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ABSTRACT

Two experiments examined the process of acquisition of sentence structure in the passive voice among young children. The subjects were several hundred monolingual French-speaking children aged 4-11 in schools in Liege, Belgium. The two experiments used different subject groups. In the first experiment, the children were required to interpret sentences of varying types (plausible and plausibly reversible, implausible but plausibly reversible, and plausible but not plausibly reversible active and passive sentences) presented in either a realistic or a fictitious instructional context. Results showed complex patterns of responses illustrating the influences of semantic and syntactic factors in sentence comprehension, and their evolution over time. In the second experiment, the subjects interpreted syntactically regular and anomalous passive sentences according to semantic type. Results suggest that when the formal syntactic marks of passivity play a major role in sentence interpretation, the influence of the agentive preposition is more important than that of the auxiliary and/or past participle. A view of the development of passive sentence comprehension that sees it as an evolutionary product of a flexible set of interpretive strategies relating semantic and syntactic factors is proposed. (Author/MSE)

PRAGMATICAL, SEMANTICAL AND MORPHO-SYNTACTICAL FACTORS IN THE DEVELOPMENT OF PASSIVES [1, 2]

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ABSTRACT

Experiment I required preschool and primary-school children to interpret plausible and plausibly reversible, implausible but plausibly reversible, plausible but not plausibly reversibla active as well as passive sentences presented in a realistic or a fictitious instructional context. Complex patterns of responses were analyzed that illustrate the respective influences of semantic and syntactic factors in sentence comprehension and their evolution over time. Experiment II had another sample of preschool and primary school children interpret syntactically regular and anomalous passive sentences varying according to semantic type. When the formal marks of passivity play a major role in sentence interpretation, the influence of the agentive preposition appears to be more important than that of the auxiliary and/or the past participle. A view of the development of passive sentence comprehension is offered that makes it the evolutive product of a flexible set of interpretive strategies relating semantic and syntactic factors.

INTROOUCTION

By passive sentence, we will mean the full syntactic passive, i.e. those passives with the verb at the passive voice and the underlying grammatical subject introduced by the preposition "by", e.g. The cup was broken by the clumsy bartender, as opposed to truncated passives, e.g. The cup was broken and to so-called lexical passives, e.g. involving process verbs (Chafe 1970), for example, The wood dries. The full syntactic passive is equivalent in its underlying relations to an active sentence although a reversal of surface grammatical subject and object is achieved. The subject noun phrase that serves as the underlying grammatical subject remains invariant whether in sentence-first position as in the active or in sentence-last position as in the passive.

Passives are generally more difficult to understand than actives (Beilin & Sack 1975). The passive form is used relatively little in speech and writing (Brown 1973). Passives are mastered developmentally later than actives (Baldie 1976). Spontaneous use of passive forms is minimal until 7 years in children (e.g. Turner & Rommetveit 1967, Gaer 1969). Beyond that age, children continue to have a good deal of difficulty producing passive constructions even when the experimenter provides examples in the context of describing a picture or when the acted-upon object, for example, is shown the first in the picture. However, if the passive is truncated, the child's difficulty is reduced (Hayhurst 1967). An increased capacity for producing passive sentences in children has been

linked to a number of cognitive factors : e.g. an ability to "focus attention" on the underlying grammatical object and to give it an emphatic position at the beginning of the sentence (Tannenbaum & Williams 1968, Turner & Rommetveit 1967); reversibility, i.e. "reversibility in thought", a necessary condition for the development of linguistic functions requiring logical reversal. Exploration of this relationship in the development of passive sentence construction has been the object of several experiments (e.g. Sinclair & Ferreiro 1970, Sinclair, Sinclair & de Marcellus 1971, Beilin & Sack 1975, Horgan 1977). Typically, children have more difficulty encoding reversible situations into passive sentences (e.g. The girl is pushed by the boy), than intermediate (e.g. The bottle is knocked down by the dog) or nonreversible situations (e.g. The car is washed by the boy). Sinclair (cfr Sinclair et al. 1971) has postulated the intervention of a general cognitive factor, i.e. logical decentration or the ability to view an event from two different sides, beyond the specific morpho-syntactic difficulties of passive forms.

Prior to 4 or 5 years most children tend to decode reversible passives as if they were corresponding actives. In reversible passives, the surface grammatical subject and object can be interchanged while maintaining a semantically acceptable construction. Bever (1970) and others (cfr Maratsos 1974, Strohner & Nelson 1974) have showed that preschool children tend to apply to the noun-verb-noun sequences an "actor-action-object" decoding strategy irrespectively of whether the sequences occur in the passive or active mode. Children have fewer difficulties in under-

standing nonreversible passives (Hayhurst 1967, Baldie 1976). Semantic expectations (Herriot 1970) also play a role. This is most often the case in our world that patients are treated by doctors, books read by people, etc. Hence the understanding of sentences like The patient was treated by the doctor or The book was read by the teacher are rendered easier by this semantic knowledge alone or together with the syntactic realization that the sentences encountered do not sound like canonical active sentences and therefore that they necessitate special decoding. Agentless passives are also better understood by children than full reversible passives (Hayhurst 1967, Baldie 1976). This observation supports the view that a minimal sensitivity for the presence of the auxiliary and the use of the past participle in the main verb operates in younger children.

There are indications that some verbs may be more difficult to understand than others in passives sentences. Sinclair & Ferreiro (1970) reported that the passive is acquired earlier for certain verbs such that the following order of acquisition was present for French - and for English- speaking children (Sinclair et al. 1971) : casser (break), renverser (knock down), laver (wash), pousser (push), and suivre (follow). Lempert (1978) found passive sentences with the verbs hit and follow to be more difficult to understand by children aged 3 to 5 years than sentences built around verbs like chase, bump, push, and wash. She suggested that passives with hit may be more difficult to understand by children relatively to other contact verbs (e.g. push, bump) because of the absence of the/ed/ morpheme in the

past-participle form of the main verb. In a recent investigation, however, Sudhalter & Braine (1985) failed to find any significant effect of irregular verb morphology in comprehensibility in passive sentences. The irregular verbs used were hear, see, understand, and forget. The difficulty of follow at the passive voice, according to Lempert (1978), was taken to reflect the fact that this verb entails two actions (if X is followed by Y, this means that X leads and that Y must follow X's movements). An alternative explanation proposed by Sinclair & Ferreiro (1970) ~~was~~ is that this verb does not entail an action with a clear-cut result. Maratsos, Kuczaj, Fox & Chalkley (1979), Sudhalter & Braine (1985) and Maratsos, Fox, Becker & Chelkley (1985) have also indicated that children find passive sentences easier to decode when (physical) actional rather than mental verbs are used. Actional verbs denote physical actions like kick, cut, dress. Mental verbs refer to subjective experiences of the subject, either of perception (e.g. see, hear), cognition (e.g. know, remember), or are affect related (e.g. love, hate). The difference between actional and mental verbs in the passive can be observed at least until 9 years according to Maratsos et al. (1985).

As suggested by Sinclair & Ferreiro (1970), Lempert (1978) and others, comprehension of the passive is a gradual evolution beginning around 3 years. The several pieces of knowledge that are necessary and sufficient to fully comprehend the passive may be acquired separately (Sudhalter & Braine 1965). Children have to realize that the first noun mentioned in the sentence is not the underlying grammatical subject, that the verb to be

combined with the past participle is indicative of the non-underlying-grammatical-subject status of the head element of the preverbal noun phrase, and that the proposition by is a cue to the underlying grammatical subject.

Other factors influencing passive comprehension are likely to interact with the formal informations mentioned. They include general knowledge of the world and the hearer's expectations regarding the relative plausibility of the particular noun-verb-noun relationship exemplified and the relative ease with which the sentence meaning can be represented in mind. The more difficult the meaning of a sentence is to represent mentally, the more difficult the sentence is to understand. It might be supposed that the relative plausibility of the passive leads the subject toward keeping the surface form of the sentence or to (mentally) converting it into a corresponding active leaving aside the overt marks of passivization in the latter case. Proposing to the children sentences varying in plausibility should inform us on the relative processing weight of the semantic and syntactic factors in comprehension. Also as younger children are generally reported to rely heavily on semantic strategies in decoding passives it would be of interest to see what would happen if they were requested to decode sentences while being granted freedom as to the world of reference, i.e. freeing them through specific instruction of the (implicit) necessity of referring to the actual world for allowing other possible series of relationships between objects, persons and animals (fence knocking down horses, patients treating physicians, etc.).

The experimental studies to be reported offer a series of controls on these factors.

EXPERIMENT I

METHOD

Subjects

360 children from preschools and primary schools in Liege, Belgium. There were 120 children (approximatively half boys and half girls) at each of three age levels : 4 to 5, 6 to 7, and 8 to 9 years. All children were monolingual French-speaking with normal intelligence and regular school advancement.

Stimuli

36 full active and 36 full passive sentences selected from two larger sets of sentences constructed in the following way : 31 verbs intuitively selected served to produce 93 active and 93 passives sentences formed according to the following semantic types : (1) Plausible and plausibly reversible sentence - PPR sentence - (e.g. Le monsieur renverse la dame-The man knocks down the lady - Le monsieur est renversé par la dame-The man is knocked down by the lady); (2) Unplausible but plausibly reversible sentence - UPR sentence - (e.g. La barrière renverse le cheval-The fence knocks down the horse - Le cheval est renversé par la barrière-The hose is knocked down by the fence); (3) Plausible but not plausibly reversible sentence - PNPR sentence - (e.g. Le cheval renverse la barrière-The horse knocks down the fence -

La barrière est renversée par le cheval-The fence is knocked down by the horse). A group of 150 first-year university students (with no background in linguistic science) were requested to evaluate the sentences separately on a 8-degree scale for (1) relative ease of mental representation and (2) plausibility. On this basis, 36 experimental sentences (12 verbs x 3 types of constructions) were retained in selecting sentences varying along the two above-mentioned criteria according to the students' judgments. The selected verbs were renverser (~~turn~~ knock down), casser (break), laver (wash), porter (carry), compter (count), perdre (lose), voir (see), montrer (show), amuser (please), oublier (forget), aimer (love), and préférer (prefer).

All the sentences employed the definite article in the two noun phrases to avoid cueing the children on the identity of the topic/comment elements therefore possibly influencing their choice of the underlying grammatical subject or object (cfr Johnson-Laird 1968, Hupet & Le Bouedec 1975). Similarly all the noun phrases were singular as there appear to exist a general preference for maintaining a singular-plural sequence in sentence organization (e.g. The man was attacked by the bandits rather than The bandits attacked the man; cfr Hupet & Costermans 1976, Costermans 1980). PPR sentences always included animate nominal entities. UPR and PNPR sentences involved one animate and one inanimate noun either in the role of underlying grammatical subject or object.

Material

A set of tridimensional toy-people, -animals and- objects was used with each child.

Procedure

The children in each age group were randomly assigned to one of four experimental conditions : (1) being exposed to active or to passive sentences; (2) receiving one of two series of instructions, either the "realistic or neutral attitude-building instruction" (children were asked to interpret the sentences proposed with no particular attempt from the experimenter to favor a "flexible" interpretive attitude) or the "fictitious-attitude-building" instruction (children were told "Anything can happen like in a fancy film or a magic cartoon". This instruction was repeated on each one of the practice trials and before the first three experimental sentences.

Each child individually heard the 36 sentences orally delivered. They were produced by the experimenter with a completely neutral intonation as to avoid possibly cueing the child on the identity of underlying grammatical subject or object (cfr Maratsos 1973, Vion & Amy 1984). Each sentence was followed by a designating-action request of the form "Show me who (verb)" for the actives and "Show me who is (verb)" for the passives. For each sentence, the child was simultaneously presented with two toys respectively figuring the underlying grammatical subject and the underlying grammatical object. The two toys were then

labelled by the experimenter. The order in which the underlying grammatical subjects and objects of the sentences were labelled was inverted from one trial to the next in an attempt to control for possible sequentiel influences on the designating responses. For instance, the sentence The dog is bitten by the boy was followed by the simultaneous presentation of the toys (dog, boy), the labelling, and the request "Show me who is bitten". An oral repetition of the initial sentence followed the request. Before the test was administrated, each child heard several active or passive practice sentences to ensure familiarization with the procedure. The designating choices were forced. In case of uncertainty, the child was encouraged to make a "best guess". He was allowed to change his mind. In such cases, only the last response given was taken into consideration for scoring.

Predictions

It was predicted that children would progressively get better at correctly understanding active and passive sentences. Passive sentences would be less well understood than actives particularly by the younger children (significant Age x Voice interaction effect). The expected effect of the so-called fictitious instructional context would be to improve the correct designating response scores for the UPR passives and actives particularly with younger children on the basis that such instructions could free their responses from semantic restraint at least to a certain extent (significant Age x Instructional context x Semantic type

interaction effect predicted). Regarding semantic type, it was predicted that this variable would interact with age in complex ways : (1) PPR sentences being as plausible as their reverse, the only satisfying way of identifying the underlying grammatical subject or object is to resort to syntactical indices (auxiliary + past participle and/or preposition). Younger children would be less able than older ones to make use of syntactical information particularly with the passives. (2) In UPR sentences, there exists a "semantic push" toward reversing the sentence. This tendency enters in opposition with the formal marking of the sentence. If younger children were more sensitive to the semantic push than to the formal markers, they would receive lower interpretive scores in this category of sentences. Older children would better resist the semantic push and would receive higher scores. (3) In PNPR sentences, the situation is the opposite from the one with UPR sentences. This allows for exactly the opposite predictions as to the children's interpretive performance.

RESULTS AND DISCUSSION

The mean number of correct designations on active and passive sentences for the three age groups, the three semantic types of sentences and the two instructional contexts are supplied in Table 1. Table 2 summarizes the four-way ANOVA (with repeated measure on the variable semantic type of sentences) performed on the data as well as the follow-up analyses (Newman-Keuls' procedure). Table 3 summarizes the correlation data (Pearson's product-

moment correlation coefficients) between the correct designations of the children and the students' judgements of representability and plausibility for the experimental sentences. A probability criterion of $P < .05$ was set for all the statistical tests performed.

Insert Tables 1, 2 and 3 here

As predicted, the children got progressively better at understanding the sentences proposed. The progress observed was a gradual one almost equally spread over the four age groups with the passives consistently trailing behind the actives (significant Age x Voice interaction effect). Contrary to prediction, the instructional context significantly influenced comprehension for the three semantic types of sentences and not only for the UPR sentences (no significant interaction between semantic type of sentence and context). The significant three-way interaction observed between age, voice and context is illustrated in Figure 1.

Insert Figure 1 here

Passives as well as actives are better understood in the so-called fictitious interpretive context than in the more realistic one at 4-5 years. The reverse situation is observed in the 8-9 years group (except for type 3 semantic active sentences). In the 6-7 years group, passive sentences are better understood in

the fictitious interpretive context but the reverse holds true for the actives. From this set of observations, we conclude that the fictitious instructional context failed to free the (younger) childrens' responses from semantic restraint in nonplausible sentences to a significant extent. We cannot think of an acceptable explanation for the significant effect of this context on the younger children's comprehension scores. For the older children, it could be suggested that the fictitious instructional context might have had the effect of inducing the children to take a freer stand with the task leading to a lower performance in terms of the comprehension scores both with passive and active sentences.

The effects of semantic type and age on the correct interpretation of the sentences were in agreement with the predictions made (significant Age effect, Semantic type effect, Age x Semantic type interaction effect). PNPR sentences (where the semantic push plays in favor of not reversing the sentence) were better interpreted by children in the younger two age groups than UPR sentences (where the opposite tendency was in action). PPR sentences ranged in between PNPR and UPR sentences for the younger two groups of children revealing the difficulty of these children to rely solely on the formal marking of the sentence in order to identify the underlying grammatical subject or object. Children in the older group (8-9 years) were about as successful in interpreting the active or the passive sentences in any of the three semantic conditions demonstrating that they

had a better ability for decoding passives on the basis of the sentence formal marking alone. The question arose then to specify the nature of the syntactical information used by the children. This was the reason for carrying over experiment II to be reported below.

The correct designations of the children were found to be positively and significantly correlated with the judgements made by the university students as to the relative representability and plausibility of the experimental sentences, except for the 8-9 years group where the low and nonsignificant correlations are due very likely to the reduction of variance in the children's responses because of a ceiling effect. The high correlation between sentence overall plausibility and correct interpretation is in agreement with the insistence on the role of people's usual semantic expectations in understanding sentences (cfr Herriot 1969). But as the rest of the present data show, this role is limited in older children in proportion of the taking into account of the formal marking of the sentence whenever the two series of informations negatively interact. The high correlation between sentence representability and correct interpretation is in concordance with Brown's data (1976) on the role of reference concreteness in the acquisition of passive sentence comprehension through abstract modeling in 3;5 to 5 year-old children. The two dimensions of judgement by the university students are highly and positively intercorrelated

(Pearson's r = 0.92, P$\angle$0.001; coefficient of determination = 85) suggesting the existence of one single factor (the more plausible the meaning of a sentence is, the easier it is to represent mentally -or the reverse-, and the easier the sentence is to understand).

The verbs used to construct the experimental sentences included what can be considered (no formal criterion exists) seven actional verbs (renverser, casser, laver, porter, compter, montrer, perdre) and five mental verbs (one of perception : voir; one of cognition : oublier; three affect related : aimer, amuser, préférer). A three-way ANOVA (Age, Verb type, Semantic type of sentence, with repeated measure on the variable semantic type of sentence) performed on the children's responses to the passive sentences in the realistic interpretive context failed to yield any significant main or interaction effect of Verb type - F = 2.07, 1.63, and .52 for Verb type (df 1,87), Verb type x Semantic type (df 2,87), and Age x Verb type x Semantic type (df 4,87), respectively -. Table 4 gives the average passive scores for each verb used in the study. As can be seen, the physical action and mental state scores overlap to a large extent with major differences being due to the semantic type of the sentences.

Insert Table 4 here

This series of indications is in opposition with the data reported by Suhalter & Braine (1985) and by Maratsos et al. (1985). No clear explanation comes to mind for this opposition.

EXPERIMENT II

METHOD

Subjects

216 children from preschools and primary schools in Liege, Belgium. There were 54 children (approximatively half boys and half girls) at each of four age levels : 4 to 4; 11, 5 to 5; 11, 6 to 6; 11, and 7 to 7; 11 years. All children were monolingual French-speaking with normal intelligence and regular school advancement.

Stimuli

20 verbs were used to construct 120 experimental passive sentences. They were : déchirer (tear), renverser (knock down), laver (wash), couper (cut), habiller (dress), pousser (push), jeter (throw), casser (break), battre (beat), scier (saw), lécher (lick), toucher (touch), vider (empty), porter (carry), frapper (hit), mettre (put), tuer (kill), essuyer (wipe), enfoncer (thrust), and déposer (put down).

The 120 sentences corresponded in equal proportions to the crossing of the following two variables : (A) Semantic type :

levels : (1) Unplausible but plausibly reversible sentences - UPR sentences - (e.g. Le cheval est renversé par la barrière- The horse is knocked down by the fence); (2) Plausible but not plausibly reversible sentences - PNPR sentences - (e.g. La barrière est renversée par le cheval-The fence is knocked down by the horse); (B) Syntactic type : levels : (1) Sentences without agentive preposition (e.g. La barrière est renversée le cheval- The fence is knocked down the horse), (2) Syntactically regular sentences (e.g. La barrière est renversée par le cheval- The fence is knocked down by the horse), (3) Sentences with proposition "chez" instead of regular agentive preposition "par" (e.g. La barrière est renversée chez le cheval-The fence is knocked down at the horse('s)).

Children in each age group were randomly assigned to one of the three syntactic conditions (n = 18). Each child in each sub-group received 20 UPR and 20 PNPR sentences. Thirty formally regular passive sentences of the two semantic types were interspersed among the 40 experimental sentences (yielding a total list of 70 sentences) in order to avoid that the children would face series of "unorthodox" sentences in syntactic conditions 1 and 3. The added passive sentences were not taken into account in the evaluation.

Material

The same set of tridimensional toy-people, - animals and - objects as in Experiment I.

Procedure

Each child individually heard the 70 sentences constructed for his syntactical group presented in a random order and orally delivered. The sentences were expressed by the experimenter with a completely neutral intonation. Each sentence was followed by a request for action "Do what I just said". For each sentence, the child was simultaneously presented with two toys respectively figuring the underlying grammatical subject and object. The two toys were then labelled by the experimenter. The order in which the underlying grammatical subjects and objects of the sentences were labelled was inverted from one trial to the next in an attempt to control for possible sequential influences on the acting-out responses. An oral repetition of the sentence followed the request. In case of no action from the child or when the action performed on the toys was not clear, the request for action was turned into a request for designation of the following type "Show me who is (verb)". Before the test was started, each child heard several practice sentences to ensure familiarization with the procedure. The choices were forced. In case of uncertainty, the child was encouraged to make a "best guess". He was allowed to change his mind. In such cases, only the last response given was taken into account for scoring.

Predictions

It was predicted, first, that the lack of agentive preposition would affect more dramatically the understanding of passive sentences in the UPR than in the PNPR condition.

Second, the use of the preposition chez instead of the regular agentive preposition was predicted to affect less the correct understanding of passive sentences in both semantic conditions than the absence of preposition. It can be hypothesized indeed either that chez placed in agentive - preposition position in an otherwize "passively sounding" sentence would allow the selection of the following noun as a plausible underlying grammatical subject at least in some cases, or that the locative meaning of chez would favor an extended causal interpretation of the type "chez x therefore by x". at least in some cases.

RESULTS AND DISCUSSION

The mean number of correct acted-out responses for the two semantic types and the three syntactic types of passive sentences are supplied in Table 5. Table 6 summarizes the three-way ANOVA (with repeated measure on the semantic type of sentences) performed on the data as well as the follow-up analyses (using Newman-Keuls' procedure). A probability criterion of $P \leq 0.05$. was set for the statistical tests performed.

Insert Tables 5 and 6 here

The results obtained with the sentences of syntactic type 2 (regular passives) are in correspondance with those of Experiment I for the two semantic types that are common to the two experiments. This is an indication that the change in proce-

dure (from a designation procedure in Experiment I to an acting-out procedure in Experiment II) did not affect the variance of children's interpretive responses.

As predicted, the lack of agentive preposition has a dramatic negative effect on the correct interpretation of the UPR sentences, i.e. those for which the usual semantic expectations "pushed" toward reversing the sentence.

As predicted also, the use of the preposition chez instead of the regular agentive preposition negatively affected the correct understanding of the sentences albeit in a less dramatic way than the lack of preposition.

One of the reasons for conducting Experiment II was to specify the relative parts of the agentive preposition and the auxiliary and/or past participle in directing the interpretation of passive sentences. As the data show, the influence of the regular agentive preposition is prevalent over that of the verbal structures in the interpretation of the passive sentences. The above finding may be in contradiction with Baldie's (1976) observation that 3 and 4-year olds tend to preserve the past tense suffix but to omit the auxiliary and/or the preposition by when imitating passives.

The present results with the unplausible but plausibly reversible sentences are in agreement with Maratsos & Abramovitch's (1975) report on the way preschool children decode

anomalous passive sentences. Notice, however, that our results with the plausible but not plausibly reversible sentences only attest to a minimal effect of the syntactic anomalies on sentence comprehension which again puts in the forefront the role of the plausibility/unplausibility dimension in the subjects' treatment of the sentences. Maratsos & Abramovitch's subjects tended to treat passive sentences lacking the agentive preposition as corresponding actives. The lack of the auxiliary be in otherwise correctly formed passives like The cat licked by the dog did not prevent the children to interpret the sentences as passives in a substantial number of cases. Passives with the preposition of replacing the preposition by (e.g. The cat is licked of the dog) elicited only slightly fewer passive responses than normal passive sentences. When asked to imitate passives with the preposition of, a number of children would substitute by for of. Passive sentences with the nonsense word po substituted for the agentive preposition by (e.g. The zebra is knocked po the camel) were predominantly interpreted as actives and very few subjects tended to substitute by for po in the subsequent imitation task. The present data as well as those of Maratsos & Abramovitch (1975) indicate that when they play a major role in sentence interpretation the formal marks of passivity considered separately can perhaps be ordered in the following order of importance : (1) agentive preposition; (2) past tense suffix; (3) auxiliary form.

Summarizing from the results of Experiments I and II, the comprehension of passive sentences at the age levels considered is the product of the interplay of semantic and syntactic factors. Depending on the actual sentence treated, the semantic factors may favor an interpretation that goes against or supports (what would be) the conclusion of a syntactic analysis. The younger the child the more likely it is that the semantic expectations will prevail over the use of the syntactic informations present in the sentence.

What do we mean exactly by expressions like the hearer constructs a semantic interpretation that converges toward or is opposed to the conclusion of a syntactic analysis of the passive sentence ? In order to be explicit, it is necessary to speculate about the way the subjects process the semantico-syntactic information available in the sentence. Let's consider the following example The fence is knocked down by the horse and assume that the hearer is familiar with all the words of the sentence. Upon hearing the words fence and knock(ed) down, the hearer constructs a mental representation conjugating the object fence and the action of knocking down. Given the inanimate status of fence and the actional nature of knocking down, it is likely that the conjugated representation of fence and knock(ed) down will be one of a fence knocked down by an unidentified (but presumed animate) object. If the subject is knowledgeable as to the syntactical aspects of the sentence, his semantic interpretation will be prompted or reinforced by the combined presence of the auxiliary is and the past participle suffix -ed.

Next the preposition by will call the hearer's attention on the coming of the agent of the action described by the verb. Decoding horse will allow recreating the full meaning of the sentence. In the case of unplausible sentences like The horse is knocked down by the fence, the mental representation horse - knock(ed) down interacts with the decoding of the auxiliary is plus the -ed suffix to build the expectation of an agent more powerful or tricky than a horse. When fence is produced in this context, two possibilities arise : either the hearer challenges the accuracy of the sentence heard or of his perception of it and decides that fence is the underlying grammatical object and not the underlying grammatical subject of the sentence, or upon mentally checking the formal marking of the sentence, he decides to stick with the interpretation according to which fence is the underlying grammatical subject despite the unplausibility of the whole thing.

The semantic expectations indicated play a major role in sentence interpretation as soon as the children know the usual meaning of the content words appearing in the sentence. It can probably be assumed that children around 4 years are sensitive enough to the morpho-syntactic marks of passivity. Systematic reversal interpretation of unplausible but plausibly reversible passives after 4 years or so may be the product of an operation of "logicization" of the sentence, i.e. reorganizing the sentence meaning as to set it in accordance with the inferences reasonably to be drawn from the usual events or cir-

cumstances. Such an operation implies neglecting the formal marks of passivity exemplified in the sentence. Depending on the child's attention, the strength of the semantic push, and the resistance to leaving aside the formal marks of passives, the interpretive strategy will go one way or the other yielding the range of results observed, With plausible and plausibly reversible sentences and overall for plausible but not plausibly reversible sentences, the interpretative errors are to be attributed in major part to a lack of attention or to an incorrect analysis of the formal marks of passivity. Finally, the present view can be extended to explain why agentless passives are usually reported to be earlier and easier to understand by children (Hayhurst 1967, Baldie 1976). Sentences like The horse is knocked down always sound plausible as no semantically discrepant underlying grammatical subject is ever formulated.

Passives comprehension develops gradually. It takes a long time for the syntactical analysis - the only one susceptible to yield unmistakenly the underlying grammatical subject and object - to be applied in perfect rigor and to successfully resist to possible semantic countersuggestions.

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TABLE 1. Mean number and standard deviation (between parentheses) of correct designations on active and passive voice sentences for three age groups, three semantic types of sentences and two interpretive contexts.

Semantic type	Age groups: 4-5 years, Context: Realistic, A[1]	4-5 years, Realistic, P[2]	4-5 years, Fictitious, A	4-5 years, Fictitious, P	6-7 years, Realistic, A	6-7 years, Realistic, P	6-7 years, Fictitious, A	6-7 years, Fictitious, P
PPR[3]	9.133 (2.459)	7.800 (2.386)	10.867 (1.284)	10.267 (1.769)	11.633 (0.836)	8.867 (3.106)	11.067 (1.769)	9.687 (1.979)
UPR[4]	7.233 (3.422)	6.667 (2.724)	9.067 (3.458)	7.567 (2.578)	11.500 (1.176)	7.800 (3.798)	10.267 (2.462)	9.067 (2.695)
PNPR[5]	9.633 (2.549)	9.067 (2.159)	11.233 (1.202)	10.133 (1.627)	11.933 (0.249)	10.300 (2.116)	11.467 (1.036)	10.800 (1.194)

1 Actives
2 Passives
3 Plausible and plausibly reversible
4 Unplausible but plausibly reversible
5 Plausible but not plausibly reversible
Maximal note = 12

TABLE 1 (following). Mean number and standard deviation (between parentheses) of correct designations on active and passive voice sentence for three age groups three semantic types of sentences and two interpretive contexts.

Semantic type	Age groups: 8-9 years			
	Context: Realistic		Fictitious	
	A	P	A	P
PPR[3]	11.667 (0.789)	11.167 (0.969)	11.633 (0.657)	10.507 (1.726)
UPR[4]	11.500 (1.176)	11.167 (1.098)	10.900 (2.181)	9.433 (2.918)
PNPR[5]	11.733 (0.640)	11.133 (1.117)	11.567 (1.145)	10.600 (1.604)

TABLE 2. Summary of statistical analyses performed on the data displayed in Table 1.

Variables	ANOVA Significant effects F and probability level	Newman-Keuls procedure Heterogenecus subsets[1]
Age (A)	F (2,348) = 53.98, $P < 0.001$	1, 2, and 3
Voice (V)	F (1,348) = 55.87, $P < 0.001$	
Semantic type (P)	F (2,348) = 71.23, $P < 0.001$	1, 2, and 3
Context (C)	F (1,348) = 4.82, $P < 0.027$	
A x C	F (2,348) = 16.30, $P < 0.001$	
A x S	F (4,348) = 11.10, $P < 0.001$	
A x V	F (2,348) = 4,07, $P < 0.017$	
A x V x C	F (2,348) = 5,06, $P < 0.007$	

1 Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size

TABLE 3. Pearson's product-moment correlation coefficients between the children's correct designations and the university students' judgements of representability and plausibility for individual sentences.

Variables	Children's Age group (years)	r	Significant effect
Correct designation and representability	4-5	0.49	$P < 0.01$
	6-7	0.68	$P < 0.01$
	8-9	0.06	
Correct designation and plausibility	4-5	0.62	$P < 0.01$
	6-7	0.75	$P < 0.01$
	8-9	0.05	

TABLE 4. Mean number of correct designations on passive voice sentences in the realistic interpretive context for the actional and the mental verbs in three age groups and for three semantic types of sentences.

Verbs	Age groups (years) 4-5 PPR[1]	UPR[2]	PNPR[3]	T[4]	6-7 PPR	UPR	PNPR	T	8-9 PPR	UPR	PNPR	T
Actional												
1. Renverser (Knock ~~Turn~~ down)	23	18	19	60	23	20	26	69	30	30	29	89
2. Casser (Break)	26	20	28	74	24	19	29	72	28	30	29	87
3. Laver (Wash)	22	13	25	60	24	20	26	70	29	29	27	85
4. Porter (Carry)	16	13	26	55	20	17	28	65	27	26	28	81
5. Compter (Count)	18	17	19	54	23	21	26	70	28	28	29	85
6. Montrer (Show)	16	17	19	52	20	18	26	64	28	29	27	84
7. Perdre (Lose)	20	15	24	59	25	19	26	70	29	29	28	86

TABLE 4 (following)

Verbs	Age groups (years) 4-5 PPR[1]	UPR[2]	PNPR[3]	T[4]	6-7 PPR	UPR	PNPR	T	8-9 PPR	UPR	PNPR	T
Mental												
1. Voir (See)	19	13	20	52	23	17	25	65	28	30	26	84
2. Oublier (Forget)	15	15	26	56	19	17	24	60	26	26	29	81
3. Aimer (Love)	22	19	22	63	24	21	21	66	27	27	26	80
4. Amuser (Please)	18	21	21	60	22	22	27	71	29	27	30	86
5. Préférer (Prefer)	18	18	22	58	19	22	24	65	27	27	26	80

1 PPR : Plausible and plausibly reversible

2 UPR : Unplausible but plausibly reversible

3 PNPR : Plausible but not plausibly reversible

4 Total

Maximal note = 30

TABLE 5. Mean number and standard deviation (between parentheses) of correct acting-out responses on passive voice sentences for four age groups, two semantic types and three syntactic types of sentences.

Syntactic type		Semantic type UPR[1]	PNPR[2]
Sy1[3]			
Age	4-4;11	2,78 (3,25)	13,56 (4,00)
	5-5;11	2,00 (3,63)	14,39 (4,29)
	6-6;11	1,89 (2,95)	14,89 (5,18)
	7-7;11	4,67 (3,16)	14,11 (6,48)
Sy2[4]			
Age	4-4;11	13,00 (4,51)	15,72 (3,61)
	5-5;11	13,00 (16,06)	18,44 (1,76)
	6-6;11	17,78 (2,48)	18,78 (1,64)
	7-7;11	15,78 (6,17)	18,72 (3,08)
Sy3[5]			
Age	4-4;11	8,00 (5,53)	16,00 (3,29)
	5-5;11	9,78 (5,65)	16,44 (2,62)
	6-6;11	9,11 (7,07)	17,17 (3,92)
	7-7;11	13,94 (2,92)	17,22 (3,28)

1 Unplausible but plausibly reversible

2 Plausible but not plausibly reversible

3 Passives without agentive preposition

4 Syntactically regular passives

5 Passives with regular agentive preposition replaced by preposition *chez*

Maximal note = 20

TABLE 6. Summary of statistical analyses performed on the data displayed in Table 5.

Variables	ANOVA Significant effects F and probability level	Newman-Keuls procedure Heterogeneous subsets [1]
Age (A)	F (3,153) = 7,29, $P < 0.001$	1 and 4
Semantic type (S)	F (1,51) = 363,49, $P < 0.001$	
Syntactic type (Sy)	F (2,153) = 86,76, $P < 0.001$	1, 2, and 3
S x Sy	F (2,51) = 44,50, $P < 0.001$	

1 Subsets of groups, no pair of which have means that differ by less than the shortest significant range for a subset of that size

FIGURE 1. Illustration of the Age x Voice x Interpretive context interaction effect on comprehension of passive and active sentences by children at three age levels.