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ABSTRACT

The experiment described in this report considers whether children who learn a second language will develop the same semantic system as monolingual children or whether their semantic system will be different because of linguistic or cultural interference, and also whether the bilingual child develops separate meaning systems for his two languages or whether he operates by means of a single system. The experiment compares the relative difficulty of certain semantic constructions in comprehension tests for two groups of young bilingual children: Spanish-English bilinguals and Navaho-English bilinguals. Details and results are provided. Findings indicate that bilingual children do not parallel monolingual children in patterns of difficulty of semantic categories. Categories not present in their first language are appreciably more difficult in relation to the other categories than for monolingual children. (Author/VM)

The Development of Semantic Categories In Spanish-English and Navajo-English Bilingual Children[1]

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The Development of Semantic Categories

In Spanish-English and Navajo-English Bilingual Children

As children acquire language, they gain control over an immensely complicated set of systems, and in acquiring the meaning or semantic system of a language, children come to recognize the many subtle differences in meanings of words and word relationships. For example, a child gradually realizes that not all motor vehicles are cars; some are pickups and some are trucks. As he gains in his perceptual capacity, his language reflects this increasing ability to differentiate and categorize.[3] However, a meaning system of a language is considerably more complex than the labels of objects. The child must come to realize that _if_ and _unless_ are not the same in meaning,[4] and that _more than_ and _less than_ are also not synonymous.[5] He must also acquire the subtle difference between expressions that are synonymous in one context but not in another, such as _return_ and _take back_. It is permissible to either return or take back a book to the library, but it is not permissible to either return or take back a friend to the zoo.[6] The child further must realize that expressions of equality will be affected differently by negation. _Equal to_ and _as many as_ are quite similar in meaning, but _not equal to_ and _not as many as_ are obviously different.

Many of these subtleties of the meaning system of a language appear to be forbidingly complex; nonetheless, almost all children eventually gain adequate control over the semantic level of their language. The current controversy over semantics in linguistic theory provides considerable motivation for investigation of this element, especially in a cross-

language situation. Different languages exhibit their own particular semantic systems, and study of how the systems differ can throw light on what is universal to language and what is specific to a single language.

The interesting question and subject of this paper is whether children who learn a second language--English in this case--will develop the same semantic system as monolingual children or whether their semantic system will be different because of linguistic or cultural interference. A second, closely related question is whether the bilingual child develops separate meaning systems for his two languages or whether he operates by means of a single system.

This paper will present evidence from a study investigating these questions by comparing the relative difficulty of certain semantic constructions in comprehension tests for two groups of young bilingual children: Spanish-English bilinguals and Navajo-English bilinguals. A group of English monolingual children provide a basis for comparison. These two groups of bilingual children were chosen because Spanish and English are semantically similar languages, and Navajo and English are semantically dissimilar languages in the area being investigated.

In this study ten categories of numeric comparison (five positive and five negative) are used which express the three basic concepts of superiority of number, equality of number, and inferiority of number plus their denials. Each of these categories includes three syntactially different sentences, which are parallel in each category except that half the categories are negative. In this way syntax can be investigated as well as semantics. The sentences were translated into Spanish and Navajo when the categories were semantically equivalent, and each bilingual child was tested for comprehension of the thirty sentences in English and thirty

sentences in his other language for accuracy and latency (response time). This methodology is an adaptation of the one developed by Kennedy.[7]

The following two tables illustrate the ten semantic categories in English used in this study and the three syntactic types established for each category.

Table 1

SEMANTIC CATEGORIES OF NUMERIC COMPARISONS

Semantic Category	Symbol	Linguistic Construction
1 Superiority	$>$	more than
2 Denial of Superiority	$\not>$	not more than
3 Inferiority	$<$	less than
4 Denial of Inferiority	$\not<$	not less than
5 Positive Equality	$=^{+}$	as many as
6 Denial of Positive Equality	$\neq^{+}$	not as many as
7 Negative Equality	$=^{-}$	as few as
8 Denial of Negative Equality	$\neq^{-}$	not as few as
9 Neutral Equality	$=^{o}$	equal to
10 Denial of Neutral Equality	$\neq^{o}$	not equal to

Table 2

SYNTACTIC TYPES WITHIN SEMANTIC CATEGORIES

1 There are (not) more X than Y.

2 There is (not) a larger number of X than Y.

3 The number of X is (not) larger than the number of Y.

The translations of the sentences into Spanish and Navajo were done by native speakers and were verified by back translations. The Spanish paralleled the English in meaning and syntactic types and reflected the language of northern New Mexico. Two informants were used for the Spanish and both agreed that the meaning system of the ten numeric comparisons was the same as it would be for English. For example, the denial of positive equality (not as many as) and the Spanish equivalent (no tantos como) both unambiguously mean numeric inferiority of the first noun mentioned in relation to the second. For the Navajo version three informants were used plus five back translations. The first difficulty was the absence of the desired syntactic variety. One informant provided different types but only through use of the English word number; two informants agreed fairly well on the single syntactic type that was used after certain exceptions had been resolved. The Navajo version was left with only one syntactic type rather than the three in English and Spanish. This is not to claim that the pattern used is the only one available; the claim is that the pattern was readily understood for the back translations and seemed compatible with Young and Morgan's explanation of the comparative construction in Navajo.[8]

The concern over syntactic variety led to a more basic problem--directness of meaning. The relationship of numeric superiority can be expressed directly in English through the sentence There are more X than Y. The relationship can also be indirectly expressed by saying There are many X; there are few Y. Navajo informants produced comparative sentences that could be literally translated to parallel the indirect English expression just mentioned. They also produced constructions parallel to the English direct comparison, lending some support to a parallelism between

the languages in directness of meaning for this category. The real concern came with the English construction There are as many X as Y. The Navajo equivalent would be parallel to an English construction The X and the Y are equal and they are many. A similar situation exists for constructions of as few as. The absence in Navajo of direct comparatives for equality which are built from adjectives of superiority and inferiority suggest that these categories (positive and negative equality) do not "directly" exist in Navajo. The clue comes when these expressions are modified by negation and they do not produce a parallel meaning. In English not as many as is not simple denial and unambiguously means less than. Negating the Navajo counterpart results in something like The X and Y are not equal and they are many. Four categories then could not be "directly" translated into Navajo and maintain a meaning system parallel with English and were omitted from the Navajo version.

The subjects were first and fourth graders recognized as bilinguals by their teachers and freely admitting to be so. All subjects were screened for knowledge of the lexical items used in the testing and general knowledge of the types of constructions in both languages. Subjects were not used without successfully completing the screening. The thirty sentences in English and the thirty in the other language were randomized and presented in blocks of ten sentences alternating between languages by blocks. The subjects were randomly assigned as to which language and which block of sentences they would begin with. They listened to tapes of the sentences which were recorded by native speakers and selected one of two pictures (rear-projected on two small screens in front of the subject) as a correct illustration of the meaning. In addition to accuracy, a latency measure was obtained. Figure 1 presents the type of illustra-

tions used with an accompanying sample sentence. The letters represent drawings of common objects selected for their cultural neutrality. The relative positions of the compared objects were controlled experimentally.

Figure 1

REPRESENTATIVE ILLUSTRATION FOR TESTING

"There are more Z than W."

From this testing came accuracy and latency scores for each semantic category. Each language group established a pattern of the relative difficulty of the ten semantic categories in English and these patterns were then contrasted without any quantitative comparisons. The bilingual's performance in his first language then provided an approach for explaining any differences. It would be expected tnat the Spanish-English group would parallel the English monolinguals but that the Navajo-English group would deviate from the pattern because of language differences.

The idea of patterns of difficulty of the ten semantic categories presupposes meaningful differences among them. These ten categories express the three basic concepts of superiority, equality, and inferiority plus their denials in subtly different ways. The concept of superiority can be expressed by more than and it can also be expressed by not as few as. Similarly, inferiority can be expressed by less than and not as many as. Equality can be expressed by equal to, as many as, and as few as. Of these last three only equal to can be denied simply. The previous examples

show that negation of as many as and as few as unambiguously represent expressions of inferiority and superiority respectively. Denial of more than and less than is simple and direct and means no more than just that. In other words, not more than can be factually illustrated by either equality or inferiority. Not less than offers the two possibilities of equality and superiority. When these categories refer to the same basic concept, the point is that there is also a difference in semantic structure and meaning. For example more than and not as few as both refer to the same basic concept. The linguistic form is obviously different and the semantic construction is also different. The semantic information contained in more than is less complex than the semantic information in not as few as.

The semantic theory of Katz & Fodor,[9] Katz,[10] and Bierwisch[11] offer an approach to explaining this by means of semantic features, which are considered universal for languages (although any particular combination of features is not). By means of features, each of the semantic structures for the ten categories can be represented and these features can also provide a way to account for the hierarchy of difficulty of these categories (The use of features and a theory of semantic markedness will be dealt with later).

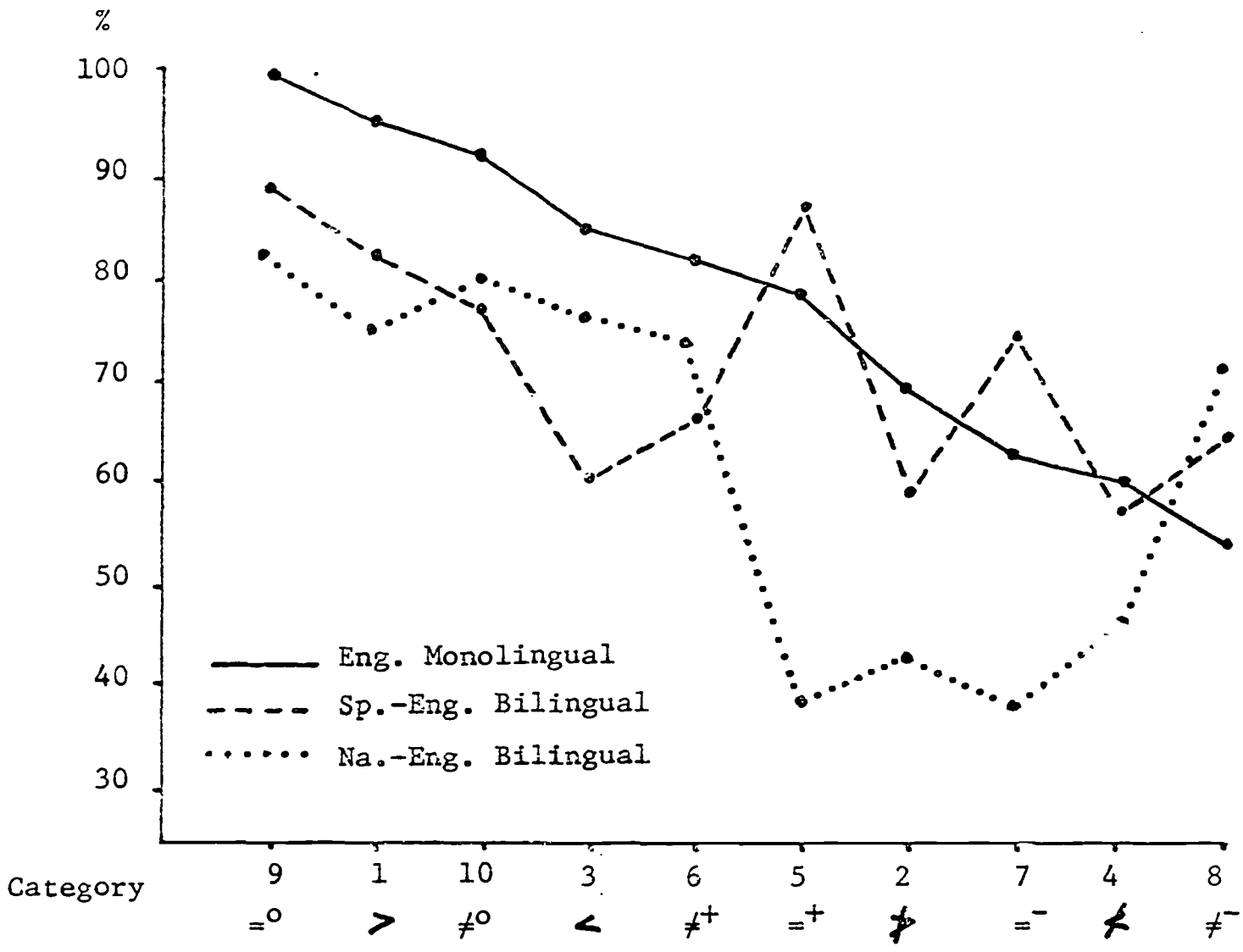
The method of study that is used for this paper determines the hierarchy of difficulty of the ten semantic categories in English for each language group and then compares the hierarchies. The first significant finding is that first grade children do not sufficiently differentiate the categories to be able to establish a true hierarchy. There was little, if any, significant difference among the ten categories for first grade children; scores were generally low indicating that the younger children

of all groups, regardless of language, were not comprehending the categories much beyond pure chance. However, the fourth graders sharply differentiated the categories on both accuracy and latency. This developmental finding strongly supports the notion that much of language acquisition is still going on after school age. With fourth grade performance strongly suitable for the technique of comparing hierarchies, the first analysis permitted a comparison of English monolingual children from two widely divergent areas. Kennedy's[12] study was located in Los Angeles and the monolingual children for this study were in Albuquerque, New Mexico. The rank order correlation of the first eight categories (Kennedy's study did not include categories 9 and 10) was quite high in accuracy (ρ = .958**) and also significant for latency (ρ = .786*). This replication of Kennedy's study is in itself a significant finding. Two groups of monolinguals from distinctly separated areas found these semantic categories similarly difficult. This high degree of similarity suggests a certain degree of cognitive commonality in processing the information in the semantic categories. Certainly this finding supports the use of the English monolingual group as a base for comparing the two bilingual groups.

For the cross-language emphasis, the primary finding was that both groups of bilinguals established different difficulty patterns than the monolingual group. Figure 2 illustrates the relative pattern for all three groups in accuracy.

Figure 2

CATEGORY HIERARCHIES IN ENGLISH ACCURACY



It is noticeable from this comparison that much of the deviation comes from categories 5, 7, and 8. For the Spanish-English group, positive equality, negative equality, and denial of negative equality (categories 5, 7, and 8) are relatively easier than the other categories in comparison to the English monolinguals. If one supports the notion of identical semantic structures for English and Spanish, this relative preference for these three categories must be explained on the basis of familiarity and preference rather than inherent complexity. This indicates that it is not only necessary to investigate language performance linguistically, but it is also necessary to investigate purely psychological factors as well.

For the Navajo group it was expected that positive and negative

equality would be relatively more difficult because of the absence of these categories in Navajo. This prediction is upheld by the data. The interesting point is how negating these categories removes the relative difficulty. Generally negating a difficult category would be expected to increase its difficulty. However, if the sentence There are as many X as Y is being erroneously comprehended as superiority of X over Y because many is connected to X alone, then denial of the many removes the source of error. The sentence is interpreted as There are not many X in relation to the number of Y. Interpreting denial of positive and negative equality in this manner is much the same as what the deep structure of the construction would be. Roughly the deep structure of negative equality would be There are few X/ there are few Y. Negating the structure produces NEG + There are few X/ there are few Y. The first structure uses few (or many) for equality while Navajo would express the equality and then add the number sense. The denial, however, is similar to the Navajo which roughly translates These X are not few/ these Y are few. The Navajo child is used to a category that is expressed seemingly by both a positive and a negative. He puts the English sentences into this system and makes errors in comprehension. Navajo does not have positive equality that is built from There are many X/ there are many Y. This system is used only for meanings of superiority or inferiority. These data then would seem to suggest that the difference between the English and Navajo semantic systems is at the base of the Navajo-English bilingual's performance.

The latency measure (using right and wrong responses) generally supports the accuracy measure for the Spanish-English group as indicated by a significant rank order correlation ($\rho = .663^{*}$). However, the latency measure for the Navajo does not even differentiate the categories unless

only the correct responses are used. Little difference exists for the Spanish-English group or the English group between latency of all responses and the latency of the correct-only responses. Time is not a significant variable for the Navajo unless he has some confidence in his understanding of the categories. The main finding from latency is that all three groups are quite similar in response time (correct-only responses for the Navajo) regardless of differences in accuracy. Latency seems to be a measure of confidence which is quite similar for all groups.

Examination of the three syntactic types in English reveals no particular preference or ease in comprehension of one type over another for the Spanish-English group or the monolingual group. However, the second syntactic type (There is a larger number of X than Y) was significant for the Navajo children. This unexpected showing is best accounted for by noting that the order of the comparison device and the nouns being compared is opposite from the order of the Navajo sentence where the comparison is last.

To answer the question of whether the bilingual child is operating with one or two meaning systems for his two languages, the hierarchies of difficulty from the child's two languages can be compared. For the Spanish-English group all ten categories can be used while only the six mutual categories can be used for the Navajo-English group. The rank order correlations for accuracy (ρ = .821** for the Spanish-English group and ρ = .943** for the Navajo-English group) strongly support the presence of a single meaning system at this level of development. This suggests a certain universality of semantics and even of some of the semantic categories in language comprehension. The latency index is similar (ρ = .810**) for the Spanish-English group, but no correlation is possible with the

Navajo group because correct-only responses are contributing scores in English, but total responses are in Navajo.

It seems apparent from the data that semantic categories are definitely significant factors in comprehension for all groups. These categories are sufficiently powerful in determining comprehension that absence of them in one language greatly increases their difficulty in another. The semantic system of one language forces interpretation of another language accordingly. The bilingual is eventually confronted with the task of acquiring a new semantic system to express the same basic meanings. However, at this state of development he definitely appears to be functioning with a single meaning system. Furthermore, presence of identical semantic categories in two languages does not guarantee the same hierarchy of difficulty as for the monolingual of the target language. Other factors are needed to explain these differences, such as preference and familiarity.

These results from analyzing comprehension by means of semantic categories can be formalized by extending a semantic theory based on features into a theory of semantic markedness on the same principle that Chomsky and Halle[13] use with phonological features. The simple presence or absence of a feature fails to reveal whether that feature is intrinsic or natural to the meaning, hence not adding to its complexity. Clark[14] establishes a principle of lexical marking to account for the extra difficulty of the negative half of a pair of polar adjectives. More is not as complex in meaning than is less. Clark uses features within a binary system to formalize this difference. Using Clark's basic principles but formalizing the use of features into markedness theory can account for this difference more realistically than the binary system. Both more and less contain the feature of "polarity," indicating their existence as polar

pairs; however, more is unmarked or natural as to "polarity" and less is marked. This captures the asymmetrical nature of polar adjectives and formalizes that less exists in contrast to more, the basic member of the pair. For other examples, equal to can be differentiated from both as many as and as few as by being unmarked for a feature "equative" while both the positive and negative equality would be marked for "equative," indicating the unnaturalness of their use in expressions of equality. As many as would further be differentiated from as few as by the previously mentioned feature "polarity" which is unmarked for as many as and marked for as few as. The principle determining complexity is that only unmarked features do not add to the complexity of meaning.

Each of the ten semantic categories can be represented with features according to markedness theory and a hierarchy of difficulty predicted on the basis of the number of marked features. The English monolingual's hierarchy highly correlates in accuracy with the one predicted by the theory (ρ = .870**). Also important is that this theoretical representation of semantic categories can be used to represent the categories from other languages. Positive and negative equality are marked for "equative" while neutral equality is unmarked for the same feature as are the Navajo categories of equality.

Although this theoretical representation is sketchily presented here, it is not difficult to imagine its usefulness in semantic analysis. Semantics, like phonology, may well be representable from a universal set of features when formalized within a theory of markedness.

In review this study has shown that bilingual children do not parallel monolingual children in patterns of difficulty of semantic categories. Categories not present in their first language are appreciably more diffi-

cult in relation to the other categories than for monolingual children. Even when categories are present in the child's first language, factors such as preference and familiarity are also significant. Semantic categories do appear to be important determiners of comprehension especially when compared to syntax. A theory of semantic markedness can appropriately account for the relative difficulty of different categories and be quite suitable for use across language boundaries.

Notes -- Continued

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