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AGENT, INSTRUMENT AND INTENTION

Ronald P. Schaefer

Introduction

1. The semantic notion instrument has been treated in some manner by most major linguistic theories of English. For this study, three of these theoretical treatments will provide linguistic models by which the semantic notion instrument can be analyzed in a basic instrumental sentence such as The boy cut the board with a saw. In the course of this analysis, it will become evident that the semantic notion instrument is not easily separable from the semantic notion agent. In fact, the semantic agent of the basic instrumental sentence always appears to function as grammatical subject.

In contrast to its treatment in linguistic theory, the semantic notion instrument as it applies in the basic instrumental sentence has received little experimental investigation by researchers of child language development. The intent of this study is therefore twofold. First, it will briefly sketch three linguistic models of English from which predictions can be made regarding the grammatical function of the semantic notion agent in the basic instrumental sentence. Second, it will present the findings of an experiment which attempted to probe for young children's understanding of the semantic notion instrument.

The first linguistic model which treats the semantic notion instrument is found in Lakoff (1968). Lakoff (1968) is concerned primarily with the non-accidental sense of the lexical items with and use as they might apply in the basic instrumental sentence. His arguments are direct-

ed against the existence of the underlying category Instrumental Adverb as it was posited in Chomsky (1965). For Lakoff (1968), the underlying structure of (1), which contains the instrumental adverb with a saw, is identical to the underlying structure of (2), which contains no apparent adverb.

1. The boy cut the board with a saw.
2. The boy used a saw to cut the board.

It follows that sentences (1) and (2) above are synonymous. More importantly for Lakoff (1968), sentence (1) is derived from the structure underlying sentence (2).

The primary motivation for postulating an identical underlying structure arises from structural constraints that appear to operate in sentences like (1) and (2). One such constraint postulated by Lakoff (1968) requires that the initial Noun Phrase (NP) in (1) and (2) be animate. If the initial NP is not animate, as in (3) and (4), then both sentences will be unacceptable.

- *3. The wind cut the board with a saw.
- *4. The wind used a saw to cut the board.

Lakoff (1968) argues that the unacceptable structures represented by (3) and (4) are not unrelated facts of grammar. Accordingly, if distinct underlying structures are postulated for (1) and (2), then two distinct structural constraints will be needed to rule out (3) and (4). In (3), the constraint will be stated in terms of the subject of the sentence and the instrumental adverb such that an instrumental adverb requires an animate subject. In (4), the constraint will be stated in terms of the subject and the verb of the matrix sentence. Of these two

possible constraints, Lakoff (1968) points out that the constraint postulated for (4) is common in most natural languages while the constraint postulated for (3) is extremely uncommon and strange.

On the other hand, according to Lakoff (1968), if identical underlying structures are posited for (1) and (2), only one constraint, the more common constraint postulated for (4), need be included in the grammar to prevent structures like (3) and (4) from occurring. Based on arguments such as the above, one might conclude that the structure underlying (1) and (2) would appear as in Figure 1.

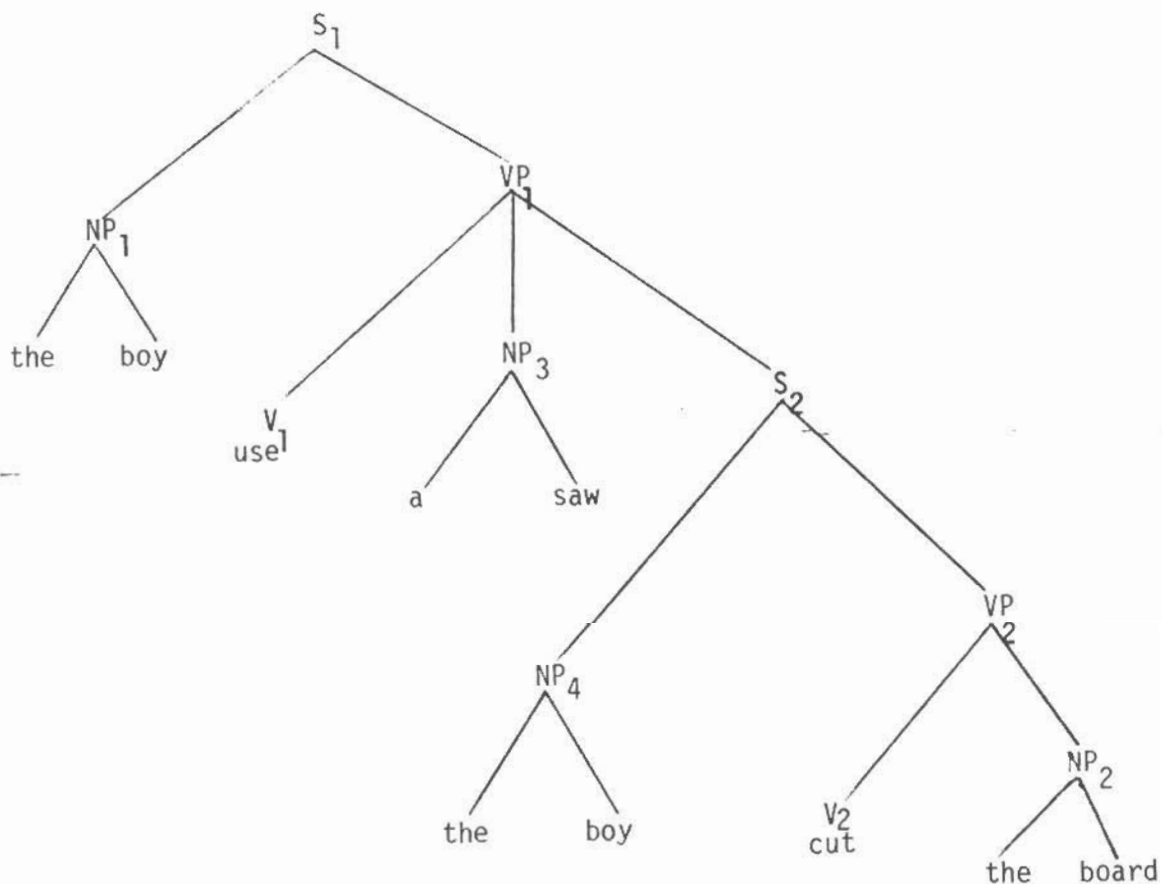


Figure 1. The underlying structure of the basic instrumental sentence The boy cut the board with a saw based on Lakoff (1968).

It is important to note that Lakoff (1968) is concerned only with the non-accidental sense of the lexical item use in Figure 1. The non-accidental or intentional sense of use requires that use refer to a specific action performed by an animate entity. In addition, this animate entity, an agent, must become the grammatical subject of use. Such is not the case in (5) below where skate is the non-animate subject of a generic action.

5. Skates use ball bearings to cut down on friction.

Thus, after inspection of the underlying structure posited by Lakoff (1968), one would predict that children would consistently prefer an agent as grammatical subject in what here has been called the basic instrumental sentence.

A second linguistic model which treats the semantic notion instrument is found in case grammar. Working within the case grammar tradition, Nilsen (1973) provides semantic as opposed to syntactic means for distinguishing one underlying case from another and, thus for defining the various cases found in a grammar. Nilsen (1973) furthermore argues that a consideration of the binary semantic features attached to the various underlying cases allows the level of explanatory adequacy to be reached. That is, a consideration of the semantic features attached to the various cases allows one to explain subject marking, object marking and case deletion.

According to Nilsen (1973), certain "active" features of the set of semantic features attached to underlying case define an activity potential or what Nilsen calls an Activity Quotient. The Activity Quotient is based on the following set of semantic features: intent, cause, controller, and

animate. In more concrete terms, the effect of this Activity Quotient can be seen in (6) where the Agent case becomes the grammatical subject, the Objective case becomes the direct object, and the Instrumental case can be optionally deleted.

6. The boy cut the board with a saw.

It follows from Nilsen (1973) that the three underlying cases represented in (6) function in their respective grammatical roles because of the following distribution of the semantically active features in each underlying case.

7. <u>Agent</u>	<u>Objective</u>	<u>Instrument</u>
+ intent	- intent	- intent
+ cause	- cause	+ cause
+ controller	- controller	+ controller
+ animate	- animate	- animate

In brief terms, the Agent case, which positively specifies all of the active features and consequently exhibits the highest Activity Quotient of the three relevant cases, becomes the grammatical subject. The Objective case, which negatively specifies all of the active features and thus exhibits the lowest Activity Quotient of the three cases, becomes the direct object. Not meeting either of these extremes of feature activity, the Instrumental case specifies neither a high nor a low Activity Quotient and therefore can be optionally deleted from (6).

With regard to the particular set of active features specified for Agent and Instrumental case, it is important to note that both the Agent and Instrumental case are specified as to the feature [+ cause]. The causative nature of the semantic notions agent and instrument was not explicitly treated in Lakoff (1968). However, there are significant ele-

ments common to Lakoff (1968) and Nilsen (1973).

As can be seen by focusing attention on the set of active features in (7), the basic distinction between the Agent and Instrumental case involves the features [intent] and [animate]. Such a distinction echoes Lakoff's (1968) emphasis on the intentional nature of use when it occurs with an animate subject in the basic instrumental sentence. As with Lakoff (1968), one would predict from Nilsen's (1973) semantic feature analysis of underlying case that children would consistently prefer an agent as grammatical subject of the basic instrumental sentence.

A third linguistic model which treats the semantic notion instrument is found in Talmy (1976). Talmy's (1976) principle concern is in formulating the underlying structure of utterances which specify a basic causative situation, a situation which Talmy (1976) defines as two causally related events. Each event is specified in terms of the notions Figure and Ground such that the Figure object is a moveable or conceptually moveable point and the Ground is a reference point with respect to which the Figure object moves.

A particular kind of causative situation is found in the basic instrumental sentence. Following Talmy (1976) one notices that the semantic relationship between the referents of boy and cut and the referents of cut and board in (8) is not equal.

8. The boy cut the board with a saw.

This inequality reflects the situation referenced by the sentence in (8), which consists of at least two causally related events: the boy does something--pushes a saw through the board, and the board does something--comes apart. Following Talmy (1976), the appropriateness of the verb cut

in (8) is dependent on the final event, the board coming apart, not the antecedent event, the boy pushing on the saw. That is, suppose a situation in which a boy was pushing a saw against a board. If the board does not come apart, then one cannot appropriately use the verb cut to describe that situation. It would appear that the semantic relationship between the referents of boy and cut and the referents of board and cut are thus not equal. Consequently, the final event, not the antecedent event, is asserted by the verb, and the final event functions as Figure with respect to the entire underlying causative structure of sentence (8).

The antecedent event mentioned above entails additional causal events. In particular, the antecedent event entails that the saw be in "force exertional contact" with the board. This force exertional event, in turn, is the result of an event in which a body part of the boy, his hand, is in "force exertional contact" with the saw. If the boy did not exert a force on the saw by some means, then it is difficult to conceive how the saw could exert a force on the board. Therefore, the event whereby the saw cuts the board is the result of the event whereby the hand pushes the saw.

The causal structure underlying the antecedent event, and hence sentence (8), is not complete however. According to Talmy (1976), the body part event, specified as contact between the boy's hand and the saw, is the result of a particular non-physical causing event, a volitional event. That is, the boy's hand touches the saw because the boy wills that it do so. The causal structure underlying (8) might appear as in Figure 2, where the capitalized morphemes are particular underlying morphemes given explicit treatment in Talmy (1976).

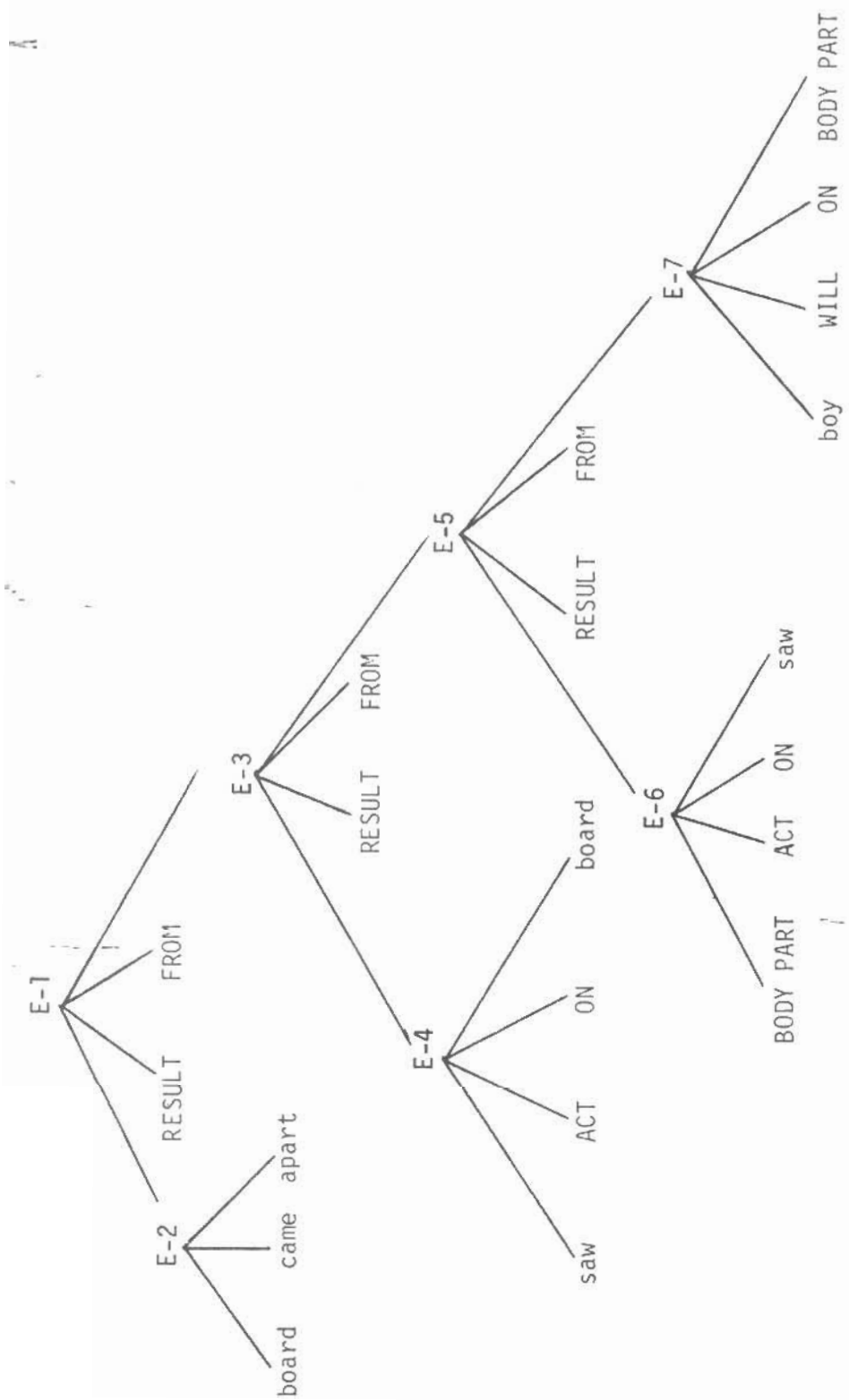


Figure 2. The underlying causative structure of the basic instrumental sentence
The boy cut the board with a saw based on Talmy (1976).

The basic instrumental sentence (8) entails still one additional event according to Talmy (1976). This additional event, termed by Talmy (1976) Intention, consists of a mental event independent of the causal events specified previously. In fact, the Intention event need not apply in some circumstances to the entire causal structure given expression in Figure 2. Rather, according to Talmy (1976), the Intention event must always apply to the body part event (E-6), the volition event (E-7) and optionally to higher events in the underlying causal structure as the circumstance dictates. (The optionality of the Intention event can be realized if one were to use (8) to describe a situation where a particular board was cut by the boy, but the boy did not intend that that particular board be cut.)

Moreover, the presence of the event Intention in the underlying structure, but not in the causal structure, allows Talmy (1976, p. 85) to define the notion agent:

The notion of an "agent" , accordingly, is criterially characterizable as an entity with "body parts," volition, and intention, where the body parts respond to volition, and intention applies to these responses, and optionally, to further subsequent events.

With respect to the underlying structure of the basic instrumental sentence (8) expressed in Figure 2, the notion agent would include the Intention event, the body part and volition events, (E-6) and (E-7) respectively, and all additional events specified in Figure 2. By thus detailing the notion agent, Talmy (1976) also provides the semantic elements which underlie the grammatical subject of the basic instrumental sentence. As with Lakoff (1968) and Nilsen (1973), one would predict

from Talmy (1976) that children would prefer an agent as grammatical subject of the basic instrumental sentence.

What can be observed from the three linguistic models briefly sketched above is that the semantic notion instrument is not easily divorced from the semantic notion agent. Indeed, it appears that the two semantic notions agent and instrument are related by the presence of the semantic notion intention, however it may be expressed in underlying structure. One might conclude that the presence of the relational notion intention figures prominently in, perhaps determines, the grammatical function which the semantic notion agent performs when it is combined in underlying structure with the semantic notion instrument.

Accordingly, each of the three linguistic models thus far discussed predicts that if the notion instrument is part of a child's linguistic system, then that child will prefer an intention bearing agent as the subject of a basic instrumental sentence. Need this be the case? The underlying structures presented above suggest that there are several semantic components, intention in particular, which influence subject marking in the basic instrumental sentence. The following is a description of an experiment which attempted to determine whether young children indeed prefer an agent as the grammatical subject of the basic instrumental sentence.

METHOD

Subjects

2. The subjects for this experiment consisted of 15 normal developing children. They included five 4-year-old children (one of whom was 3.10 years), five 5-year-old children and five 6-year-old children. All subjects were

acquiring English as a first language.

Stimuli

2.1 The stimuli consisted of eight core sentences. Each sentence expressed the use of an instrument by an agent. The eight core sentences are listed in Table A.

The boy is cutting the board with a saw.
 The girl is slicing the pie with a knife.
 The girl is scrubbing the pig with a brush.
 The man is painting the fence with a brush.
 The lady is cutting the paper with a scissors.
 The boy is watering the garden with a can.
 The lady is sweeping the floor with a broom.
 The man is hitting the nail with a hammer.

Table A

Photographic plates were made of line drawings depicting each of the agent/instrument relationships expressed in the core sentences. Two spoken versions, one using the agent as subject and one using the instrument as subject, were also recorded for each core sentence. The visual depiction and the two recorded sentences for each core sentence were combined, as described below, to form two groups of experimental test plates. One group of experimental test plates consisted of the eight pictures of the eight core sentences in which the agent of the sentence was depicted. In the second group of experimental test plates, the agent was photographically deleted.

Agent Test Plates

2.2 There were eight Agent Test Plates. Each was composed of two

auditory stimuli and one visual stimulus. The visual stimulus on each test plate consisted of a 4 x 5 inch black and white photograph which portrayed an ongoing action. Each ongoing action interrelated agent, instrument and object roles such that an explicit agent was depicted.

For each of the visual stimuli, two corresponding sentences were formulated from the core set of sentences. One of the sentences, the Agent Sentence, contained the agent of the core sentence as grammatical subject, but it did not overtly express the instrument of the core sentence. The Agent Sentences thus took the form The boy is cutting the board.

The other sentence formulated for each of the visual stimuli, the Instrument Sentence, contained the instrument of the corresponding core sentence as grammatical subject. In contrast to the Agent Sentences, the Instrument Sentences were unacceptable by adult standards. The Instrument Sentences took the form The saw is cutting the board.

Thus, the two sentences on each of the Agent Test Plates differed as to the semantic notion which functioned as grammatical subject. The purpose in placing the two contrasting recorded sentences on the Agent Test Plate was to determine if individual subjects preferred an agent or an instrument as the grammatical subject of a sentence which referred to a photograph depicting an explicit agent.

Agentless Test Plate

2.3 There were eight Agentless Test Plates. Each was composed of two auditory stimuli and one visual stimulus. The auditory stimuli consisted of the same two sets of sentences, Agent and Instrument, placed

on the Agent Test Plate.

The visual stimuli differed, however, in that an explicit agent was not depicted on any Agentless Test Plate. The visual stimuli on the Agentless Test Plates were identical to the visual stimuli on the Agent Test Plate in all respects except that the agent had been photographically deleted on the Agentless Test Plate. The purpose in placing the two contrasting sentences on the Agentless Test Plate was to determine if subjects preferred an agent or an instrument as the grammatical subject of a sentence which referred to a photograph depicting no explicit agent.

In summary, the test sentences on each test plate, the Agent Sentence and the Instrument Sentence, contained either an agent or an instrument respectively as grammatical subject. The two paired test sentences were matched with one set of visual stimuli, that of the Agent Test Plate, which depicted an explicit agent and with a second set of visual stimuli, that of the Agentless Test Plate, which did not depict an agent.

Filler Test Plate

2.4 There were eight Filler Test Plates. Each was constructed in the same manner as the other test plates except that only one of the two auditory stimuli (sentences) on each Filler Test Plate provided an appropriate match for the visual stimulus. For instance, with the photograph of a young boy catching a fish, the two presented sentences were The boy is catching the fish and The girl is pushing the cart. The purpose of the Filler Test Plate was to provide a check for on task behavior and to ensure that the subjects understood the preference procedure. If a sub-

ject missed more than one of these filler stimuli, he was dropped from the study. No subjects were lost during the conduct of the study on the basis of this criterion.

Procedure

2.5 The experiment consisted of a production task and a comprehension task. The production task consisted of a verbal response by the child to the experimental test plates. The comprehension task consisted of a preference task whereby the child matched one of two given auditory stimuli to a given visual stimulus.

The entire set of 24 test plates were divided into two Presentation Sets of 12 test plates each. Each Presentation Set consisted of 4 Agent Test Plates, 4 Agentless Test Plates and 4 Filler Test Plates. With respect to the Agent and Agentless Test Plates, they were assigned to the Presentation Sets in such a manner that the Agent or Instrument Test Plates that were based on the same ongoing action did not occur in the same Presentation Set. This was done to minimize the immediate transference of visual and auditory information from the Agent Test Plate to its counterpart among the Instrument Test Plates.

Within each Presentation Set, the test plates were given in a random order to each subject. Each test plate was presented by means of a language master placed within arm's reach of the child. The language master had two color-coded buttons that each activated a tape recording of one of the paired sentences.

For the comprehension task, the two Presentations Sets of test plates were given to each subject at two meetings. The meetings with each child were separated by a time lapse that varied from as much as 24 hours for

4-year-old subjects to approximately 20 minutes for the 6-year-old subjects.

At the outset of the first meeting, each subject was given the following instruction for the comprehension task: Which sentence tells me best about the picture? Following the verbal instructions, two or sometimes three Filler Test Plates were presented to acquaint each subject with the preference procedure. After acquainting the subject with the preference procedure, the first test plate in the Presentation Set was positioned in the language master and the experimenter pushed the two record activating buttons in succession. All test plates were presented in this manner. The subject's task was to point to the sentence button which he/she preferred as a match for the photographic plate.

At the completion of the first Presentation Set, each subject was immediately given the production task. For the production task each subject was given the following instruction: What is happening in the picture? After the instructions were given, each subject was shown the pictures in the Presentation Sets. The Presentation Sets in the production task were given in an order opposite to that given in the comprehension task. Subject responses in both the production and comprehension tasks were recorded by the experimenter on an answer sheet.

RESULTS AND DISCUSSION

The purpose of the experiment presented in the previous section was to determine whether experimental subjects preferred an agent or an instrument as grammatical subject in sentences which referred to agent and agentless visual stimuli. The findings suggest that the experimental subjects' preferences were non-uniform.

Results Across Age Groups

3.1 Table 1 indicates the response pattern obtained from all subjects in both the production and comprehension tasks. The production and comprehension columns in Table 1 indicate that comprehension does not appear to mirror production when the response pattern of all subjects is considered. The percentage of Agent Sentence and of Instrument Sentence preference, and hence, the preference for an agent or an instrument as grammatical subject in the production task, is not the same or even similar to the percentage figures in comprehension. Such variability may be misleading, since the percentage figures in each category encompassed all age groups represented in the experiment.

	PRODUCTION		COMPREHENSION	
	INSTRUMENT	AGENT	INSTRUMENT	AGENT
AGENT TEST PLATE	8.3%	91.6%	49.1%	50.8%
AGENT-LESS TEST PLATE	53.3%	46.6%	77.5%	22.5%
AGENT & AGENT-LESS TEST PLATE	30.8%	69.1%	63.3%	36.6%

Table 1. Preference in percentage for an Agent or Instrument Sentence with experimental test plates for all subjects.

Results According to Age Group

3.2 The response pattern for both the production and comprehension tasks according to the age of the experimental subjects is presented in Tables 2,3, and 4. The response pattern to the Agent Test Plate, which depicted an explicit agent, shows that all age groups tended to prefer an agent subject in the production task. The same response pattern is not shown in the comprehension task.

PRODUCTION TASK

	INSTRUMENT SUBJECT	AGENT SUBJECT
AGENT TEST PLATE	2 of 40	38 of 40
AGENT-LESS TEST PLATE	20 of 40	20 of 40

COMPREHENSION TASK

	INSTRUMENT SUBJECT	AGENT SUBJECT
AGENT TEST PLATE	23 of 40	17 of 40
AGENT-LESS TEST PLATE	33 of 40	7 of 40

Table 2. Response preference for an agent or instrument grammatical subject in the production and comprehension tasks for 4-year-old subjects.

In the comprehension task with the Agent Test Plate, only the response pattern of the 6-year-old subjects in Table 4 shows that they preferred an agent subject. The response pattern of the 5-year-old subjects in Table 3 shows that they preferred instrument subjects in the comprehension task. Note that the response pattern of the 5-year-old subjects in the comprehension task is almost the exact opposite of their response pattern in the production task. The response pattern of the 4-year-old subjects in the comprehension task parallels the response pattern of neither the 5- nor 6-year-old subjects. The 4-year-old subjects as a group preferred both agents and instruments as grammatical subject.

Thus with respect to the Agent Test Plate, 6-year-old subjects preferred an agent as grammatical subject in both production and comprehension, 5-year-old subjects preferred an agent subject in production and an instrument subject in comprehension, and 4-year-old subjects preferred an agent subject in production and either an agent or an instrument in comprehension.

The response pattern of each of the age groups for the Agentless Test Plate, the test plate with no explicit agent depicted, is somewhat different than the response pattern to the Agent Test Plate. In the production task, the response pattern for each age group reveals that no experimental age group expressed a clear preference for either an agent or instrument as grammatical subject. The absence of an explicit agent in the Agentless Test Plate had a uniform effect on all age groups in the production task. This finding contrasts with the findings from the production task for the Agent Test Plate where all age groups preferred an agent as subject.

PRODUCTION TASK

INSTRUMENT SUBJECT		AGENT SUBJECT	
AGENT TEST PLATE	8 of 40	32 of 40	
AGENTLESS TEST PLATE	21 of 40	19 of 40	

COMPREHENSION TASK

INSTRUMENT SUBJECT		AGENT SUBJECT	
AGENT TEST PLATE	33 of 40	7 of 40	
AGENTLESS TEST PLATE	37 of 40	3 of 40	

Table 3. Response preference for an agent or instrument grammatical subject in the production and comprehension tasks for 5-year-old subjects.

PRODUCTION TASK

INSTRUMENT SUBJECT		AGENT SUBJECT	
AGENT TEST PLATE	0 of 40	40 of 40	
AGENTLESS TEST PLATE	23 of 40	17 of 40	

COMPREHENSION TASK

INSTRUMENT SUBJECT		AGENT SUBJECT	
AGENT TEST PLATE	3 of 40	37 of 40	
AGENTLESS TEST PLATE	23 of 40	17 of 40	

Table 4. Response preference for an agent or instrument grammatical subject in the production and comprehension tasks for 6-year-old subjects.

With the Agentless Test Plate, the response pattern in the comprehension task does not parallel the response pattern of the production task for all age groups. The response pattern of the 6-year-old group in Table 4 shows that they did not prefer either an agent or an instrument as grammatical subject in the comprehension task.

In contrast, the 5-year-old group preferred an instrument as grammatical subject. The 4-year-old group, as well, preferred instrument subjects with the Agentless Test Plate

In summary, the 6-year-old subjects as a group preferred either an agent or an instrument as grammatical subject in both the production and comprehension tasks for the Agentless Test Plate. The 5-year-old subjects as a group preferred either an agent or an instrument as subject in the production task, and preferred an instrument as subject in the comprehension task. Much as the 5-year-old subjects, the 4-year-old subjects as a group preferred either an agent or an instrument as grammatical subject in the production task, but they preferred only an instrument as subject in the comprehension task.

Results According to Strategy

3.3 The results according to age group suggest that all subjects in a given age group were performing uniformly. In order to investigate this matter a criterion response level was established. The criterion level was set at .75 responses (6 of 8) per test plate-sentence subject category. That is, at least 75% of the 8 responses a subject made to a particular test plate had to occur under one sentence-subject category in order to meet the criterion level.

Using this criterion level as a measure, three strategies could be identified. The Agent Strategy was defined as a criterion level response preference for the agent subject in both the production and comprehension

tasks. The second strategy identified, the Instrument Strategy, was defined as a criterion level response preference for the instrument subject in both the production and comprehension tasks. Lastly, the Agent-Instrument Strategy was defined as a criterion level response preference for the agent subject in the production task, and a criterion level response preference for the instrument subject in the comprehension task.

Table 5 presents the classification of the 15 experimental subjects according to their observed strategy with the Agentless Test Plate, the test plate lacking an explicit agent. Table 5 indicates that of the three strategies mentioned above, the Instrument Strategy was most often used by 5- and 6-year-old subjects. The next most often used strategy was the Agent-Instrument Strategy by the 4- and 5-year-old subjects. Note that only 6-year-old subjects used the Agent Strategy and only two of the 4-year-old subjects appeared to use no identifiable strategy at all. It would appear therefore that the Agentless Test Plate had the greatest influence on the choice of grammatical subject for the youngest children in the experiment and the least influence on the oldest children in the experiment. However, it is also apparent that age is no certain guide to the strategy used by the experimental subjects.

Table 6 presents the classification of the 15 experimental subjects according to their observed strategy with the Agent Test Plate, the test plate with an explicit agent. Table 6 indicates, first of all, that all experimental subjects used a consistent strategy with the Agent Test Plate. Seven subjects used the Agent Strategy, seven used the Agent-Instrument Strategy and only one subject used the Instrument Strategy.

AGENTLESS TEST PLATE

AGENT STRATEGY	INSTRUMENT STRATEGY	AGENT-INSTRUMENT STRATEGY
Christy-6 Bob-6	Julie-5 Jeff-4 Tom-6 Ken-6 Lance-6 John-5 Scott-5	Michael-4 Noel-5 Christy-5 Steven-4
	<u>NO CONSISTENT STRATEGY</u>	
	Jeff L.-4 Eva-3	

Table 5. Classification of experimental subjects according to their observed strategy with the Agentless Test Plate.

AGENT TEST PLATE

AGENT STRATEGY	INSTRUMENT STRATEGY	AGENT-INSTRUMENT STRATEGY
Christy-6 Tom-6 Ken-6 Lance-6 Bob-6 Jeff-4 Jeff L.-4	Julie-5	Noel-5 Christy-5 Scott-5 John-5 Michael-4 Steven-4 Eva-3

Table 6. Classification of experimental subjects according to their observed strategy with the Agent Test Plate.

With respect to the age of the subjects, all 6-year-old subjects used the Agent Strategy with the Agent Test Plate. Two of the 6-year-old subjects who used the Agent Strategy with the Agentless Test Plate also used the Agent Strategy with the Agent Test Plate. In addition, two of the 4-year-old subjects used the Agent Strategy with the Agent Test Plate. One of these subjects, Jeff L., used no consistent strategy with the Agentless Test Plate. Since all other experimental subjects used a consistent strategy with both test plates, one cannot easily arrive at any firm conclusions regarding the strategies used by these two subjects.

Only one of the 5-year-old subjects used the Instrument Strategy with the Agent Test Plate. This same 5-year-old subject used the Instrument Strategy with the Agentless Test Plate, suggesting therefore that the presence of an explicit agent on the test plate had little effect on the preference of grammatical subject in either production or comprehension for this experimental subject.

Four of the 5-year-old subjects and three of the 4-year-old subjects used the Agent-Instrument Strategy with the Agent Test Plate. Four of these subjects also used the Agent-Instrument strategy with the Agentless Test Plate. This finding suggests two things about these four experimental subjects. First, the absence of an explicit agent on the Agentless Test Plate had little influence on preference of grammatical subject in the production task. Second, the presence of an explicit agent on the Agent Test Plate had little influence on the preference of grammatical subject on the comprehension task. These suggestions hold only for those subjects that used an Agent-Instrument Strategy however.

Based on the above findings it appears that there may be a developmental progression in the strategies observed by the experimental subjects in response to the Agent Test Plate. The findings show there to be a strong tendency for 4- and 5-year-old subjects to use the Agent-Instrument Strategy and for 6-year-old subjects to use the Agent Strategy with the Agent Test Plate. Such findings have implications for the linguistic knowledge attributed to young children.

DISCUSSION

4.1 The results presented in the previous section indicate that experimental subjects employed three identifiable strategies in response to the experimental test plates. The Instrument Strategy was most often used with the Agentless Test Plate. The Agent and Agent-Instrument Strategies, by contrast, were most often used with the Agent Test Plate. The use of these strategies can only partially be explained by the prediction from linguistic theory that experimental subjects would prefer an intention bearing agent as grammatical subject of the basic instrumental sentence.

With respect to the Instrument Strategy, it should be noted that it was primarily used when no explicit agent was depicted on the test plate. Although such a finding was not predicted by the linguistic models discussed in the first section of this study, one might conclude that the Instrument Strategy was a result of the subject's sensitivity to the perceptual cues provided by the Agentless Test Plate. As support for this, consider that only one subject used the Instrument Strategy with the Agent Test Plate, the test plate with an explicit agent. Also, consider

that two subjects, 6-year-olds, displayed no such sensitivity to perceptual cues since they used the Agent Strategy with both sets of test plates. Such considerations suggest that there may be a point in the sixth year of life when a child's sensitivity to such perceptual cues does not affect his choice of grammatical subject and, hence, his linguistic system.

As opposed to the Instrument Strategy, the Agent Strategy conforms to the predictions of the linguistic models discussed in the first section of this study. One might conclude that the semantic notion instrument is a linguistic reality for experimental subjects who used the Agent Strategy with both the Agent and Agentless test plates. Furthermore, the semantic notion agent and the semantic notion intention would appear to have equal linguistic reality for these experimental subjects. For those experimental subjects who did not use the Agent Strategy with both experimental test plates, it may be concluded that the notions agent, instrument and intention have not yet achieved full linguistic reality.

The third strategy observed by the experimental subjects, the Agent-Instrument Strategy, cannot be easily explained either by perceptual cues provided by the Agent test plate or by the models presented in this study. Recall that in the Agent-Instrument Strategy the experimental subjects preferred an agent as grammatical subject in the production task and an instrument as grammatical subject in the comprehension task. Why uniformity does not exist between the response preferences in the production and comprehension tasks is difficult to explain. The particular difficulty with the Agent-Instrument Strategy is that it implies that the experimental subjects possessed some sense of the semantic notion agent in the production task but lacked such a sense in the comprehension

task. Another difficulty with the Agent-Instrument Strategy involves how one might explain, by means of the linguistic models discussed earlier in this study, the choice of an instrument as grammatical subject with the Agent Test Plate. That is, how did the semantic notion instrument become the grammatical subject of the basic instrumental sentence?

To begin with Lakoff (1968), recall the underlying structure represented in Figure 1. In Figure 1 one observes that the semantic notions agent and intention are located respectively at the nodes NP_1 and V_1 of the matrix sentence. If it is assumed that it is these two notions which are absent from the child's linguistic system when an agent is not chosen as grammatical subject, then it is from the remaining underlying structure that the child would derive the instrument as grammatical subject. In addition, since Np_4 of the deepest underlying sentence is identical to and therefore redundant with the agent NP, the boy, one might assume that the child's linguistic task becomes one of finding a Noun Phrase that can function as the subject of the remaining underlying structure. As represented in Figure 1, the two remaining $\bar{N}P$ s from which a grammatical subject may be chosen are NP_3 and NP_2 . If the child were to follow a process akin to Chomsky's (1969) Minimal Distance Principle (MDP) whereby the NP most closely preceding the complement verb becomes the grammatical subject, then NP_3 would become the grammatical subject. NP_3 , as Figure 1 reveals, is the structural location of the semantic notion instrument. Through some such process as the MDP the semantic notion instrument might then come to function as the grammatical subject of the basic instrumental sentence.

The preceding is one possible linguistic explanation for the observed

preference of an instrument subject in the Agent-Instrument Strategy. It is, nevertheless, a somewhat strained explanation. Notice first of all that NP_3 may not be the structural location of the semantic notion instrument. Pursuing this line of thought one recognizes that since an instrument was preferred as grammatical subject, there are grounds to question the highest S node in Figure 1. That is, since an S is defined by the constituents NP and VP, and since NP_1 and V_1 , the core constituents of S_1 , are assumed to be absent, little justification remains for positing the node S_1 .

It may be more in line with the experimental facts if one assumes an underlying structure consistent with the elements represented by The saw cut the board, where no mention is made of an agent NP or an intentional element use. Such an underlying structure does not appear to allow for any linguistic insight as to why an instrument, rather than an agent, was preferred as grammatical subject. One merely posits two distinct underlying structures to account for the experimental facts without suggesting any relation between the two structures. An explanation of the experimental facts based on the MDP, therefore, would appear to assume an underlying structure in which constituents that might provide potential insights into those facts are not presented.

Perhaps a more conclusive explanation for the preference of an instrument as grammatical subject with the Agent Test Plate can be found in Nilsen's (1973) approach to the semantic features attached to underlying case. With respect to semantic features, it is important to recall that the basic distinction between the Agent and Instrumental case focused on the positive features [+ intent] and [+ animate] attached to

the Agent case. Moreover, it is the feature [+ intent] that ultimately specifies the higher Activity Quotient of the Agent case. Nilsen (1973, p. 95) states the following about the significance of the feature [+ intent]:

These observations lead me to conclude that the feature Intent is at the top of a hierarchy of features, each of which entails all of the features below it. The feature [+ intent] entails the feature [+ cause], and [+ intent] also entails the feature [+ animate].

It follows that since the feature [+ intent] specifies the higher Activity Quotient of the Agent case and therefore determines the subject of the basic instrumental sentence, the absence of the feature [+ intent] will systematically reduce the Activity Quotient of the Agent case. The exact feature profile of the Agent case when the feature [+ intent] is absent is not self-evident however. On the one hand, since the feature [+ intent] in Nilsen's hierarchy entails those features below it, it is necessary only that the Agent case exhibit an active feature profile which includes the feature [- intent]. In this reduced form the Agent case might have the following feature profile as compared to the Instrumental case.

<u>Agent</u>	<u>Instrumental</u>
- intent	- intent
+ cause	+ cause
+ controller	+ controller
+ animate	- animate

An important point to notice about the above feature profiles is that the Agent case, due primarily to the feature [+ animate], exhibits a higher Activity Quotient than the Instrumental case. Therefore, the Agent case ought still be marked as grammatical subject.

On the other hand, since the hierarchy of positive features only

exists to support its apex, the feature [+ intent], the absence of that feature might systematically reduce each active feature to its negative value. The following feature profiles might thus exist for the Agent and Instrumental case respectively.

<u>Agent</u>	<u>Instrumental</u>
- intent	- intent
- cause	+ cause
- controller	+ controller
- animate	- animate

This second feature profile for the Agent case allows for a desired result: the case with the higher Activity Quotient, the Instrumental case, can now function as the grammatical subject of the basic instrumental sentence.

Although the second feature profile presented above can account for a semantic instrument as grammatical subject, it does not appear to present a more conclusive explanation than that derived from Lakoff (1968). A direct implication of the second feature profile is that comprehension of causation, as it is expressed linguistically, is not fully developed by the age of 4 or 5 years. That is, the feature [- cause] under the Agent case suggests that the 4 or 5 year old child is not completely sensitive to the linguistic expression of causation. Such an implication contrasts with Bowerman (1974) which strongly indicates that children at 26 months of age show signs of being linguistically sensitive to causative structures. The children in this study, however, were almost 2 years older than those in Bowerman (1974). It would appear then that Nilsen's (1973) approach to semantic features may provide a less conclusive explanation of the instrument as grammatical subject than that derived from Lakoff

(1968).

The last linguistic model discussed in the first section of this study may be able to conclusively account for the preference of an instrument as grammatical subject with the Agent Test Plate. Recall Figure 2, the underlying causative structure suggested by Talmy (1976). Recall in particular that Talmy (1976) defines the notion agent in terms of the notion Intention and its necessary application to specific events of the underlying causative structure, E-6 and E-7 to be exact. Therefore, the three components Intention, E-6 and E-7 of the underlying structure in Figure 2 define the semantic notion agent and, ultimately, form the semantic basis for the grammatical subject. If a child does not prefer an agent as grammatical subject of the basic instrumental sentence, then one might assume that the above three components do not enter into the derivational process of subject marking as it applies in Figure 2.

There are two aspects to be noted about such an assumption. First, it does not imply that a child's comprehension of the linguistic causative structure is deficient. The causative structure is complete; it is the notion Intention and its scope of application that limit the amount of underlying structure open to derivational processes. Second, the above assumption does not result in underlying structures which are unrelated.

Insight can still be gained into processes that might affect underlying structure in the course of linguistic development.

As part of a general discussion of underlying causative structures, Talmy (1976) discusses the process of Foregrounding. Foregrounding appears to be a process whereby an element of a causing event is singled

out, as when (2) is derived from the basic causative structure in (1).

1. The vase broke as a result of a ball rolling into it.
2. A ball broke the vase by rolling into it.

In (2), the instrument, ball, is foregrounded with respect to the entire causative situation.

To perhaps clarify the derivational process of subject marking as it is found in Talmy (1976), it may be beneficial to contrast the normal derivation of the basic instrumental sentence, which includes the notion Intention, with the derivation exhibiting the process of Foregrounding, which excludes the notion Intention. Figure 3 presents the derivation of the basic instrumental sentence in which the agent becomes the grammatical subject. The notation is entirely derived from Talmy (1976) where S (R) is the caused event and S (a) the causing event. In Figure 3, notice in particular the crucial role INTEND (the representation of the notion Intention) plays in formulating the agent and, hence, the grammatical subject.

Figure 4, in contrast, presents a derivation of the basic instrumental sentence minus those underlying components that define agent (the node E-5 and below). The notation again is entirely derived from Talmy (1976) and the process of Foregrounding is specifically indicated by the constituent WAS THE INSTRUMENT IN.

- a. [S (R) RESULTed FROM S (a)]
NP (In) INTENDED [S (R) RESULTed FROM S (a)]
- b. NP (Au) AUTHOREd [S (R) RESULTed FROM S (a)]
NP (In) INTENDED [S (R) RESULTed FROM S (a)]
- c. NP (A) AGENTed [S (R) RESULTed FROM S (a)]
- d. NP (A) AGENTed TO RESULT S (R) BY S (a)
- e. NP (A) AGENTed S (R) BY S (a)
- f. The boy AGENTed [board come apart] BY [boy ACTing ON the board with a saw]
- g. The boy AGENTed To come apart the board BY his ACTing on the board with a saw]
- h. The boy cut the board BY ACTing ON the board with a saw
- i. The boy cut the board with a saw.

Figure 3. The derivation based on Talmy (1976) of the basic instrumental sentence in which an agent becomes the grammatical subject.

- a. [S (R) RESULTed FROM S (c)]
- b. NP (I) WAS THE INSTRUMENT IN [S (R) RESULTed FROM S (c)]
- c. NP (I) INSTRUMENTed [S (R) RESULTed FROM S (c)]
- d. NP (I) INSTRUMENTed TO RESULT S (R) WITH S (c)
- e. NP (I) INSTRUMENTed S (R) WITH_C S (c)
- f. The saw INSTRUMENTed [board come apart] WITH_C [the saw ACTed ON the board]
- g. The saw INSTRUMENTed the board to come apart WITH_C its ACTing ON it
- h. The saw INSTRUMENTed to come apart the board WITH_C its ACTing ON IT
- i. The saw cut the board.

Figure 4. The derivation based on Talmy (1976) of the instrumental sentence in which an instrument becomes the grammatical subject.

A comparison of the two derivational structures appears to reveal quite naturally how an instrument might come to function as the grammatical subject of a basic instrumental sentence. Also, a comparison of the two derivational structures indicates that the surface verb cut does not derive from the same constituent structure in Figure 3 and in Figure 4. In Figure 3, the constituent structure underlying cut is AGENTed TO come apart. Figure 4, in comparison, indicates that the constituent structure underlying cut consists of INSTRUMENTed to come apart. The surface form cut is thus derived from distinct underlying structures that the choice of grammatical subject reflects. It would appear, therefore, that by relying on the assumption that the semantic notion Intention is not present in underlying structure and Talmy's (1976) explication of the process Foregrounding, one may be able to account quite naturally for the choice of an instrument as grammatical subject of the basic instrumental sentence.

The original disparity between production and comprehension implied by the Agent-Instrument Strategy must still be faced despite Talmy's (1976) suggestive insights. In accord with the conclusions derived from Talmy (1976), one might claim that experimental subjects using the Agent-Instrument Strategy used functionally distinct verbs in the production and comprehension tasks. However, such a claim would seem to overcomplicate the lexicon and the whole process of language acquisition. Another approach to the production/comprehension disparity may be to claim that production exceeds comprehension in language development. Such a conclusion, however, is directly opposed to the findings of Fraser, Bellugi, and Brown (1963) with an age group similar to that used in this study. Rather than becoming involved in the intricacies of the produc-

tion/comprehension debate, it may be advantageous to attempt no explanation of this experimental phenomenon. It may be more beneficial to present a few areas for future investigation suggested by the results of this study.

Three specific areas of investigation are suggested by the semantic elements which may have played a role in the findings of this study. One might investigate the notion instrument as it applies in sentences like (3).

3. The boy rang the bell with his finger.

Rather than being a tool, as was the case in this study, the instrument in (3) is a body part. In addition, the body part is attached to an agent. Based on the findings of this study, one would predict that the body part instrument would receive a response pattern similar to the tool instrument despite the obvious connection between body part and agent.

One might also investigate the notion intention in linguistic contexts other than the basic instrumental sentence. Accordingly, children's responses to sentences like (4) and (5) could be investigated.

4. The boy jumped off the cliff.

5. The boy fell off the cliff.

An important distinction between these two sentences is the intention as it applies to the grammatical subject of (4) but not (5). Sentences such as (4) and (5) might also allow one to investigate the notion intention across a wider spectrum of age groups than those represented in this study.

A third area of investigation might employ sentences similar to those in this study. Such an investigation might attempt to determine children's ability to discriminate between the intentional and unintentional reading of a basic instrumental sentence like (6).

6. The boy broke the vase with the ball.

Such sentences could be designed for a wider range of age groups than that found in this study and could possibly determine the stage in linguistic development at which the unintentional interpretation of (6) becomes a linguistic reality.

In conclusion, this study found that not all experimental subjects preferred an agent as the grammatical subject of a basic instrumental sentence. 6-year-old subjects, in accord with predictions derived from linguistic theory, tended to prefer an agent as grammatical subject in both the production and comprehension experimental tasks. [4- and 5-year-old subjects, in partial opposition to predictions derived from linguistic theory, tended to prefer an agent as grammatical subject in the compre-^{NOT}hension task. Such a preference for an instrumental subject can be explained by assuming that the semantic notion intention is not present in underlying structure and that the underlying structure of the basic instrumental sentence is most clearly explicated in the work of Talmy (1976).

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