external because it requires access to both initial and terminal boundaries requiring the speaker to conceptualize a span of time. The speaker must step back from a specific point in time and view past, present and future to conceptualize the event bounded by the discrepancies found at different points in time. Progressive aspect is unbounded referring only to the state of a temporary model at a particular point in time - an internal perspective. Statives similarly internally refer to the state of a model at a particular point in time, but that model is understood to be more permanent. Figure 11 illustrates these different conceptualizations.

USING THE PERCEPTION OF:	Changes between models	Temporary models	Permanent models
CONCEPTUALIZATION	EVENT	PROCESS	STATE
PERSPECTIVE			



CHARACTERISTICS	Bounded External structure Time-span Complete, whole	Unbounded Internal structure Point-in-time In progress	Unbounded Internal structure Point-in-time State
LINGUISTIC VERB FORM	Punctual 'He picks up some wood.'	Progressive 'He's picking up some wood.'	Stative 'He's a black man.'

FIGURE 11. Conceptualizations from the contiguous series of neural models and their possible linguistic encodings.

In the next section, we will examine how we can manipulate stimuli to influence the forming of propositional structure or the preverbal message and its eventual encoding with progressive or non-progressive aspect.

4.3 Manipulation of Stimuli to Produce Progressive Versus Non-progressive Forms

The real test to the validity of these cognitively based definitions is whether the predictions resulting from such definitions hold true. In this section, I will present a number of predictions that the definitions make and how they can be tested. The formal experimental designs and their results will be presented in the next chapter.

4.3.1 Aspect and Trains

According to the definition presented here, EVENT conceptualization requires an external perspective - the speaker must have access to the initial and terminal boundaries of the event. As already established, these boundaries are determined by dishabituations or discrepancies in neural models. Such access does not *insure* that a speaker will use the non-progressive form. The speaker may still refer to a particular model at a particular point in time. However, it is the position of this paper that given access to both boundaries, the speaker is much more likely to encode an EVENT.

The speaker must also have as part of his lexical inventory, a word that encompasses the boundaries as an EVENT. For example, a person who has no sports experience is unlikely to verbalize as many EVENTS as an expert in a particular sport. The expert is familiar with EVENT labels and the boundaries associated with them.

Manipulating stimuli in such a way to motivate PROCESS encoding over EVENT encoding requires limiting the speaker's access to EVENT boundaries - to neural model discrepancies. Picture a person watching a series of trains go by. Each train represents a neural model and each train is separated by an empty space of 10 meters which represents dishabituation to the model. The person watches train A go by. It is a very short train consisting of three cars. He conceptualizes it as a train with a beginning and an end - as an EVENT. Train B is coming and is also short consisting of ten cars. Even before the last car passes in front of him, he conceptualizes the train with a beginning and an end because he can see the caboose coming - he can easily predict the terminal boundary. Again he conceptualizes it as an EVENT. Train C is very long, consisting of more than 200 cars. The viewer is not able to see the end of the train but knows that it will eventually come. He conceptualizes it as a PROCESS because he does not have access to the caboose - the terminal boundary.

Now imagine that same viewer looking through a hole in fence right next to the tracks. He can only see straight in front of him. Train A goes by. The distance between the engine and the caboose is short enough that he is able to put the two together to form an EVENT conceptualization. Train B is somewhat too long however. Its caboose cannot be seen through the hole in the fence; thus, the viewer conceptualizes a PROCESS. Train C seems unbearably long through the hole and again a PROCESS is conceptualized.

The illustration is simplistic but demonstrates that we can limit access to initial and terminal boundaries in two ways. The first is to make the train longer. We do this by animating stimuli in such a way that a neural model exists for a longer period of time - to make an activity more durative. The second method is to force a perspective that only allows access to a small part of the train for brief periods of time. We can do this by producing animations that have smaller "fields" of view reducing the access of the speaker to parameters on the screen. Change or dishabituation is measured against parameters in the field of view. Without an entity to measure change against, no change can be recognized. In the boy, the ball and window scenario (section

2.1.4), the lack of a window might hamper the speaker's ability to predict the endpoint of the throwing event.

Givón's (1984, section 4.2.3 above) notion that progressive aspect is used to encode those actions that are more durative is explainable in the cognitive terms presented here. Longer predictable activity forms a neural model that exists for a longer time, restricting access to both initial and terminal boundaries of the model - thus hampering an EVENT conceptualization. Osgood and Bock's (1977) and Van Voorst's (1988, section 3.2.2 above) idea of EVENTS finding their termination in parameters or objects is also captured in the cognitive terms presented here. Our cognitive definition terminates EVENTS in parameters as well, *if* those parameters were the objects against which a model discrepancy occurred. By limiting access to those parameters, the speaker is less able to predict a forth-coming terminal boundary in an "object or parameter of termination."

4.4 From Stimuli to Utterance: A Summary

Our cognitive model of information processing and linguistic production begins at the stimuli themselves. The stimulation affects the building of neural models. Changes in stimulation cause discrepancies or dishabituations to pre-existing neural models of predictable states. These model discrepancies are used as "cut points" or boundaries for chunking information. From the neural models, information is extracted to form a proposition or preverbal message. The functional grammar of the language then chooses those lexical and grammatical forms appropriate to express the message. Chunks of information can be propositionalized as EVENTS if that chunk embodies the changes that occurred between two neural models (the chunk is bounded on both sides by a dishabituation). PROCESSES are propositionalized when a speaker refers to the state of a temporary neural model and STATES are propositionalized when a speaker refers to the state of permanent neural model. By creating animations that reduce access to terminal boundaries, we can increase the probability of PROCESS conceptualization over EVENT conceptualization. EVENTS are articulated with non-progressive punctual verbs while PROCESSES are articulated with progressive verbs (in English). STATES are articulated with stative verbs.

CHAPTER V

EMPIRICAL STUDY

5.1 Association Between Use of Memorial Representation and Aspect

5.1.1 Hypothesis

This section and section 5.2 describe two analyses based on the data mentioned in section 1.0. These analyses demonstrate the cognitive principles above without direct manipulation of the stimuli.

The online production paradigm mentioned in section 1.3 forces speakers to use only the information at hand. A postviewing production paradigm allows speakers to rely on their memorial representation, providing the speaker with a memory of all significant models and the dishabituations in between them. The speaker therefore has the boundaries necessary to form EVENT propositions rather than PROCESS propositions. In comparing the two types of productions, we would expect the following:

(6) Postview production allows a speaker to access memorial representations with both initial and terminal endpoints of EVENTS available. EVENTS

> are encoded with punctuals. The discourse produced in postview production will therefore exhibit a greater frequency of punctual verbs and a reduced frequency of progressive verbs as compared to the discourse produced in online production.

5.1.2 Subject Task and Data Collection

The following task was given to subjects for the analysis in this section and in section 5.2 below. Subjects were asked to watch a short 6 minute film[1] twice. The first trial allowed the subject to practise the task of describing the film while watching it (on-line production). This data was not analyzed. The second trial required the subject to once again describe the film while on online. This second set of online data was analyzed. In addition, subjects were asked to recount the story of the film from memory (postview data). The descriptions of both online and postview productions were tape recorded and transcribed on a clause by clause basis. A clause was defined as any utterance that contained a verb (main clauses, relative clauses, complement clauses).

Clauses with the verbal gerund "*-ing*" were recorded as "progressive." This included verb forms that did *not* have the copula "to be" associated with it. These often occurred in relative and adverbial clauses as in (7) below. Clauses with "*-ing*" gerunds were also recorded as progressive if they were preceded by an inchoative verb as in (7c):

(7) a. Okay, the man, you see a man *walking* out.
b. He chops at them, *throwing* them aside as he's done.
c. ... [he] *starts chopping* at it.

I recorded these "non-standard" progressives as progressives primarily because it is the "*-ing*" morpheme that makes reference to the neural model (refer to section 6.3)

5.1.3 Results

Table 3 and Figure 12 compare the use of progressives as found in online and postview texts. In general, we find what we expected - progressive is used less in postview production than online production. Only in subject 3 do we find a reverse relationship.

TABLE 3. Online Versus Postview Usage of the Progressive

SUBJECTS	ONLINE		POSTVIEW	
	PROGRESSIVE	TOTAL CLAUSES	PROGRESSIVE	TOTAL CLAUSES
Subject 1	82 (62%)	132	7 (12%)	60
Subject 2	26 (21%)	124	8 (13%)	63
Subject 3	12 (11%)	109	20 (16%)	127
Subject 4	51 (36%)	142	14 (14%)	100
All Subjects	171 (33%)	507	49 (14%)	350

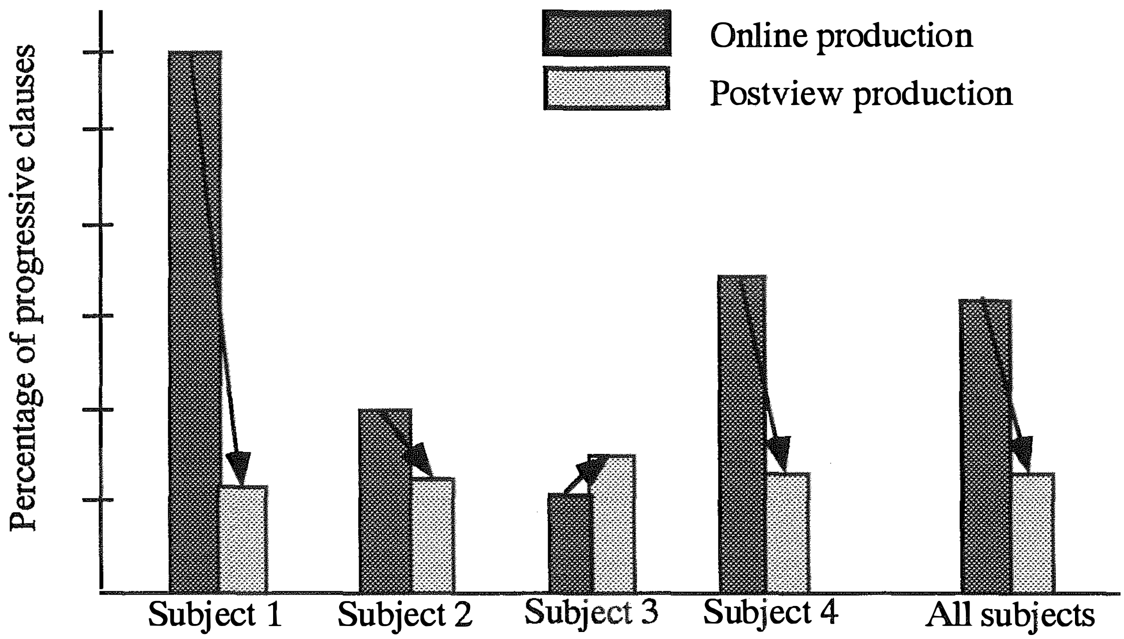


FIGURE 12. Percentage of progressive clauses: online and postview production.

The rather low use of progressives in the online task may be accounted for by the fact that this analysis was based on the second viewing of the film. This particular subject may have been particularly skillful in using their memorial representation to establish EVENT conceptualizations - even in online production. Using chi-square analysis, the probability across all four speakers that this was due to chance is less than 0.0001. The association provides evidence that the speaker's reliance on his memorial representation allows him access to both initial and terminal endpoints of EVENTS. The sequential unfolding of activity in the online task does not always allow access to these boundaries leading to greater use of progressive and decreased use of punctuals.

5.2 Text-based Analysis: The Association Between Durativity and Aspect

5.2.1 Hypothesis

Looking only at the online data, we can also make another prediction. If a speaker at the time of utterance formulation has no idea when the next model discrepancy will occur or predicts that it will be some time before such a discrepancy does occur, he/she will use the progressive. Essentially, those neural models of unchanging stimuli that exist for longer durations will prevent the speaker from having access to the terminal boundary (cf. the longer train). Those models that exist for short durations will allow the speaker to conceptualize the EVENT with its initial and terminal boundaries.

Figure 13 below represents the speaker who, at the time of formulating both utterance A and B (represented by the large points on the time line), has already experienced both the initial and terminal endpoints of EVENTS A and B. The models of activity are relatively short lived. Under these conditions, we would expect punctual forms to be produced.

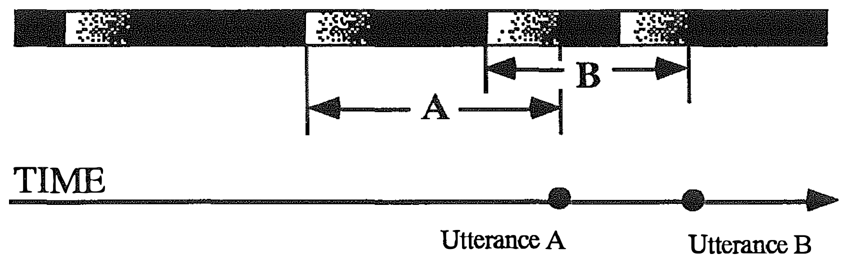


FIGURE 13. EVENT conceptualizations of short duration neural models (allowing access to both initial and terminal endpoints of the EVENT).

Figure 14 represents the speaker who, at the time of formulating utterance A, does not know when the next terminal endpoint will be or predicts that it is too far removed to permit EVENT conceptualization and thus PROCESS conceptualization occurs. A progressive form will result.

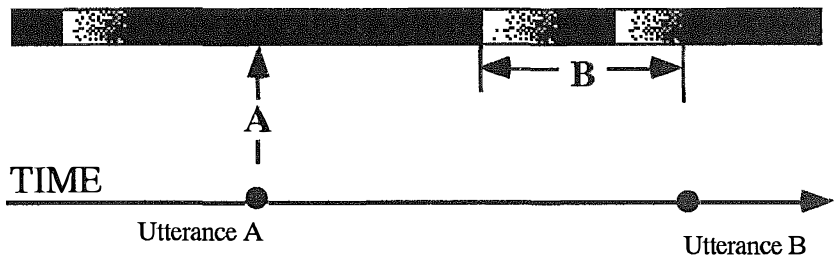


FIGURE 14. PROCESS conceptualizations at A due to lack of known terminal endpoint.

Figure 15 represents the speaker who waits for a terminal endpoint to occur to the habituated model and then encodes an EVENT.

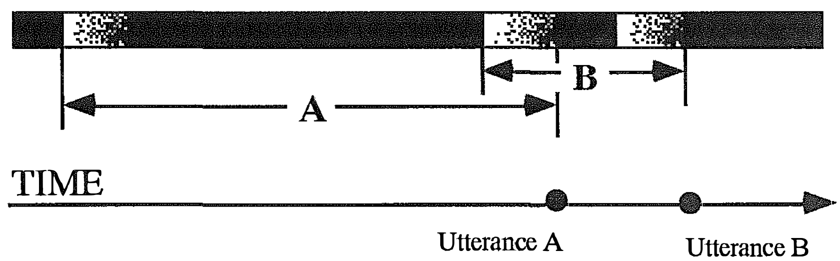


FIGURE 15. Speaker waits for terminal boundary before formulating utterance. Formulation is then based on an EVENT conceptualization.

Note that the PROCESS conceptualization in Figure 14 produces a greater temporal distance to the initiation of the next clause. Speakers use progressives when the terminal boundary of a neural model is not available or predictable - i.e. the speaker believes that the model will continue to exist for an extended duration. Therefore, if we measure the time between the initiation of each verbalized clause, we would expect greater periods of time following progressive clauses (as in Figure 14) and shorter periods of time following punctual clauses (as in Figures 13 and 15). The verbal clause initiation reflects the a short time after formulation of the EVENT or PROCESS (this "short time" is equal to the amount of time it takes to process the stimuli, form a preverbal message, select the forms appropriate to the message followed by the articulation of that message). On the basis of this, we predict the following:

(7) A greater temporal distance (to the next clause initiation) is more likely to occur after a progressive clause, indicating the speaker's lack of access to a model endpoint. Smaller temporal distances to the next clause occur with punctuals.

5.2.2 Method

Online data was digitized allowing for accurate measurements of the time between clause *initiations* (as shown below in Figure 16).

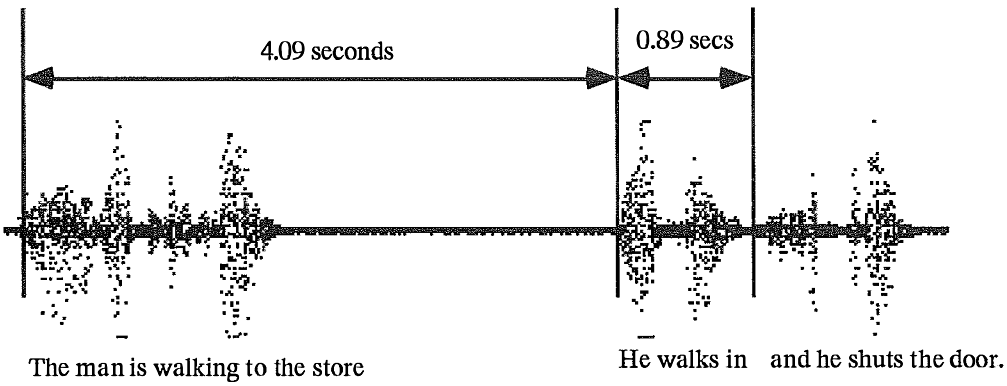


FIGURE 16. Digitized speech and measurement of temporal distance between clause initiations.

The temporal distance between initiation of a clause and the initiation of the following clause was measured for each clause. Complement clauses were not included in the count although if a main clause was followed by a complement clause, it was that distance that was measured. As stated earlier, inchoative verbs followed by the present participle were counted as progressives. Figure 17 below demonstrates the measuring process with respect to clause types:

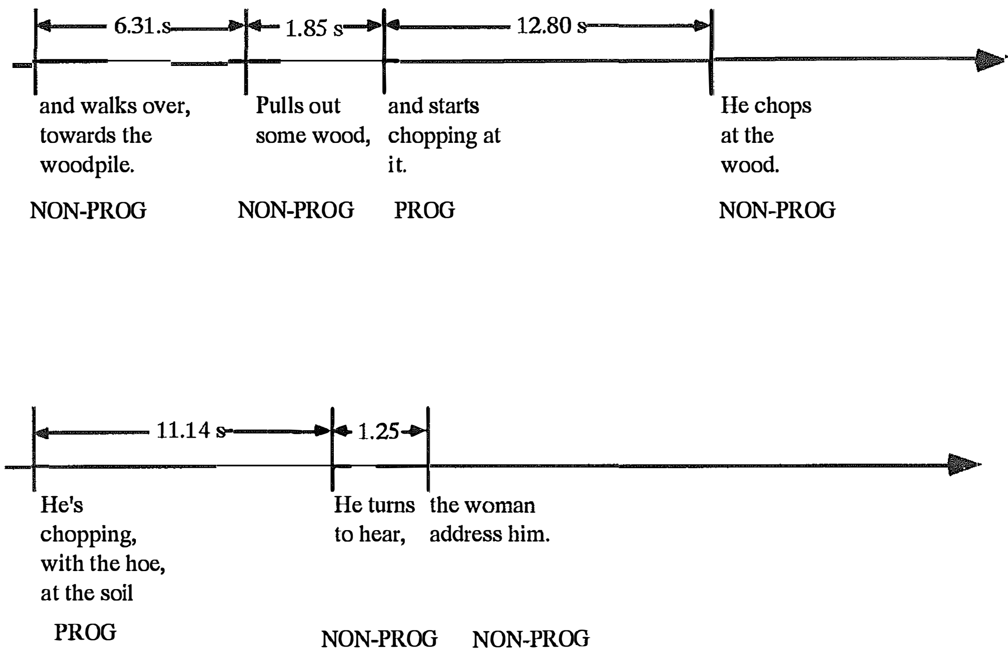


FIGURE 17. Measurement of temporal distance between initiations of different types of clauses.

5.2.3.Results

Tables 4-8 and Figures 18-22 summarize the results. As can be seen clearly with all but one subject (Subject 3's sample of progressives was too small to be of significance), progressives correlate with greater temporal distances between clause initiations while non-progressives correlate with smaller temporal distances between clause initiations.

TABLE 4. Subject 1: Temporal Distance Between Clause Initiations Versus Percentage of Punctual Versus Progressive Encoding

Time T:	Punctual Percentage	Punctual N	Progressive Percentage	Progressive N
Less than 2 secs	34	13	66	25
Less than 4 secs	44	12	56	15
Less than 6 secs	13	2	88	14
Less than 8 secs	9	1	91	10
Less than 10 secs	0	0	100	5
More than 10 secs	0	0	0	0
Totals:	29	18	71	69

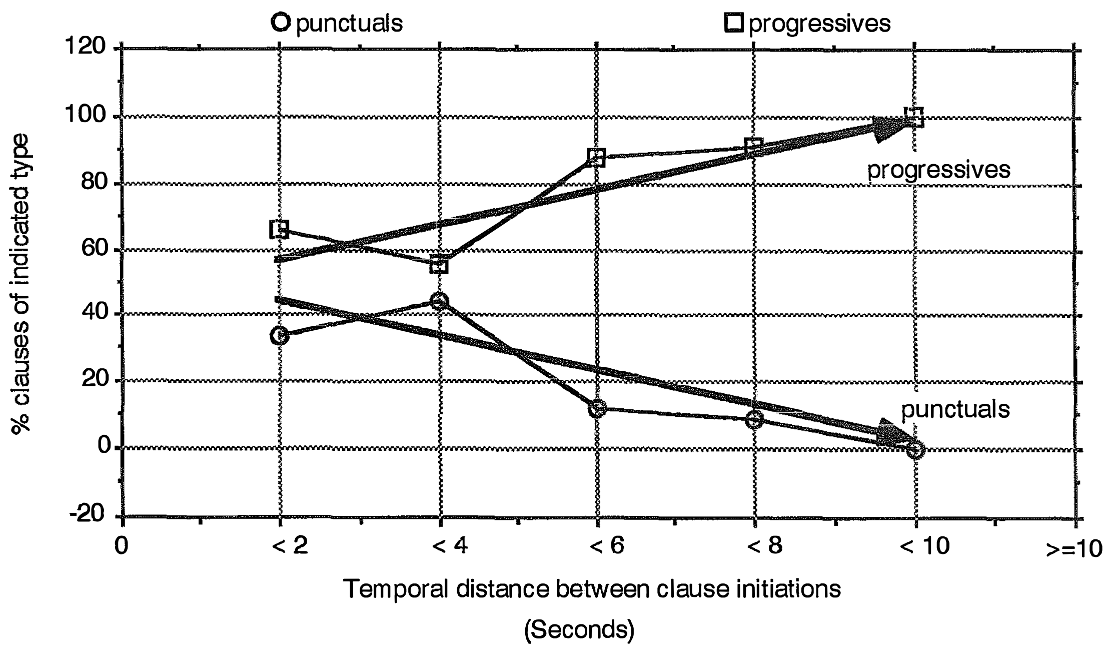


FIGURE 18. Subject 1: % punctuals/progressives vs. temporal distance between clause initiations. Chi-square analysis p = .0416.

In Figure 18, the bold lines represent lines of best fit and demonstrate that as the temporal distance between clause initiations becomes greater, progressive encoding increases. In Figure 19 below, we see the same relationship although the point at which progressives and punctuals are equal (the 50%-50% cross-over point of the bold lines) occurs at a much higher temporal distance than that for subject 1. This may be due to one subject (Subject 2) waiting longer than subject 1 to determine whether or not an EVENT conceptualization could be made. The speakers may also have relied on their memory of the first practise viewing in different ways. Subject 2 may have had a better recollection of when EVENT boundaries occurred and therefore waited longer for them before linguistically encoding the model. We find an even more pronounced "waiting" in Subject 3 (Figure 20) below where the speaker chooses to use progressives only for those models that continue for longer than twelve seconds. For all others, the speaker used only punctuals.

TABLE 5. Subject 2: Temporal Distance Between Clause Initiations Versus Percentage of Punctual Versus Progressive Encoding

Time T:	Punctual Percentage	Punctual N	Progressive Percentage	Progressive N
Less than 2 secs	91	39	9	4
Less than 4 secs	80	33	20	8
Less than 6 secs	58	11	42	8
Less than 8 secs	50	1	50	1
Less than 10 secs	50	2	50	2
More than 10 secs	0	0	100	3
Totals:	77	86	23	26

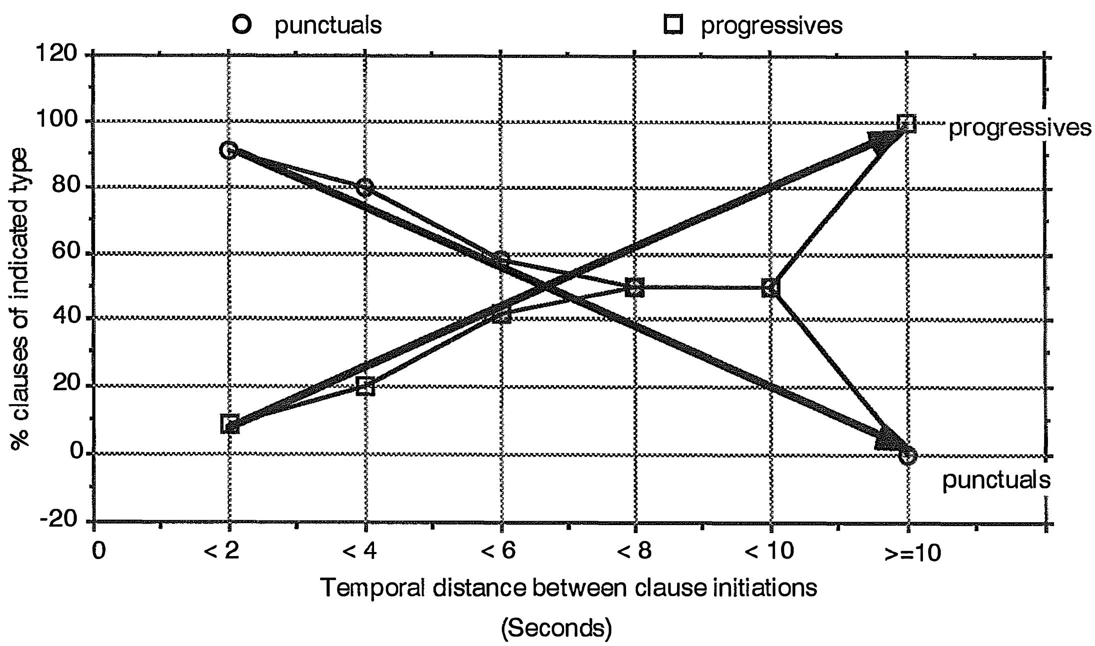


FIGURE 19. Subject 2: % punctuals/progressives vs. temporal distance between clause initiations. Chi-square analysis p = .0008.

TABLE 6. Subject 3: Temporal Distance Between Clause Initiations Versus Percentage of Punctual Versus Progressive Encoding

Time T:	Punctual Percentage	Punctual N	Progressive Percentage	Progressive N
Less than 2 secs	95	37	5	2
Less than 4 secs	96	27	4	1
Less than 6 secs	100	6	0	0
Less than 8 secs	100	5	0	0
Less than 10 secs	100	3	0	0
More than 10 secs	33	1	67	2
Totals:	94	79	6	5

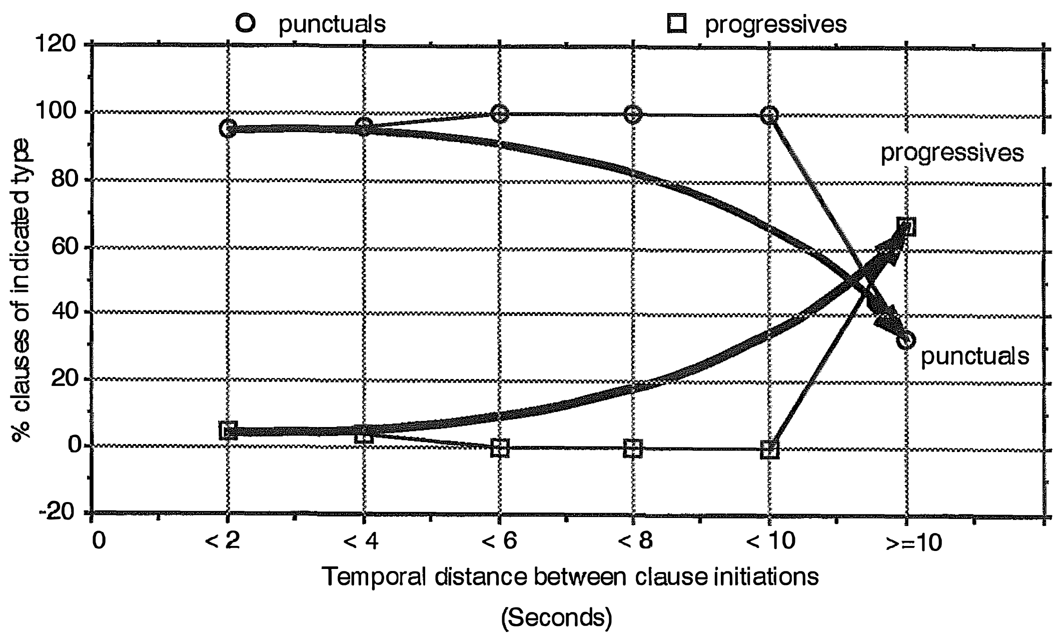


FIGURE 20. Subject 3: % punctuals/progressives vs. temporal distance between clause initiations. Chi-square analysis insignificant due to small sample of progressives.

TABLE 7. Subject 4: Temporal Distance Between Clause Initiations Versus Percentage of Punctual Versus Progressive Encoding

Time T:	Punctual Percentage	Punctual N	Progressive Percentage	Progressive N
Less than 2 secs	81	43	19	10
Less than 4 secs	48	20	52	22
Less than 6 secs	58	7	42	5
Less than 8 secs	13	1	88	7
Less than 10 secs	100	1	0	0
More than 10 secs	0	0	100	1
Totals:	62	72	38	45

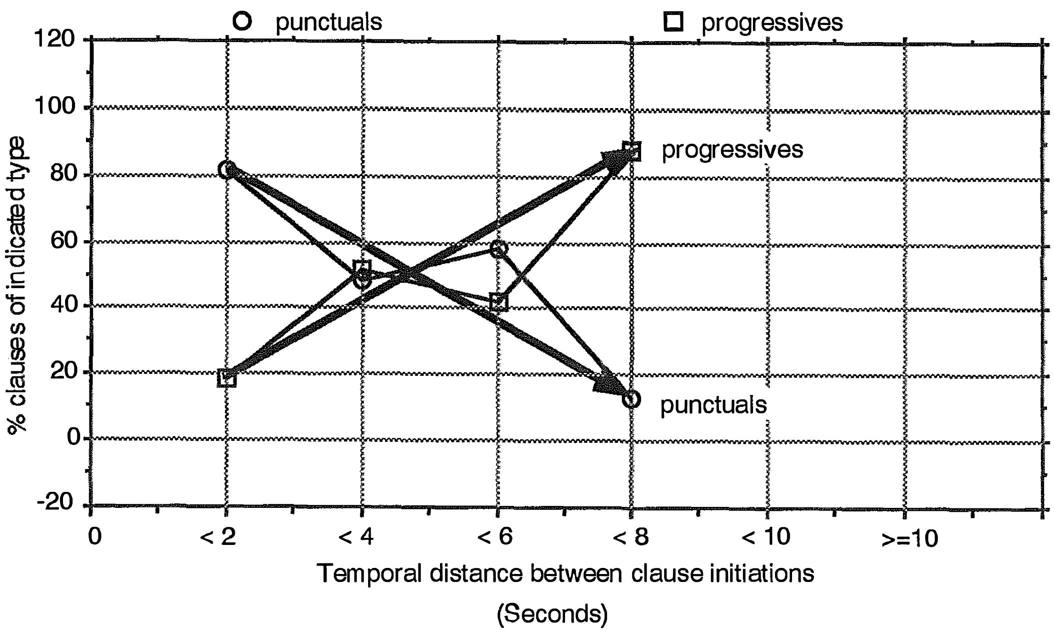


FIGURE 21. Subject 4: % punctuals/progressives vs. temporal distance between clause initiations. Chi-square analysis p = .0004.

TABLE 8. All Subjects: Temporal Distance Between Clause Initiations Versus Percentage of Punctual Versus Progressive Encoding

Time T:	Punctual Percentage	Punctual N	Progressive Percentage	Progressive N
Less than 2 secs	76	132	24	41
Less than 4 secs	67	92	33	46
Less than 6 secs	49	26	51	27
Less than 8 secs	31	8	69	18
Less than 10 secs	46	6	54	7
More than 10 secs	14	1	86	6
Totals:	65	265	35	145

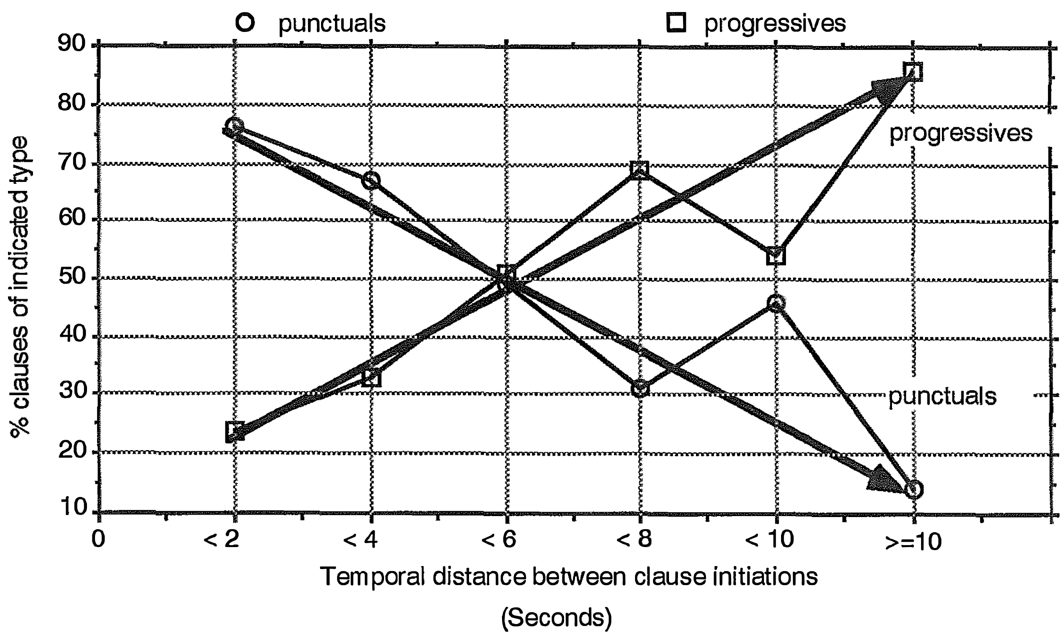


FIGURE 22. All subjects: % punctuals/progressives vs. temporal distance between clause initiations. Chi-square analysis $p = 0.0001$.

Note especially the very strong association of Table 8. Chi square analysis yielded over a 99% probability that the relationship between temporal distance between clause initiations and use of progressive aspect is *not* due to chance. The greater distance is due to the speaker's inability to predict or determine the terminal boundary of an existing neural model. Short-lived models allow the speaker to easily access both initial and terminal boundaries giving rise to punctuals. Durative models reduce the speaker's ability to predict or access the terminal boundary thereby giving rise to progressives.

5.3 Experimental Analysis: The Causal Relation Between Parameter Access and Aspect

5.3.1 Hypothesis

The previous analysis demonstrated that greater model duration, as reflected by temporal distance between clauses, was associated with greater use of the progressive. The longer duration reduced the speaker's access to the model's terminal boundary. Another method of reducing access to initial and terminal boundaries is to limit access to parameters (as defined in section 3.2.3) involved in EVENTS. This requires an online task to prevent the speaker from using a memorial representation and to allow us a better determination of the mental representation's nature at any particular time. We can thus infer what parameters are available and the habituated/dishabituated state of the neural model in activated memory. The neural model that I have been representing with a single bar representation is actually made up of many different "sub-models" - each sub-model belonging to a certain parameter (Figure 23).

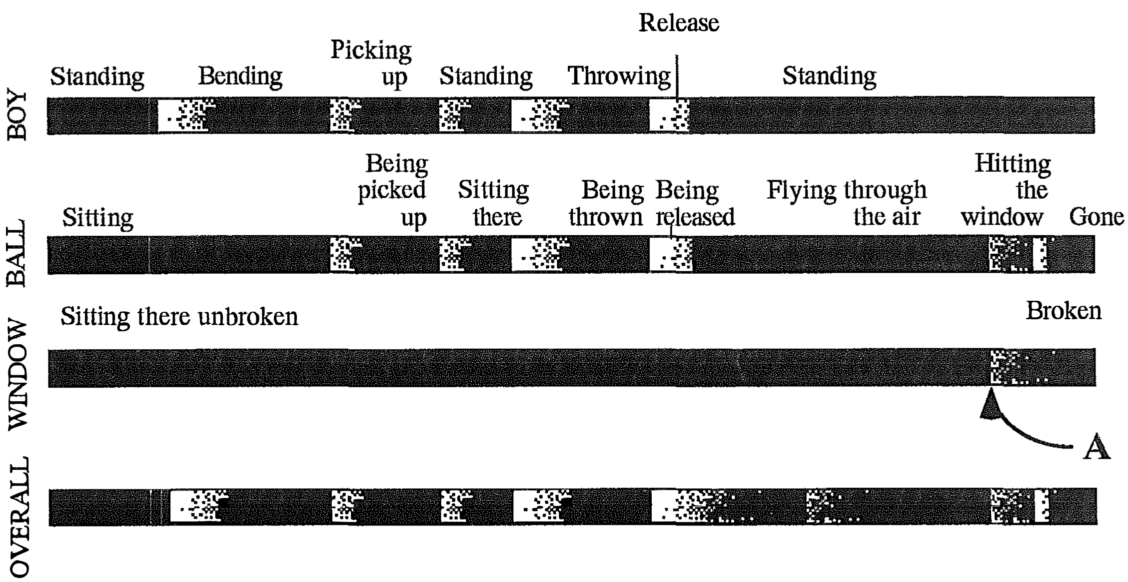


FIGURE 23. Overall neural model made up of sub-models.

If we imagine a speaker watching the boy, the ball and the window scenario, the probability of *predicting* a model discrepancy (for example, at A, the window being hit) decreases if the parameters involved in the discrepancy are not available until the discrepancy actually occurs. If the speaker is able to predict the discrepancy, he is more likely to form EVENT conceptualizations because he has access to both initial and terminal boundaries. On the basis of this, we make the following hypothesis:

(8) Situation A: the speaker has access to a parameter or parameters involved in an upcoming model discrepancy before the discrepancy occurs.

Situation B: the speaker has access to a parameter or parameters involved in a model discrepancy only at the time the discrepancy occurs.

Given situation A and B above, a speaker will use more punctuals and fewer progressives in situation A than situation B. In situation B, the opposite is true.

5.3.2 Method

The experiment design employs two sets of animations, both animating exactly the same activity. The difference between the two sets is in how many of the parameters are available to the speaker at particular points in time during the animation. In one condition, the WIDE condition, speakers are able to see all parameters that will be involved in models and their dishabituations at all points in time during the animation. In the second condition, the NARROW condition, a "zoom window" is placed over the animations of the first condition to limit the speaker's access to the parameters. The speaker has access to these parameters just a short time before they are involved in a major change in the animation. For example, in the animation below, a man walks from his trailer to a restaurant and then walks in. In the NARROW condition (Figure 25), a zoom spotlight follows the man from the trailer to the restaurant. The restaurant is not seen by the speaker until he is very close to it. The WIDE condition (Figure 24) allows the subject to access all involved parameters.

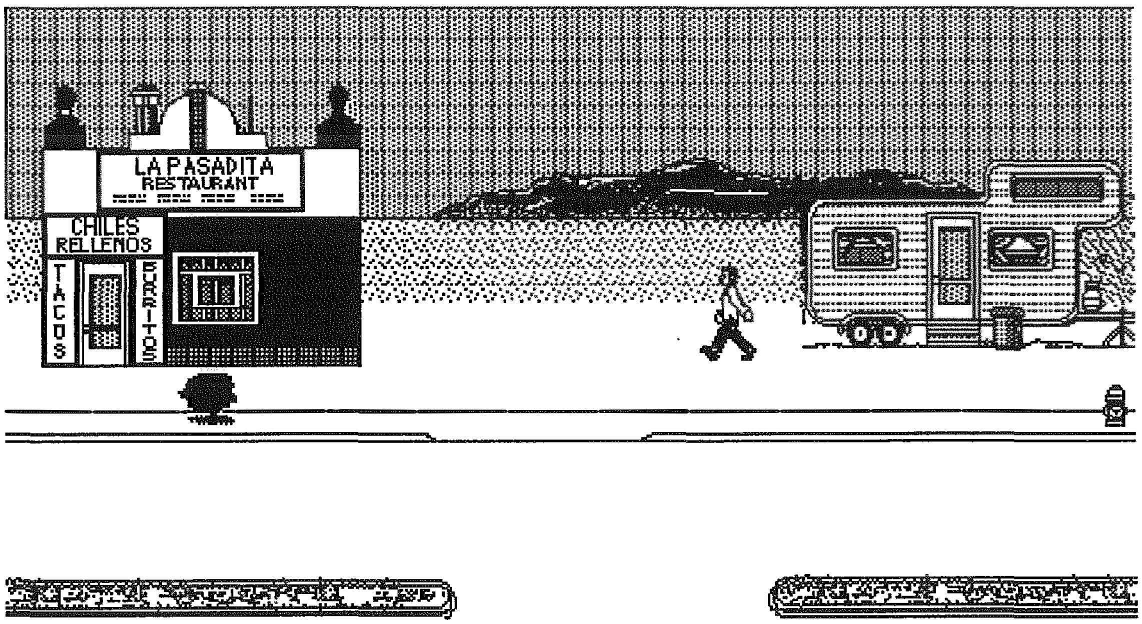


FIGURE 24.   WIDE condition in "Restaurant" film.

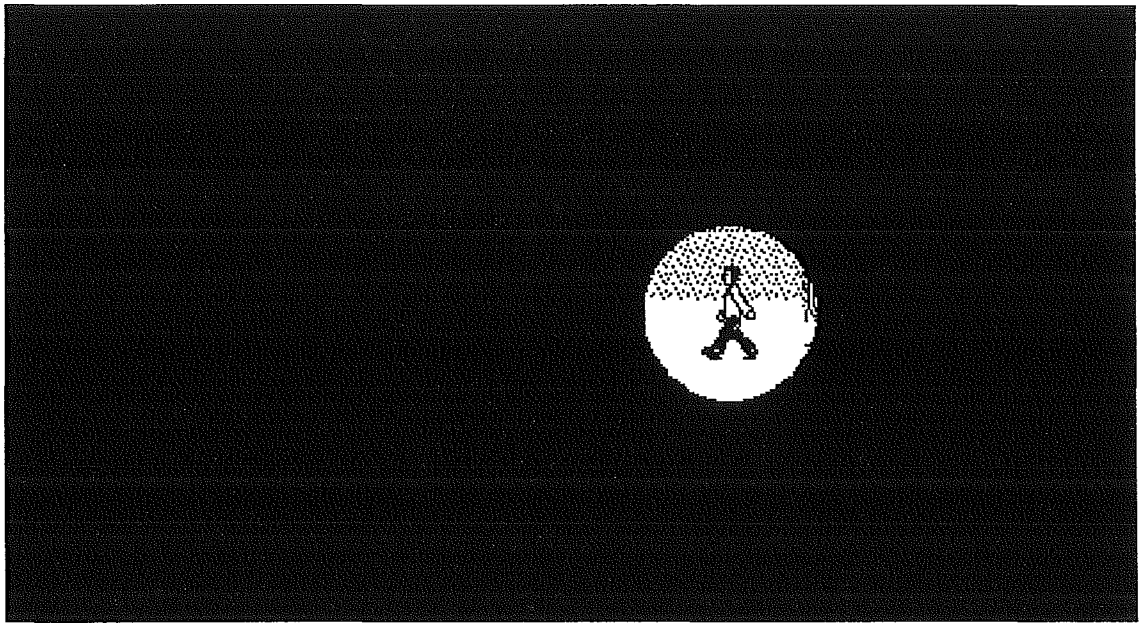


FIGURE 25. NARROW condition in "Restaurant" film.

The animations that were used included various activities. As we will see in the results section, certain types of films were better suited to produce the progressive/non-progressive distinction using this type of manipulation. Possible reasons for this will be explained in section 5.3.3.2. The following is a list of the animations and their basic "story" content.

(9) List of Animations[2]

a. Lady in car: a woman in a red car is driving from the right hand side of the screen to the left and passes a tree and fire hydrant.

b. Statue: a man runs up to a ball and kicks it over a statue.

c. Airplane: an airplane circles the Statue of Liberty and flies through some clouds.

d. Fish: a big fish swims towards a stationary little fish and eats it.

e. Bicyclist: a man on a bicycle rides past a dog and a mailbox. He stops at a red light and then goes off the screen on the green light.

f. Donkey: a man walks up to a branch, picks it up and walks towards a donkey and hits it with the branch.

g. Ball in window: a man picks up a ball and throws it at a window and breaks the window.

h. Dog: a dog runs and walks by different objects such as a garbage can, a fence, a table and many others.

i. Boulder: a dog at the top of a hill nudges a boulder with his nose. The boulder rolls down a hill and hits a bush where a cat is lying down. The cat gets up and leaves.

j. Triangle: a triangle different directions among other objects (circles, squares and stars) on the screen.

k. Restaurant: a car drives by and then a man gets out of his trailer and walks to a restaurant. He enters the restaurant. Another car drives by. The man comes out of the restaurant with a bag in his hand and walks back to his trailer.

These animations were shown to two groups of fifteen subjects each. Group A watched one set of the above animations randomly chosen for order and the WIDE-NARROW condition (e.g. animation A. WIDE, B. NARROW, C. NARROW, D. WIDE). These were followed by the same set and order of animations but in the opposite condition as the first set. Group B watched the same animations as group A, in exactly the same order but the NARROW-WIDE conditions were opposite.

(10) Example animation sets for groups A and B

Group A		Group B	
1a.	Woman in car.WIDE	1a.	Woman in car.NARROW
2a.	Soccer kick.NARROW	2a.	Soccer kick.WIDE
3a.	Airplane. NARROW	3a.	Airplane. WIDE
4a.	Fish.NARROW	4a.	Fish.WIDE
5a.	Biker.WIDE	5a.	Biker.NARROW
. . .			. . .
11a.	Trailer man.NARROW	11a.	Trailer man.WIDE
1b.	Woman in car.NARROW	1b.	Woman in car.WIDE
2b.	Soccer kick.WIDE	2b.	Soccer kick.NARROW
3b.	Airplane. WIDE	3b.	Airplane. NARROW
4b.	Fish.WIDE	4b.	Fish.NARROW
5b.	Biker.NARROW	5b.	Biker.WIDE
. . .			. . .
11a.	Trailer man.WIDE	11a.	Trailer man.NARROW

Subjects were instructed as follows:

(11) I am going to show you a series of short animations on the computer screen in front of

> you. What I would like you to do is describe to me what you see on the screen as the action unfolds. In other words, describe what you see while simultaneously watching the animation.
>
> In some of the animations, you will see a zoom window, or a spotlight. Do not describe the window or spotlight itself but what only what is inside it.
>
> You will see each film twice[3]. While watching it the second time, be sure to tell me only what's on the screen as you describe it. In other words, although you already know what's going to happen from the first viewing, do not go ahead of what's on the screen.
>
> Any questions?
>
> Try to keep up with the film as best you can.

The discourse produced by each of the speakers was tape-recorded and then transcribed. As with the analyses in sections 5.1 and 5.2, all verb forms with "*-ing*" were counted as progressive (including true progressives, inchoatives + gerund *-ing*, relative and complement clauses with *-ing* verbs). In the "Chicken Story" of sections 5.1 and 5.2, the number of characters (two main characters) and scenes (three major scenes) were limited. In these animations, there are more than eleven different scenes and each animation has a different character set. For this reason, many existentials and statives appeared. These were counted separately from the progressives and simple punctual forms of the verb. Infinitive complements were also counted.

5.3.3 Results

5.3.3.1 Significant Differences Between Progressive and Punctual

The experiment was designed to produce differences between progressive and simple punctual forms. Typical subject descriptions demonstrating these differences is given in the appendix. In the following analysis, the percentage of progressives was taken from the total of progressives and simple punctual forms (in other words, this percentage is NOT based on the total sample of clauses including existentials, statives and infinitive complements). Analysis of variance was used to determine whether or not the difference between the mean progressive percentages of the narrow and wide conditions is significant or not.

Figure 26 below verifies the prediction: limited access to parameters (the NARROW view) produces more progressives than the WIDE view in which the speaker has access to all parameters at all times during the viewing.

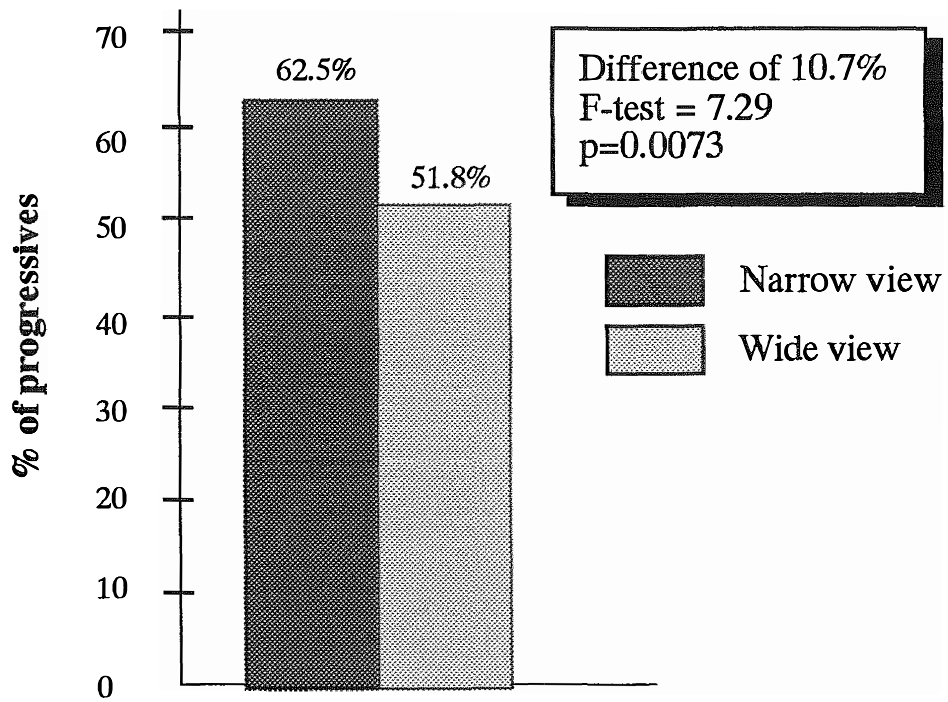


FIGURE 26. Mean percent progressive encoding of narrow and wide views across all subjects and all films.

Although the difference is only 10%, the ANOVA analysis[4] shows the difference as significant with a probability greater than 95%.

In carrying out the ANOVA analysis for each specific film, the results appear much more conflicting - and interesting. The analysis for each film is presented below in Figures 27 and 28. They have been arranged according to the differences in the mean progressive percentages between narrow and wide conditions. The differences decrease as one moves to the right. As one can see, the "Restaurant" and "Dog" film account for the significant difference across all films. The "Airplane," "Triangle," "Donkey," "Bicyclist" and "Boulder" films have means that correspond to the prediction (greater progressive use in the narrow condition) but the difference between the means is insignificant ($p > 0.05$). The "Statue," "Lady in car," "Ball in window" and "Fish" films demonstrate differences that *contradict* the prediction, although these differences are insignificant.

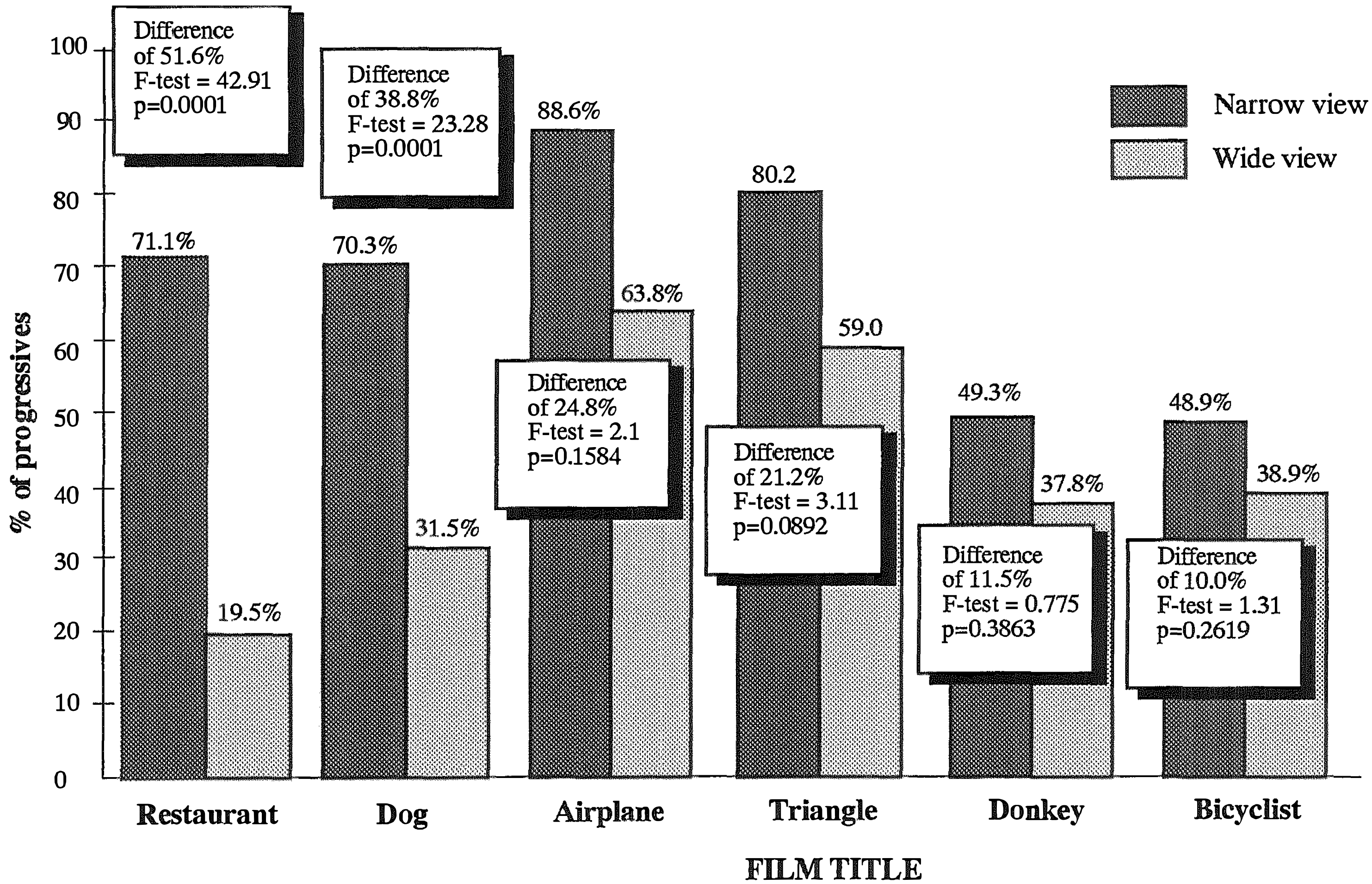


FIGURE 27. A comparison of mean progressive use in narrow versus wide condition across the different films.

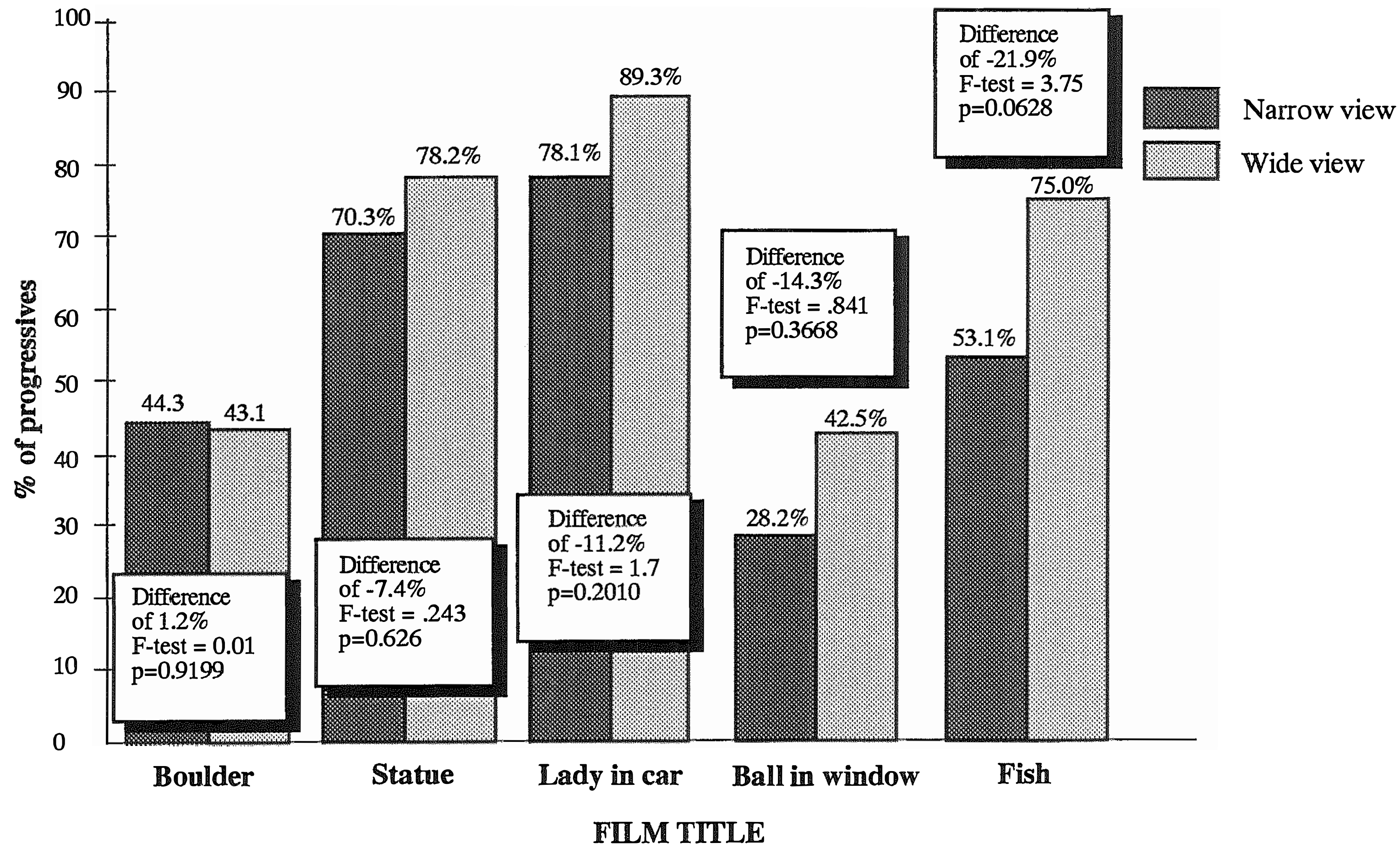


FIGURE 28. A comparison of mean progressive use in narrow versus wide condition across the films that demonstrate greater use of progressive in the wide condition..

At first glance, it might appear that the experiment was a failure. After all, only 2 of the eleven films significantly demonstrate the expected results. However, the analysis below examines the differences between the films and demonstrates that the apparent failure of the hypothesis is due to film design.

5.3.3.2 Examination of Experimental Design in Light of Results

As shown in Table 9, subjects used more clauses in describing the "Restaurant" and "Dog" film than the other films. Any sample size less than 5-6 clauses per film does not produce a significant difference between narrow and wide views. The length of the film might therefore affect clause encoding. Upon viewing a new film, the subject attempts to "set the scene" using existentials and statives. Often these existentials are accompanied by progressive relative clauses ("There's a man riding a bike"; "There's a fish swimming above some rocks.") If the film is of short duration, the speaker can do little more than set the scene. A high percentage of existential and stative encoding results. For example, the "Statue," "Lady in car" and "Fish" films are all encoded with an average of 2 to 4 clauses, with at least 30% of those clauses being a stative or existential. The speaker is not able to form EVENT conceptualizations that span any period of time. Few non-progressive punctuals are the result. If the film is of longer duration, the speaker is able to set the scene and then attend to the changes taking place over time within the scene.

TABLE 9. Average Number of Clauses and Average Percentage of Statives and Existentials Used for Each Film Across All Subjects

FILM TITLE (arranged from most in line with the hypothesis to the least)	Average number of clauses (all types) used to describe film	Average percentage of statives and existentials used to describe film
Restaurant	7.9	12%
Dog	19.5	6%
Airplane	3.1	21%
Triangle	3.8	27%
Donkey	4.8	16%
Bicyclist	5.8	17%
Boulder	4.7	16%
Statue	2.0	32%
Lady in car	3.3	39%
Ball in window	3.7	10%
Fish	2.9	31%

In retrospect, the specific actions of each film also contributed to its success or failure as a progressive/punctual eliciting film. During the recording of each subject's production, the initiation and end of different actions were indicated by beeps inaudible to the speaker. These were recorded on the left track of the tape[5]. Each beep represented a major change in the animation stimuli (changes in direction of objects, passing another object, hitting an object, etc.). The "Restaurant" film has 16 such beeps while the dog film has 30. The remaining films have only 5 to 7 beeps each. Here again, we see that those films with less action produce less distinction between progressive and punctual forms. In addition, the actions of the "Restaurant" and "Dog" films have the greatest degree of change. For example, in the "Lady in car" and "Bicyclist" films, a car driver and bike rider move from right to left in/on their vehicle, passing various objects. There are no changes in direction and very little change of speed. The degree of dishabituation is likely minimal. In contrast, in the "Restaurant" film, a man comes out of his trailer, turns a full ninety degrees and walks towards another building. He turns another ninety degrees again and enters the building - disappearing from view. These changes in direction and disappearances/reappearances likely cause greater dishabituation of the orienting response and hence sharper, more distinct EVENT boundaries. The "Restaurant"/"Dog" films demonstrate the greatest progressive/punctual distinction between the WIDE and NARROW condition simply because they provide the speaker opportunity to make such a distinction. The other films do not.

One other issue to consider in looking at the unexpected results of the experiment, is the effect of lexical aspect over grammatical/periphrastic aspect. For example in the "Ball in window" film, the ball *breaks* the window. This change was encoded by most speakers using a verb referring to a very specific point in time - i.e. "break" - a verb encoding the change over only one dishabituation. It is conceivably difficult to elicit these verbs as progressives. Other examples are "hit" as in the "Donkey" film - "The boy hits the donkey" and "stop" as in the "Bicyclist" film - "He stops at the light." I considered not including these types of verbs in the sample, but it was difficult to determine an objective means of establishing which verbs would be granted such status. In addition, a *few* speakers, did use the progressive "breaking the window," "He's hitting the donkey," "He's stopping at the light." Presently, it appears that the design of the films does not normally elicit progressive aspect with these highly punctual verbs.

Notes

1. This film was produced by T. Givón in consultation with two New Guinea anthropologists. The film presents the story of a man who goes to chop wood with an axe. A woman appears on the scene and talks to the man. Afterwards, she goes to prepare a meal by a fire. The meal preparation consists of going to get water, lighting the fire, getting a chicken and attempting to butcher it. She ends up putting together an adhoc meal. When she presents the meal to the man, he is disgusted and chases the woman.

2. The following animations were produced using graphics from a number of sources: MacroMind, Inc.; Russ Tomlin's Fish film; and my own artwork.

3. My original intent was to compare the WIDE-NARROW condition within subjects. However, because the second set of films is the same as the first, memorial representations are utilized and the WIDE-NARROW distinction is lost. For the purposes of this research, I compare only the first viewings of Group A with the first viewings of Group B.

4. The ANOVA analysis compares the variance between subjects and calculates the means of the two conditions. If the means are different but the variance among subjects is great, then the relationship proves less significant. If the means are different but the variance is small, the difference proves to be more significant.

5. These beeps are meant for future use in determining the timing interaction of speech utterance initiation with change in stimulus.

CHAPTER VI

IMPLICATIONS AND FURTHER COGNITIVE RECASTING OF EXISTING IDEAS

6.1 Significance of Both Positive and "Negative" Results

The results of the previous section demonstrate that the aspectual predictions of the information processing model hold true. The production from the postview task produces less progressives and more punctuals than online production. This difference is attributed to the speaker's use of his memorial representation. This allows greater access to dishabituations, or model changes, that act as boundaries for EVENTS. The limited access to such boundaries in online production causes the speaker to use more progressives, encoding the PROCESS conceptualizations at particular points in time.

The text-based measurement of temporal distance between clause initiations demonstrated that when a speaker was not able to predict the terminal boundary of a model due to its durativity, PROCESS conceptualization occurs and progressive encoding results. Short duration models allow the speaker access to both initial and terminal boundaries, resulting in the punctual forms associated with EVENT conceptualizations.

The stimulus-based experiment demonstrated that a view which limits access to parameters involved in future dishabituations hampers speakers' predictions of EVENT endpoints. This results in PROCESS conceptualizations and hence progressive forms. Not all of the films in the experiment demonstrated data consistent with this prediction. The above listed reasons - small sample size, short film duration, and type of animated event - are as yet unproven explanations which account for the inconsistencies.

These hypotheses and the inconsistencies themselves provide insight to a number of aspectually related issues. The results that do verify the predictions provide the basis for cognitively recasting a number of existing ideas concerning progressive aspect and aspect in general.

6.1.1. Parameter Establishment - Reference to Models

As stated earlier, the shorter films may not have provided the speaker time to deal with much more than setting the scene. Interestingly enough, setting the scene in the films was often done with *progressive* verbs preceded by an indefinite noun phrase or with an existential clause followed by a *progressive* relative clause.

(11) a. A man is picking up the ball.
b. There's a man picking up a ball.

Of all the first utterances produced by all subjects describing the films, 33.5% were of type (11a). Another 33.5% were of type (11b). Thus, sixty-six percent of all first utterances begin with a progressive or existential + progressive construction. Less than 15% began with a clause consisting of a simple punctual verb. According to Tomlin (1987, 1991), global shifts in attention, referred to as episode boundaries, produce full noun phrases rather than pronomial reference - a reflection of the resetting of the mental representation. These nominals often occur in existentials when indefinite. In new episodes (new films in this case), a speaker uses these forms to help the listener "set the scene" in his mental representation. With the films used above, the speaker first attempts to "set the scene" of the film being viewed by referring to the neural models in his mental representation. Thus, the speaker makes reference to the parameters ("the stable conceptual units" - the referential entities of the film) of the model and, as shown by the progressive forms, the PROCESS conceptualization of the neural models. The speaker essentially tries to help the hearer relegate new information to a predictable state as quickly as possible.

6.1.2 Lexical Aspect: A Cognitive Recast of Vendler and Dowty

As explained in section 5.3, some of the films may not have elicited the progressive/punctual distinction simply because the form used encodes a truly punctual EVENT - i.e. an EVENT which caused a change between two models over a very small duration of time. Verbs such as "shatter," "snap," "break," etc. are typical examples. The EVENT spans only one dishabituation and this short span is inherently coded in the lexical item. Vendler (1967) classified verbs according to their lexical aspect and provided tests for each of his four classes. Dowty (1979) provides more criteria for each of these classes in addition to providing further tests of class membership. Although the above research deals primarily with grammatical aspect as coded in the progressive, the general information processing theory behind it can also be used to explain and define the lexical aspectual distinctions of Vendler and Dowty.

Only verbs of two classes can occur in the progressive according to Vendler: ACTIVITIES and ACCOMPLISHMENTS. ACTIVITIES are processes that occur through time "in a homogeneous way; any part of the process is of the same nature as the whole" (1967:101). Thus "to run around" is an ACTIVITY. At any time of the ACTIVITY, "running around" is occurring. ACCOMPLISHMENTS "also go on in time, but they proceed towards a terminus which is logically necessary to their being what they are" (p.101). Thus "to run a mile" is an ACCOMPLISHMENT. The running of the mile proceeds through time and is only accomplished once the terminus (a distance of one mile) is reached (Holisky, 1981). ACHIEVEMENTS embody either the initiation or the termination of an act and include verbs such as "recognize," "find," "win," "start," and "stop." STATES "cannot be qualified as actions at all" (Vendler, 1967:106). They involve no dynamics but rather are a result of change or existent regardless of change (Mourelatos, 1981). Verbs such as "have," "know," "desire," and "love" belong to this class. STATES usually do not take progressive form (*"I am knowing the answer", *"I am having a car", *"I am loving my wife"). This diagnostic is not definitive however, in that certain contexts may allow STATE verbs to take the progressive form (see section 6.4). The classification of ACHIEVEMENTS, ACTIVITIES, ACCOMPLISHMENTS AND STATES is binary as represented in Figure 29 below.

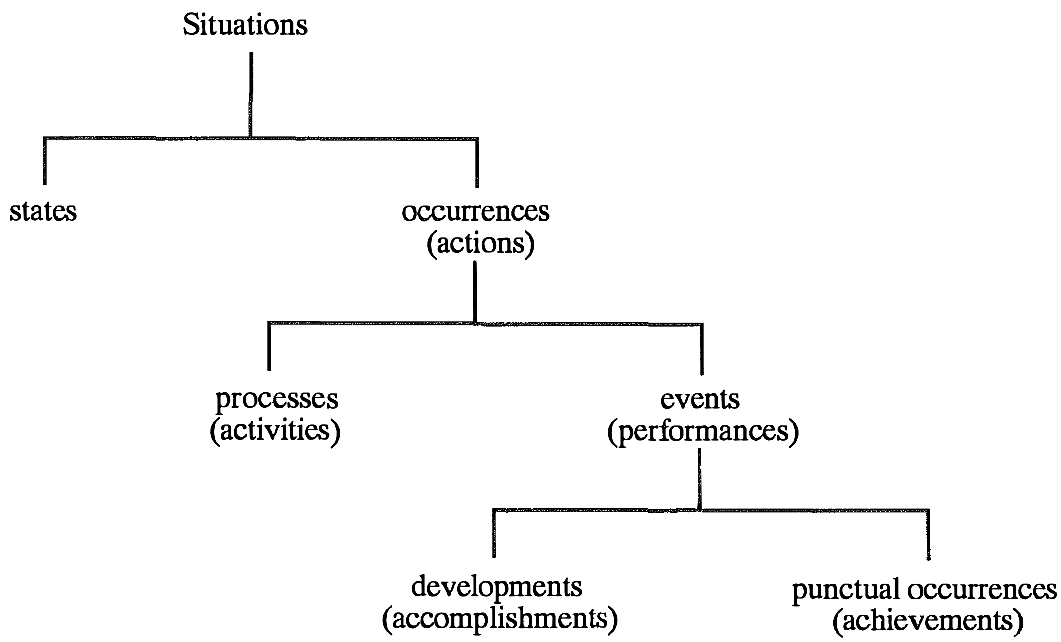


FIGURE 29. Lexical aspect according to Vendler (1967) and Dowty (1979).

Figure 29 can be cognitively recast in terms of dishabituations and neural models, as in Figure 30. Lexical items belonging to the ACHIEVEMENT aspectual class (punctual occurrences, such as the previously mentioned "shatter," "snap," "break," etc.) encode the change that occurs across one dishabituation - a very short span of time. Thus, those films with EVENTS that could be labelled with ACHIEVEMENT class verbs inhibited any alternative progressive encoding. ACHIEVEMENTS can also be the culmination of a PROCESS. For example: "He was searching for the money when suddenly he found it." The first clause encodes the PROCESS model of "searching" while the second clause encodes the change - the single dishabituation - from "lost and searching" to "found and no longer searching." ACCOMPLISHMENT lexical items encode the EVENT conceptualization bounded by two different dishabituations, with the terminal dishabituation being a change of a specified type. The ACCOMPLISHMENT takes time, as indicated by the existence of a neural model between the dishabituations. The ACCOMPLISHMENT does not actually occur until the goal of the neural model, the change in state of the present model to the new model, occurs. ACTIVITIES are very similar to accomplishments except that the terminal dishabituation is not of a specific type. STATES are the equivalent of the cognitive model STATES. Figure 30 summarizes the differences between these conceptualizations.

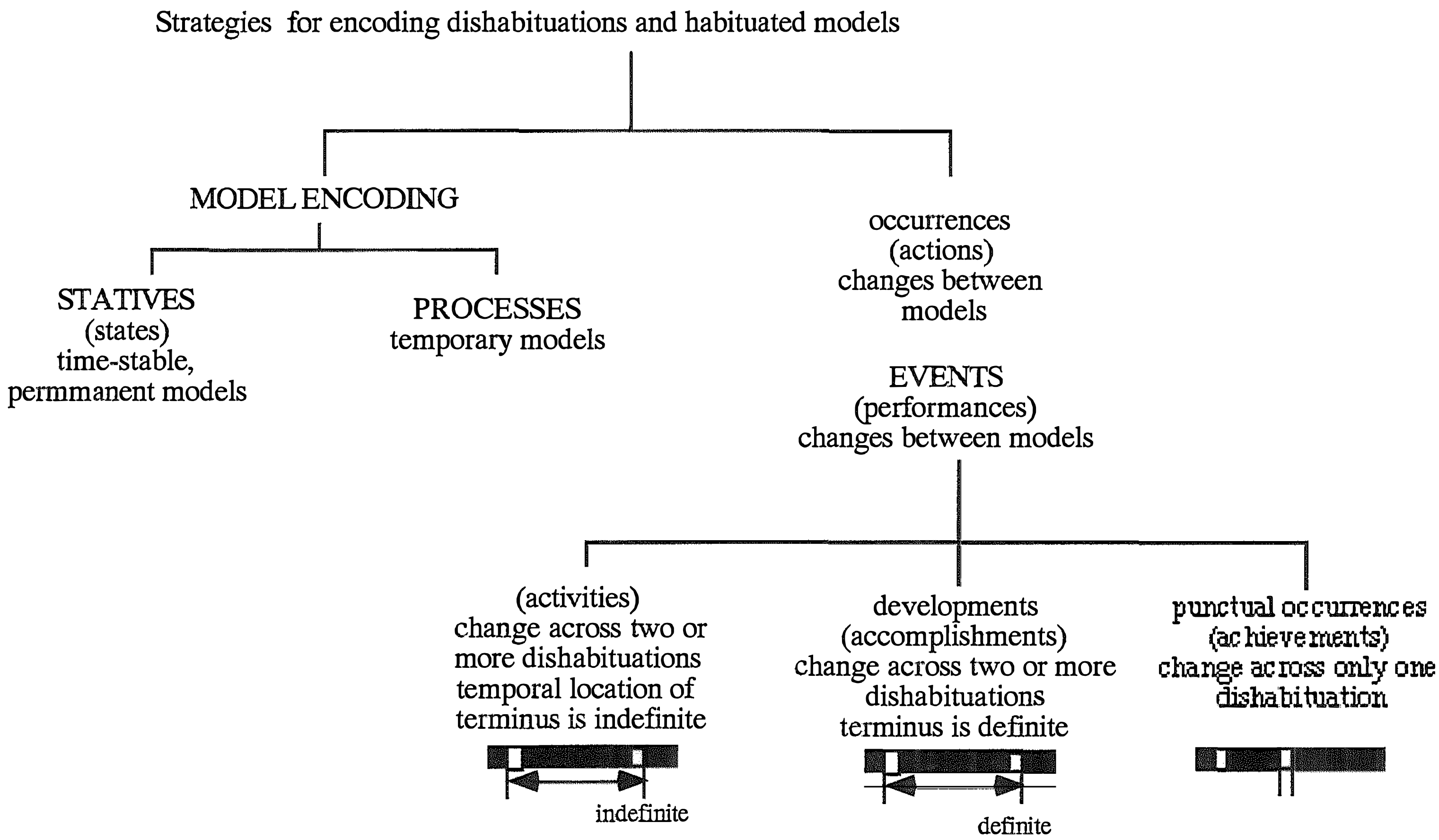


FIGURE 30. A cognitve recast of Vendler (1967) and Dowty (1979) lexical aspect distinctions

6.1.3 Complementation and Aspect

This cognitive recast of lexical aspect also reveals the cognitive underpinnings of participial complementation found in English. As stated earlier, the progressive form of English encodes the state of a temporary neural model at any particular point in time. Models can also be encoded with respect to the dishabituations that mark the beginning or end of the model - similar to the ACCOMPLISHMENT aspect class discussed above. This often occurs in complement constructions in which the main verb encodes the dishabituation and the complement verb encodes the model. For example, inceptive verbs such as "begin," "start," and "initiate" often take participial complements. These participial complements encode the model following the dishabituation which initiated the model. Likewise, verbs such as "finish," "quit," "terminate," and "stop" are often followed by participial complements that encode the model *preceding* the terminal dishabituation. Figure 31 demonstrates the relationship that exists between these types of verbal constructions and neural models.

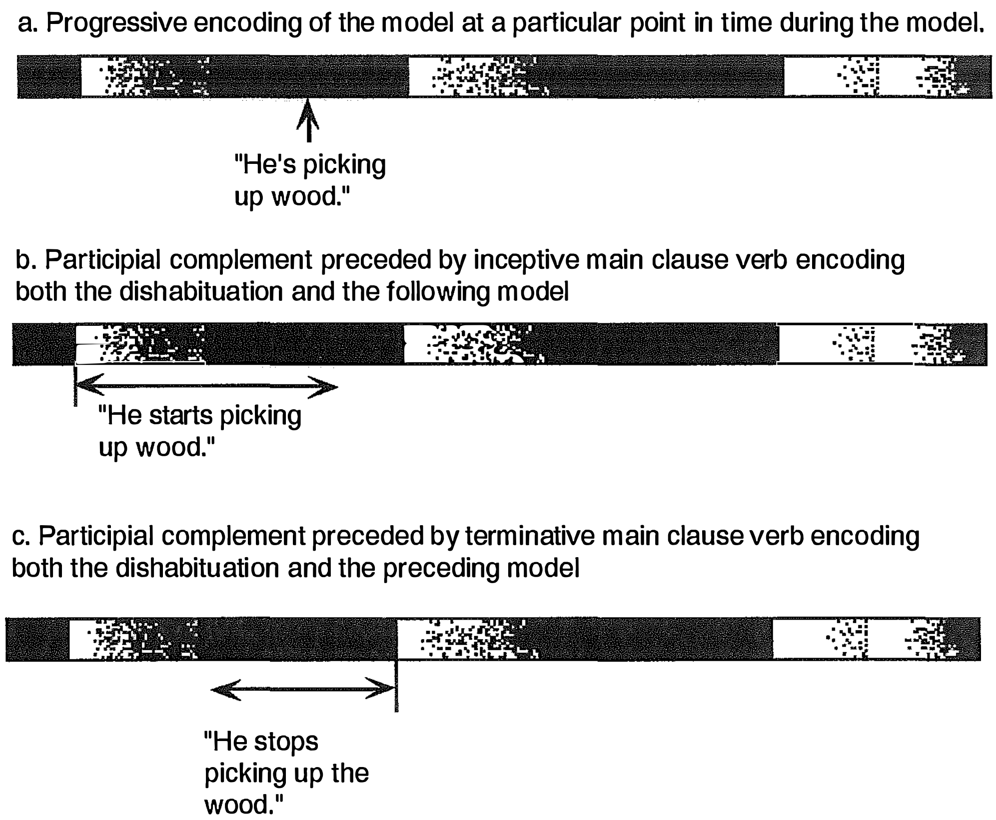


FIGURE 31. A cognitive recast of English complementation.

This analysis suggests that the very form of the English progressive behaves very similarly to a participial complement, using the copula "to be" as the main verb. Rather than encoding an accompanying EVENT, the copula indicates that what is encoded is the *state* of a neural model at a particular point in time. The following cognitive recast of Comrie's aspectual distinctions provides further motivation for this "hybrid" analysis of the progressive.

6.2 A Cognitive Recast of Comrie's Aspectual Distinctions (1976)

Aspect, according to Comrie (1976), refers to the internal temporal constituency of a situation. Perfective aspect "indicates the view of the situation as a single whole, ... while the imperfective pays essential attention to the internal structure of the situation" (p.16). The imperfective can be further subclassified into habitual and continuous varieties. Habituals describe a situation characteristic of an extended period of time. Continuous forms can be subdivided into progressive and nonprogressive classes. Progressiveness is defined as continuousness not occasioned by habituality. These subdivisions are shown in Figure 32.

These same subdivisions can be recast in the cognitive terms of dishabituation and habituated models (Figure 33).

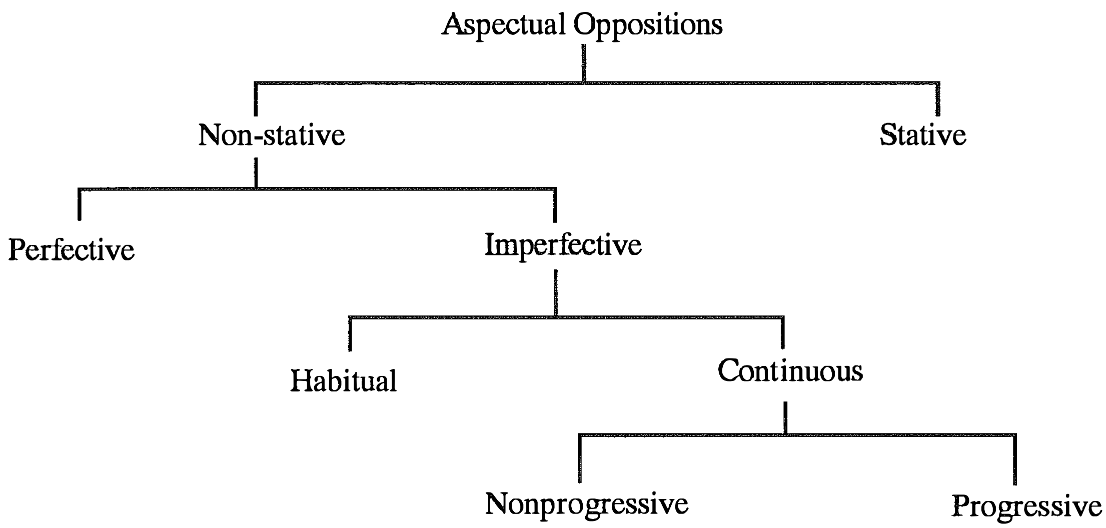


FIGURE 32. Aspectual distinctions according to Comrie (1976).

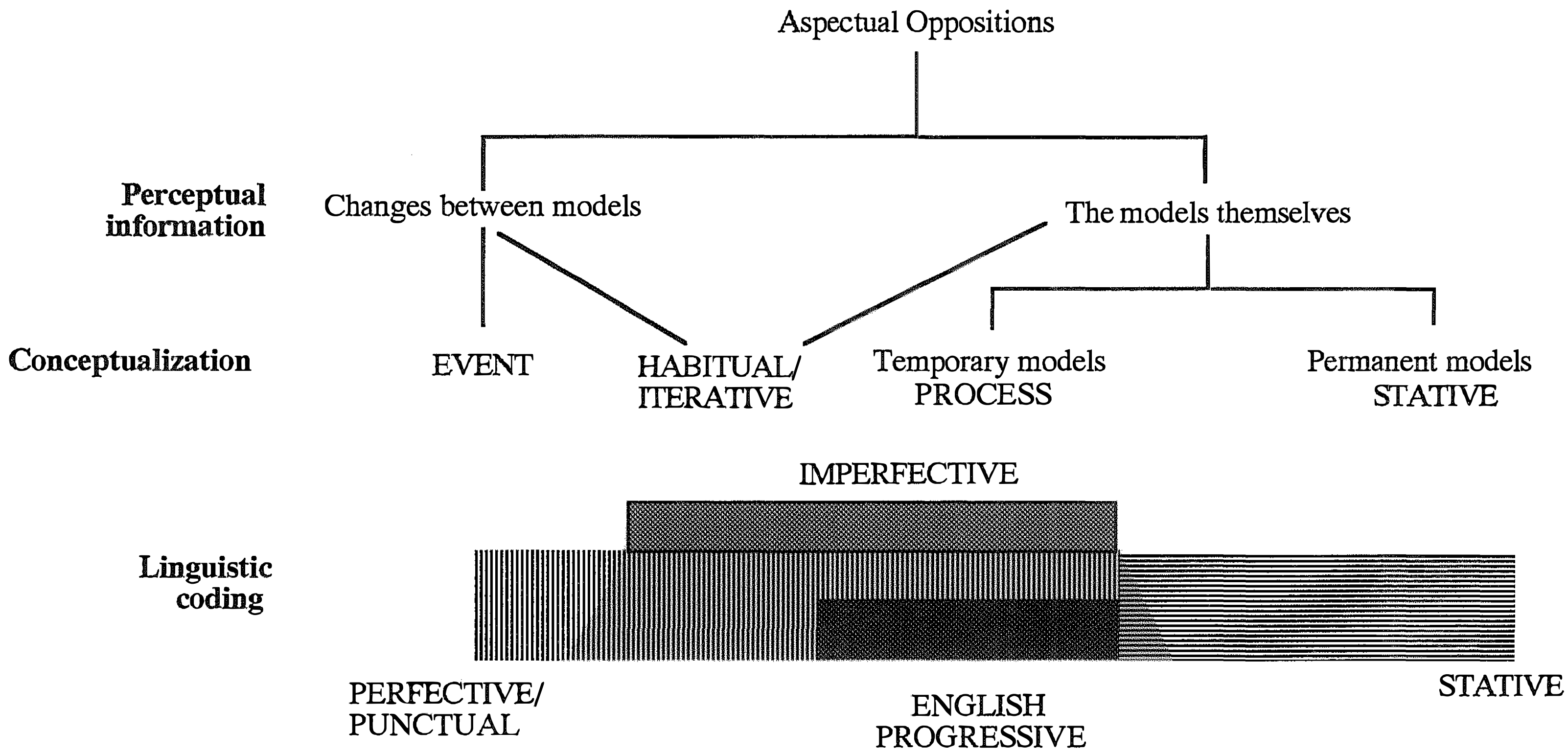


FIGURE 33. A cognitive reanalysis of Comrie's (1967) aspectual classification

The shaded boxes on the bottom of the figure indicate the different forms used in different languages to encode the conceptualizations found above. Starting from the left side of the diagram, we see that EVENT conceptualizations are encoded by perfective forms. Moving rightward, note that habitual conceptualizations may be based on the changes between models or a model itself. In English, habituals are encoded using the perfective or periphrastic form:

(12) a. He works (every day).
b. He used to work (everyday).

In some languages with an imperfective form, such as Bulgarian (Comrie, 1976:31), the imperfect is used in conjunction with the perfect to form a habitual. Other languages, such as some of the Celtic languages (Comrie, 1976:39) use the imperfective/progressive form to code both habituality ("He goes."), and process ("He is going."). We can understand why both the perfective and imperfective forms are used cross-linguistically to encode habituality by examining the types of models habitual concepts are encoding. Habitual concepts involve the same EVENT repeated over and over for an extended period of time. The speaker may either refer to the EVENT occurring over and over again or relegate such repetition to a PROCESS *model* of repeated EVENTS (Figure 34 below).

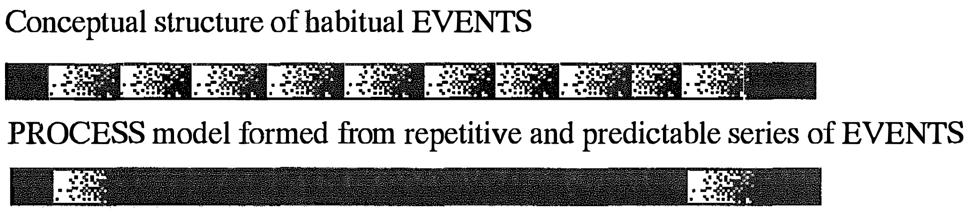


FIGURE 34. Possible habitual conceptualizations.

Thus, we can see why, cross-linguistically, either the PROCESS or EVENT forms might be used to encode habituality.

Moving to the right of the figure, encoding of temporary PROCESS models is accomplished by using a specifically Imperfective/Progressive form or as found in English, a hybrid STATIVE-PERFECTIVE form (denoted by the overlapped cross-hatched region). This "hybrid" is discussed below. On the far right of the diagram, we find statives encoding STATIVE conceptualizations based on relatively time-stable models.

6.3 Relationships of Analogy Between Progressive and Stative

The hybrid form of the English progressive demonstrates its "medial" PROCESS relationship to EVENTS and STATES. That is the progressive form is composed of a form related to that used to encode STATES and a form related to that used to encode EVENTS. PROCESSES and STATES are both conceptualizations of habituated models. In English, STATES are usually encoded with a fully inflected form of the stative verb "to be" along with a nominal or adjectival predicate:

(13) She is tall.
The ball is red.
He was a good worker.

PROCESSES are grammatically encoded using the progressive. There is evidence that the English progressive is diachronically derived from a predicate locative construction in which the nominalized form of the EVENT verb is used as the location. The stative predicate locative construction of (14a) becomes more event-like in the reduced and now progressive form of (14b). In (15a,b) we find a similar process occurring except that the predicate adjective of (15b) has retained vestiges of the prepositional locative.

(14) a. He is at working.
b. He is working.

(15) a. He is at sleeping.
b. He is asleep.

Synchronically, the English progressive uses the verb "to be" in its fully inflected form while the verb denoting the process is in a participial form:

(16) He's picking up the hatchet.
He's carrying wood.
She's lighting the fire.

The PROCESS verb is derived from an EVENT verb that has lost its agreement with the subject and any finite tense-aspect-modality marking. It is much more "model-like" or adjectival/nominal in form and is often found operating in these domains.

(17) Nominal: "*Walking* is good for the heart."
Adjectival: "The *running* water spilled out."
Predicate adjective: "The man was *sitting*."

Thus the progressive form reflects its the encoding of conceptual structure caught in between STATIVE and EVENT. The use of the copula indicates that a model is being encoded (as it does with STATIVES). The participial/nominal form ("He is picking up the wood.") of what would normally be an EVENT encoding ("He picks up the wood") reflects that the speaker is not encoding the change but the model of activity and that this model is temporary. The EVENT form has undergone nominalization or more specifically "modelization" where the derived form encodes a model rather than a change.

6.4 A Cognitive Look at Progressive Statives

Vendler (1967) states that lexically STATIVE verbs cannot be found in progressive form. In general, this is true. Speakers do not normally say "I am knowing the answer" or "I am believing the government" - however, these sentences are not impossibilities. Indeed, given a suitable context, they make perfect sense.

(18) a. "I am knowing the answer more and more during class."

b. "I am believing the government these days, but who knows what tomorrow will bring?"

Verbs associated with experience also are rarely found in progressive form, but may be permissible given certain contexts.

(19) a. *"I am seeing Kim." cf. "I see Kim."

b. "I am seeing Kim but I'm not sure - perhaps its an illusion."

The contexts of (18a,b) and (19b) that allow the progressive share one characteristic - temporary states or experience. As stated earlier, the English progressive is used to encode those neural models that are believed by the speaker to be temporary. Here we see that it is precisely that condition that allows the progressive to be used with verbs that are not normally associated with PROCESS conceptualizations.

6.5 Conclusion

This research has demonstrated that progressive-punctual aspect distinctions in English can be explained cognitively. The cognitive information processing model presented here, utilizes the dishabituation of the orienting response to chunk information. These information chunks can be approached from EVENT, PROCESS or STATE perspectives. The formation of EVENT conceptualizations requires that the speaker have access to both initial and terminal boundaries, or dishabituations of an EVENT. PROCESS conceptualizations are based on the state of habituated neural models, believed to be temporary by the speaker. STATE conceptualizations are also based on the state of habituated neural models, however these models are believed to be time-stable.

This research provided empirical testing of the model using an online production paradigm. The results demonstrated that by limiting access to stimuli involved in EVENTS, PROCESS conceptualization occurs and progressive encoding results. The results and subsequent analysis indicated a number of film design parameters that should be implemented in future research of this sort.

Finally, this research has shown that traditional ideas of grammatical and lexical aspect can be cognitively recast. This recasting has provided further insight into the mental representations behind aspect and the form-function relationships governing the encoding of those representations.

APPENDIX

SAMPLE DATA OF A CONDITION A SUBJECT AND A CONDITION B SUBJECT

The following are examples of data typically given by subjects in describing each of the films for the first time.

Condition A	Condition B
Narrow There's a red car driving left and there's a woman sitting inside. She just past a yellow fire hydrant. Now it's gone.	*Wide* There's a car driving by a tree and by a fire hydrant
Narrow There's a little kid kicking a ball and it went over a statue of a man.	*Wide* And there's a person kicking a ball over a statue
Narrow There's a red airplane flying further ... closer.	*Wide* And a plane just flew by a, statue of liberty and through the clouds

Condition A continued	Condition B continued
Wide There's a person on a bike just passed a dog and then a letter box and stopped for a red light. And he proceeded to go after the light turned green.	*Narrow* And a bicycle guy just drove by a a dog and a post office box and stopped at a red light and it turned green he's driving still.
Wide The child came up and picked up a stick. And hit a donkey who tried to kick him.	*Narrow* And a man is walking and picking up a ruu.. stick and hitting an animal
Wide There's a person picked up a ball or a rock threw it at a window and the rock went thru the window into the house.	*Narrow* A guy is picking up a ball and throwing it through a window
Narrow There's a dog running or jumping another dog walking in a house another dog jumping and running another dog walking near a brick wall another dog walking walked around a chair another dog running and jumping another dog walking by a box another dog running by a tire jumped over a table now he's running and jumping and he stopped.	*Wide* A dog just jumped over a stump and walked by a TV and a dog just ran by a garbage can walked around a brick wall the dog just walked by a chair and ran by a garbage can walked by an open box and ran by a tire and jumped on a table and off and by a stone wall and over a broken statue
Wide There's a cute dog just knocked a rock down a hill and hit a bush and scared a cat away.	*Narrow* Little dog's sniffing around oh, pushed a rock down a hill and a cat came

Condition A continued	Condition B continued
Narrow There's a yellow triangle going up and down next to a blue circle now it moving to the right past a pink star and up past a pink circle	*Wide* A yellow triangle and a red triangle and blue circle went down by a star went by a purple dot
Narrow There's a car driving really fast Person gets out of his little house He's walking past a red building. Goes inside. And a blue car going left Man comes out of the house, building back to his old trailer	*Wide* A car just drove by and a guy came out of the trailer he's walking to a restaurant and a blue car drove by and a guy is coming back out of a restaurant and back in the trailer

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