SEMANTIC SATIATION

AMONG BILINGUALS

by

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A thesis submitted to the Faculty of Graduate Studies
and Research in partial fulfilment of the
requirements for the degree of
Master of Arts

Department of Psychology
McGill University
Montreal

April 1960

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INTRODUCTION

Bilingualism has been investigated by linguists interested in the phonemic and grammatical interactions of two or more languages used in the same community. The psychologist's interest centers on the effects of two sets of semantemes upon verbal behavior and thinking. Weinreich (1953) in a recent review of the literature reports several studies in which two types of bilingual systems are identified. Linguists have used various names to distinguish between the two, e.g. "pure versus mixed", "organic versus inorganic", etc. Roberts (1939) distinguishes between "subordinative" and "co-ordinative" bilingualism at the socio-cultural level: the former is found in a community in which one language is the principal or dominant one, and the other language is specific or subordinate; the latter exists in a bilingual society where the two languages are spoken with equal fluency and frequency.

The distinction between the two types of bilinguals is

often made on the basis of differences or similarities of meaning of translated equivalents. According to Roberts, "subordinative bilingualism is characterized by the borrowing of a word by one language from another without change in meaning; (in co-ordinative bilingualism there are) two heterosemantic languages, differently employed, possessed of different connotations, appropriate under different conditions" (1939, p. 35). An instance of co-ordinative bilingualism is to be found in Italy where the priests use the Italian language in every day life but employ Latin in all affairs pertaining to the Church. A similar situation exists in Montreal where for many French Canadians English is used only for business transactions.

Recently, the notions of subordinative and co-ordinative bilingualism, or in the words of another linguist, "pure versus mixed" (Scerba, 1945), have been extended by two psychologists whose interest lies in the differences of meaning of translated equivalents in the two types of bilingual systems. Ervin & Osgood (1954) have presented a theoretical model which represents "compound" (subordinative, pure) bilingualism and "coordinate" (co-ordinative, mixed) bilingualism in terms of Osgood's (1953) theory of "representational mediation processes." In this model, the meaning of a sign (word) is identified with a process (response)

which is elicited in the organism by the presentation of the sign. This process is "representational" because it is part of the total behavior originally made toward the referent for which the sign stands; it is "mediational" because the self-stimulation produced by the representational response may become associated with other overt responses appropriate to the referent (e.g. hearing the word "dinner" may mediately evoke responses such as switching off the television set and sitting down at the table). The representational mediation process is thus a reduced part of the original behavior of the organism to the object, and has been conditioned to the sign. The "meaning" of a word is defined as the particular representational process which that word elicits in the organism. Using this paradigm, Ervin & Osgood (1954) define a "compound bilingual system" as one in which the representational process for a sign in language A is identical with that for the translated sign in language B. This is represented in Figure 1. For example, the English word "church" and its French equivalent "église" elicit the same representational mediation process and, consequently, the meaning of the words is identical. Compound bilingualism develops either because the object or referent for which both signs stand are the same, hence the original behavior during conditioning to the signs is identical,

or because the meaning of one sign has been directly conditioned (assigned) to the meaning of the other sign, as is the case in the so-called "indirect" method of language learning, e.g. "église means church." On the other hand, if the signs in the two languages are conditioned to different objects, separate and different representational mediation processes will develop for the signs in the two languages and, consequently, translated equivalents will have different meanings. This, the "coordinate bilingual system", is also represented in Figure 1. For example, the bilingual who learns the word "église" in France, associating it with a building of a particular structure and function, will have a different meaning for it than for the word "church" which he has learned in Canada and which represents a building of a different structure and function. Even though such a bilingual may learn later on that "church" is to be translated by "église", differences in connotations will remain.

A pioneer study which presents evidence for the differential behavior of bilinguals corresponding to a dichotomous interpretation of bilingualism is that of Saer (1931). That author notes that some (but not other) bilingual children have a tendency to respond with translations in a free association test where stimulus words appear in either of two languages, thereby

showing their preoccupation with translation. These "translators" would correspond to compound bilinguals who have learned their second language through the indirect method. Since the meaning of translated equivalents for a coordinate bilingual is different, it may be expected that his behavior will differ when his responses in the two languages are compared. Evidence for such differences has been presented by Ervin (1955) who reports that bilinguals who have learned their two languages in different countries give strikingly different stories to the same TAT pictures when asked at one time to relate in French and at another time in English. A direct verification of the assumptions made by Ervin & Osgood (1954) in their theoretical paper has been presented by Lambert and his associates. Using a retroactive inhibition paradigm, Lambert, Havelka, and Crosby (1958) have shown that the acquisition of two languages in separate cultural contexts (coordinate bilingualism) increases the associative independence of translated equivalents in the bilingual's two languages as measured by the amount of interference which an interpolated list of verbal material in one language has upon the retention of the same list translated in the other language. It was also shown that there are greater differences in the meanings of translated equivalents (semantic separation) for

those bilinguals who have learned their two languages in different cultures than for those bilinguals who have learned both their languages in the same culture. Lambert & Fillenbaum (1959) have analyzed the literature on polyglot aphasics in order to "test the hypothesis that the functional dependence or independence of polyglots' languages, determined by the manner in which languages were originally learned, will determine, in part, how the languages are affected by an aphasic insult" (p. 33). Although the data did not exclude alternative interpretations, the authors concluded that "the results are consistent with the theoretical analysis of compound and coordinate bilingualism" (p. 33).

It is evident therefore that the bilingual dichotomy first suggested by linguists at the socio-cultural level, then elaborated upon at the individual level by Ervin & Osgood (1954) has received experimental support. At this stage, however, several difficulties remain in the formulations made by Ervin & Osgood. In the first place, these authors have not specified the characteristics of a bilingual who has had both types of experiences, i.e. of the kind that lead to compound bilingualism as well as experiences which lead to coordinate bilingualism. As Weinreich (1953, p. 10) suggests, some signs of a bilingual's two languages may be "compounded" while others are

not. Does this group constitute a third "type" of bilingualism? Furthermore, some of the predictions in the study mentioned above (Lambert, et.al., 1958) failed to materialize. Coordinate bilinguals who acquired their languages in separate contexts within the same geographical culture (e.g. home versus school), did not differ from compound bilinguals in the extent of semantic separation of translated equivalents. Also, coordinate and compound bilinguals appeared to have equal facility in switching from one language to the other, a finding which contradicts the theoretical position that "decoding from a foreign language should be facilitative for a compound system" (Ervin & Osgood, 1954, p. 143).

Facility in decoding from a foreign language may be influenced, quite apart from considerations of compoundness, by dominance (Lambert, 1955; Lambert, et.al., 1958), and by specialization and language switching experience (Weinreich, 1954, p. 73f). Furthermore, acquiring two languages in separate contexts (which presumably defines coordinate bilingualism) is apparently not a sufficient factor for obtaining semantic separation of translated equivalents; "bicultural" experience seems to be a necessary condition (Lambert, et.al., 1958). It is evident therefore, that more work has to be done to identify the

variables which affect the behavior of bilinguals and to define the behavioral attributes of compound and coordinate bilingualism.

The task seems difficult since, although the theoretical definition of compound and coordinate bilingualism in terms of representational mediation process is quite explicit, no adequate behavioral measure of this dimension has as yet been found. In their classification of bilinguals into a compound and coordinate group, Lambert et.al., (1958) used a questionnaire about the bilingual's acquisition and usage of his two languages. In many cases the bilingual's history is so involved and his experiences so mixed that the final decision involves an unknown degree of arbitrariness as well as judgment bias. Such a method of classification is not satisfactory and can be justified at present only because no other method is available, and because it has yielded two groups of bilinguals who actually differed with respect to a behavioral measure. The fact that these differences yielded scores with considerable amounts of overlap between the two groups implies that either the classification or the measure (associative independence) or both are not wholly adequate. However, if we could find several such measures which would differentiate the behavior of members of the two groups, our chances of developing an adequate single measure of compoundness

and coordinateness would be improved. The purpose of the present study is to test another aspect of behavior which should differentiate compound and coordinate bilinguals.

STATEMENT OF THE PROBLEM

Recently Lambert & Jakobovits (1960) have developed a convenient method for measuring a particular kind of meaning change known to psychologists as "verbal satiation." This phenomenon can be defined as the decrease in the meaning of a linguistic symbol or sign as a result of its continued presentation. The fact that a word loses its meaning when it is continuously repeated has long been common knowledge but little psychological concern has been shown to this everyday experience. (Wertheimer, 1958, mentions, in what is apparently an exhaustive list, only six papers on this topic since 1916.) Probably because no objective and reliable measure of changes in meaning has been available, researchers have been handicaped in their attempts to bring the phenomenon of verbal satiation under careful experimental investigation. They were dependent upon observers' introspective analysis of the time and manner in which the meaning of a word seemed to "fade away." The development of an objective and quantitative method to measure certain aspects of connotative meaning by Osgood and his collaborators (Osgood, Suci, & Tannenbaum, 1957) offered a solution to the problem of measuring changes in meaning involved in verbal satiation.

In a recent study, Lambert & Jakobovits (1960) reported an experiment in which the semantic differential (Osgood et.al., 1957) was used to index changes in the connotative meaning of a word which were induced by verbal repetition. In their experiment, subjects (Ss) repeated a particular word continuously for 15 seconds and the amount of change in meaning was determined by comparing the intensity changes of the ratings of the word on various semantic scales. For example, the ratings of the word "father" would reliably move, after repetition, toward more neutral or meaningless positions on semantic scales such as "good-bad", "active-passive", "fast-slow", when pre- and post-repetition profiles were compared. (For an example of a semantic profile and the method by which it is scored, see Figure 2.)

Verbal satiation, or more appropriately "semantic satiation" when measured by the semantic differential, becomes particularly relevant to the hypothesis of functional dependence or independence of language systems among bilinguals. Semantic satiation was viewed by Lambert & Jakobovits (1960) as a linguistic analogue of "reactive inhibition" (Hull, 1943). When a word is repeated, the "representational mediation processes" (Osgood, 1953) which constitute the meaning of the word are

continuously elicited. Theoretically, reactive inhibition develops to the point where it suppresses or at least reduces the intensity of the representational processes, resulting in the temporary loss, or reduction, of the meaning of the word. This reduction in meaning is indexed on the semantic differential as a decrease in the intensity with which the word is rated on the scales. The compound bilingual has been described as having the same meaning for translation equivalent signs in his two languages. In terms of the theoretical formulations of Ervin & Osgood (1954), the signs in both languages in a compound bilingual system are mediated by the same representational processes, whereas for the coordinate bilingual the representational processes for equivalent signs in the two languages are separate and different enough for translated words to have somewhat different meanings.

When a compound bilingual continuously repeats a word in language A, the mediation processes corresponding to that word should be suppressed making for a loss of meaning of that word as well as the meaning of its translated equivalent in language B. However, for the coordinate bilingual, translated equivalents function relatively independently so that the cross-linguistic satiation effect (hereafter called cross-satiation) should not be exhibited at all, or at least, should be exhibited

to a lesser extent than in the contrasting case of the compound bilingual. Specifically, then, the purpose of the following experiment was to determine whether the repetition of a word in one language (e.g. "kitchen" or "maison") would result in the cross-satiation of the meaning of the corresponding word in the other language ("cuisine" and "house") and whether this effect would be more marked for compound than for coordinate bilinguals.

METHOD

Subjects

The Ss were 31 English-French bilinguals the majority of whom were college students who were paid for their services. An attempt was made to use "balanced" bilinguals by asking for volunteers who were "equally proficient in both languages." However, to insure this requirement Lambert's word fluency and automaticity measures were administered. The word fluency measure (Lambert, 1956) determines the total number of associational responses given within a 60-second period (in the present experiment) to English as well as French words of equivalent word frequency. The expectation is that balanced bilinguals will emit an equal number of associations in both

languages. The automaticity measure (Lambert, 1955; 1959) involves the use of eight finger-keys, the stems of which are differently colored, an exposure apparatus which directs the S to depress a particular key with directions appearing randomly in either language and a chronoscope measuring latency of response (see Fig. 3). The direction "right, black" for example, and S's speed of response is measured; later in the series, S is directed in French to depress the same key ("droite, noir"). After 32 practice trials, 32 directions are given and S's comparative latencies of response in his two languages are determined. The expectation is that balanced bilinguals will show a mean differential latency of response which is not significantly different from zero.

A convenient statistic for a relative word fluency and a relative dominance score (automaticity) was determined by dividing the difference between English and French scores by the "better" score (greater number of associations, shorter latency) and expressing the result as a percentage. In this manner, tests of significance for departure from zero could be applied for each S. It was found that only one S (a compound bilingual) had a relative dominance score significantly different from zero.

Since no adequate behavioral index analogous to the automaticity measure was available to determine compoundness

or coordinateness among bilinguals, detailed information was obtained from each S concerning how, when, and where his languages were acquired. The variables which have been shown by Lambert, Havelka, & Crosby (1958) to be relevant were used as a basis for classification, i.e., whether S learned the two languages in the same cultural setting or not, and whether he has used both languages interchangeably inside and outside the home. On the basis of this interview, Ss were classified as either compound or coordinate. (A form of the questionnaire and the method by which it is scored is presented in the Appendix.) Two groups of Ss, one of 15 compounds and the other of 16 coordinates, were thus obtained.

We obtained information about the Ss' subjective evaluation of their relative fluency in the two languages as well as their self-ratings as to compoundness or coordinateness when these terms were explained to them at the end of the experiment. Twenty-six of the 31 Ss expressed preference for either English or French by stating that they were "slightly" more fluent in one or the other of the two languages. These findings indicate that "balanceness" as used here is a statistical measure that need not correspond to the phenomenal state of the bilingual.

When the Ss were asked to classify themselves as

compound or coordinate, they did so easily. Compound bilingualism was defined to them as that "type" for which "translated words do not have identical meaning"; coordinate bilingualism, they were told, was that type for which "translated words do not mean quite the same, but differ slightly." Only 5 of the 31 bilinguals seemed undecided stating that they felt they were "both." The other 26 Ss classified themselves into one or the other of the two categories, and only three of these judgments were in disagreement with the experimenter's (E) classification which was based on the biographical questionnaire.

The answers to the questions posed by E following the completion of the experiment indicated that the Ss were not aware of the purpose of the experiment. Most Ss believed that E was investigating "the differences in my reactions in French and English." The Ss who stated that their ratings fluctuated (from normal to treatment conditions, see Procedure below) thought this was due to the fact that "I forgot what I had done before," or that "I thought of something else." All but two Ss believed that repetition had little effect upon their responses. None of the Ss saw any significance in the fact that at some times the same word was both repeated and rated (Satiation condition, see Procedure below), while at other times the word repeated and the word rated were different (Cross-satiation

and Different-word control conditions, see Procedure below). Only three Ss could recall and correctly classify all the words in the conditions under which they were used (see Table 1).

Procedure

The method used here to determine semantic satiation was essentially the same as that already described elsewhere (Lambert & Jakobovits, 1960). Briefly, this procedure consists of rating words on the semantic differential under two different conditions. In the first condition the S's normal semantic profile is determined by having him rate particular words on a number of semantic scales, as in Fig. 2 (X ratings). Then, in the second or treatment condition, S is required to repeat rapidly a word aloud for a period of time (15 seconds were found to be convenient) just before he gives the rating on that word (Y ratings in Fig. 2). By comparing the semantic profiles or ratings under the two conditions, the amount of decrease in the intensity of ratings attributable to repetition can be determined (polarity-difference scores, see Fig. 2).

The words (see Table 1) and scales were printed on 3 x 5 in. white index cards and placed in a Kardex folder in such a manner as to enable E to expose them in a predetermined randomized order (see Fig. 3). Five semantic scales were

used in English for the English words and their French equivalents for the French words. These were: good-bad (bon-mauvais), pleasant-unpleasant (agréable-désagréable), large-small (grand-petit), strong-weak (fort-faible), active-passive (actif-passif). S made his ratings by pointing with a stylus to one of the seven positions of each scale and his responses were recorded by E. The various treatment conditions which were used are described below and summarized in Table 1.

Normal semantic differential. The experiment started with the determination of S's semantic ratings under normal conditions for 10 words each rated along 5 scales (making a total of 50 responses). For example, E would expose the word "father" which S pronounced aloud once; then E exposed a scale and S made his rating. This procedure was followed until all words were rated on the five scales. The 50 stimuli for rating were presented in random order. Eight of the ten words rated in this initial condition served as points of comparison for the various treatment conditions described below (the remaining two words were included for other reasons and their analysis is not included in this study).

Satiation condition. Four of the words rated above were presented again (20 responses). E first exposed a word

which S had to repeat aloud for 15 seconds at a rate of about two repetitions per second. Then E exposed a scale, a signal to S to stop repeating and make his response.

Cross-satiation condition. Two other words among those rated under the initial normal condition were presented again (10 responses). E first exposed a word such as "kitchen" and S repeated it aloud for 15 seconds. Then E exposed a second word which was the translated equivalent word of the first, in this case "cuisine." S pronounced this second word once, after which E immediately exposed a scale and S made his rating. S had been instructed to always make his response to the second word, not to the first. By comparing the ratings under the present condition with those made under the initial normal condition, we could determine the effect of the repetition of its translated equivalent upon the semantic ratings of a particular word.

Different-word control condition. Two other words among those rated under the initial normal condition were presented again. E first exposed a word such as "sky" which S repeated aloud for 15 seconds. Then E exposed a second word in the other language ("fleur") and S pronounced it once, after which E immediately exposed a scale and S made his

response to the second word. This condition was therefore parallel to the Cross-satiation condition except that the word repeated and the word rated did not bear the relationship of translated equivalents, but were semantically unrelated words. This condition served as a control for the Cross-satiation condition and was introduced to determine the effect of the task of repetition per se upon the rating of another word. In view of the results obtained in a previous study with monolinguals (Lambert & Jakobovits, 1960), no satiation effect was expected under this condition. The 10 responses under this condition and those under the Cross-satiation condition were intermingled in random order and administered in the same block of time.

Dissipation condition. In the previous study using monolinguals (Lambert & Jakobovits, 1960), it was found that the semantic satiation effect persisted for at least five minutes after repetition. The Dissipation condition consists of determining the S's semantic profile a second time under a normal (non-treatment) procedure. It is thus identical with the initial Normal semantic differential condition described above except that the Dissipation condition follows (by several minutes) the satiation or treatment conditions, whereas the Normal semantic differential

condition precedes them. In the present study the dissipation period was 30 minutes. For purposes of analysis, the words used under the various treatment conditions were tabulated separately so that the rate of dissipation or the degree of persistence of the satiation effect could be determined for each condition. The results are thus tabulated as "Dissipation condition for the Satiation words," "Dissipation condition for the Cross-satiation words," etc.

In order to minimize possible interference effects between the various conditions described above as well as to reduce fatigue effects due to repetitions, the experiment was divided into eight separate steps. These are listed below in the order in which they were administered: (1) Normal semantic differential; (2) Biographical questionnaire about the acquisition of the bilingual's two languages; (3) Satiation condition; (4) Relative fluency measure; (5) Cross-satiation and Different-word control conditions; (6) Relative dominance measure (automaticity); (7) Dissipation condition; (8) Questionnaire about Ss' self-judgment relating to fluency and compoundness or coordinateness, as well as Ss' comments on the experiment.

Scoring

The scores for the various treatment conditions for both

compounds and coordinates are expressed as mean-polarity-difference scores which represent the average (per group) difference in the intensity of ratings under normal conditions (Normal semantic differential) and those under the other (treatment) conditions. The seven-point semantic scale yields four different intensity scores ranging from 0 (the fourth or middle position) to 3 (positions one and seven) as diagramed in Figure 2. In the case of the "good-bad" scale the four intensities are arbitrarily defined for the S as follows: neutral or meaningless (0), slightly good (or bad) (1), quite good (or bad) (2), and extremely good (or bad) (3). A negative polarity-difference score indicates a decrease in the intensity of rating from normal to treatment condition. For example, a change from "extremely good" (3) to "slightly good" (1) represents a decrease of two units or a polarity-difference score of -2. This decrease is what we have called "semantic satiation." A positive polarity-difference score indicates a change in the opposite direction (toward a more extreme rating) and is the opposite of the satiation effect. For the Dissipation condition a negative score also indicates a satiation effect, i.e., a lack of dissipation or a persistence of the satiation effect induced under (the previous) treatment condition.

The maximum possible polarity-difference score under any particular condition is given by the number of responses for that condition multiplied by three. This maximum would be obtained if all responses under the initial Normal semantic differential condition were of maximum intensity (3) and all responses under the subsequent treatment condition were of zero intensity. Actually the responses under the Normal semantic differential condition usually distribute themselves over all four ranges of intensity so that the maximum possible score for any S would be less than the theoretical maximum and would depend upon the intensity distribution of the scores under normal conditions. In comparing the effectiveness of a particular treatment (e.g. Satiation condition versus Different-word control condition), it is necessary that the words used under each of these conditions be rated with approximately equal intensity under normal conditions so that differences in polarity-difference scores can be attributed to the differential treatment and not to differential initial polarity. This requirement can be insured by choosing words with known semantic ratings from available tables (e.g. Jenkins, 1959; Jenkins, Russell, & Suci, 1958; 1959), or, as it has been done in the present experiment, by testing the significance of difference between the intensity ratings given for the various words under the initial normal condition.

RESULTS AND DISCUSSION

Table 2 presents mean polarity-difference scores and their standard deviations for the various conditions as well as tests of significance for the departure from zero of each group's mean scores. Also shown are tests of significance of difference between the compound and coordinate group on each of these conditions. The results can be inspected from two points of view: we can look at the differences between the conditions within each group, and we can look at the differences between compounds and coordinates on each of the conditions. These will be discussed separately.

In the last column of Table 2 (upper half), the two groups differ significantly from each other on two of the three conditions. The difference in both cases is in the same direction, showing that compounds cross-satiate for translated equivalents and show the same tendency for unrelated words in the other language; the coordinates are not affected by any treatment. Correlated t-tests of significance of difference between the means of the three conditions of Satiation, Cross-satiation, and Different-word control, failed to reach statistical significance for either group. These findings suggest that

the Ss will behave in a particular manner no matter what kind of treatment is given: the compounds will satiate when they move from one language to the other (Cross-satiation, Different-word control), but not the coordinates. Let us now examine the results for each of the conditions separately.

Satiation condition. On the basis of results obtained with several groups of monolinguals in previous studies (Lambert & Jakobovits, 1960), it was expected that all Ss would satiate under this condition and that we would obtain a negative mean significantly different from zero for both groups. However, the results indicate that there is only a tendency to satiate on the part of the compounds, and no tendency (if anything, a trend in the opposite direction) on the part of the coordinates. This finding takes on added significance since similar data were obtained with 27 other bilingual Ss in a pilot study in which no significant satiation effects were found using the same condition. There is, then, the suggestion that bilinguals tend to resist the satiation effect in contrast to monolinguals who, under similar conditions, clearly exhibit the satiation effect.

This finding is important in the light of other (unpublished) evidence on semantic satiation which we have previously obtained in our laboratory. A large significant negative

correlation was found between facility in paired-associates learning and "semantic satiability" as measured by the size of the negative score which Ss obtain under the Satiation condition. This finding was interpreted to mean that people who satiate quickly and thoroughly under conditions of repeated presentation of verbal material (as, for example, in vocabularly drill) will be impaired in their ability to learn paired-associates and other types of rote learning, and, by extension, will have difficulty in learning those features of a second language which require drill. On the other hand, people who are able to resist the satiation effect will profit from repetition in vocabulary drill and other such repetitive experience, and more likely succeed in second language learning. The bilinguals in the present study were balanced (with one exception) and equally proficient in both languages, i.e. they were skilled language learners. It is likely, therefore, that our sample was biased with respect to semantic satiability, and it is possible that balanced bilinguals in general are at the lower end of the scale with respect to this trait. In other words, it is suggested that a person must be able to resist semantic satiation effects in order to become highly proficient in more than one language. Further experiments on the relation between semantic satiability

and verbal learning are being planned to study this possibility more fully.

Cross-satiation and Different-word control conditions. The fact that there is no significant difference between the means of the Cross-satiation and Different-word control conditions for either group requires a re-evaluation of our position with respect to the predictions made concerning the cross-linguistic effect of repetition. It now appears that compound bilinguals exhibit the satiation effect after repetition whether or not the word repeated and the word rated are semantically related, as long as they are in different languages. The original explanation for the Cross-satiation effect, namely that continued elicitation leads to inhibition of the representational mediation processes, does not apply to the Different-word control condition since the representational processes elicited during repetition are not the same as those identified with the meaning of the word which is rated.

By postulating a language switching mechanism which would keep the signs in the bilingual's two languages separate and minimize interference effects in the balanced compound bilingual, it is possible to account in a rational manner for the pattern of results. For the compound bilingual, there is constant

pressure to confuse the signs of the two languages since the representational mediation processes for both sets of signs are identical. In order to reach bilingual fluency and balance, the compound bilingual must be able to inhibit the decoding process of one language while the other language is being used. It is hypothesized that this selective inhibition would be carried out by some sort of language switching mechanism. For the coordinate bilingual, such a mechanism would not be of great importance or would function differently since two sets of separate representational processes are available for translated equivalent signs and the pressure for confusing signs in the two languages during decoding is not as great.

The present suggestion of a language switching mechanism is by no means new. Leischner (1948) formulated a neurological theory of bilingualism "according to which there exists at the posterior edge of the Sylvian fossa and in the adjoining parietal regions of the brain a special language switching mechanism" (Weinreich, 1953, p. 72). This hypothesis of an anatomically localized control center has been criticized by other researchers and still requires experimental confirmation. However, Goldstein (1948) mentions several studies in which the capacity of polyglot aphasics to switch

languages voluntarily is said to depend on the location of the brain lesion. Other behavioral evidence reported by Goldstein (1948) renders our account of the language switching mechanism and the inhibition of the decoding process more plausible. For instance, some aphasics are able to repeat and pronounce certain words (encode) but are unable to understand them. Others often unwittingly alternate languages while speaking but are unable to translate, indicating their incapacity for active or voluntary language switching. In all these cases it would seem that decoding and encoding mechanisms of several languages in the same individual can be separately affected (inhibited), a notion similar to our own interpretation.

Recent neurophysiological theories such as those of Hebb (1949; 1958) and expecially the recent re-examination of Hebb's theory by Milner (1957) support the theory of a selective inhibitory decoding process. For instance, Milner's notion of recurrent inhibitory connections between adjacent cells in the cortex whereby the firing of cell A for example inhibits the adjacent cells B, C, and D (1957, Fig. 2, p. 246) parallels our notion of inhibition whereby the repetition of a word in one language ("cell A") inhibits the decoding of signs in the other language ("firing of cells B, C, and D").

Let us now look more closely at what happens under the Different-word control condition. As the compound bilingual

repeats a word in language A ("sky"), the language switching mechanism inhibits the decoding process of language B. After 15 seconds of repetition, a word in language B is presented ("fleur") which the S is required to place along a semantic scale. However, since the decoding process of language B is in an inhibited (or refractory) state, the sign "fleur" cannot be decoded, i.e. it will fail to elicit its appropriate representational mediation process, meaning that "fleur" is a meaningless word for that moment in time. This explanation would account for the fact that compound bilinguals exhibit the satiation effect in the Different-word control condition.

In the case of the coordinates, repetition of a word in language A ("sky") does not necessarily inhibit the decoding process of language B since there is less pressure for confusion. Hence, when "fleur" is presented, it is successfully decoded and no satiation effect results.

The present explanation may also account for the larger satiation effect observed with the compounds under the Cross-satiation condition. Our original explanation in terms of inhibition of the representational processes with repetition of the word is no longer adequate as a single explanation in view of our later assumption that balanced bilinguals resist the

satiation effect. Although our samples of bilinguals are more resistant than monolinguals to the satiation effect, compounds are not completely unaffected as the negative mean for the Satiation condition indicates (Table 2). It is probable that both language switching and repetition of the translated equivalent contribute to the negative mean for the Cross-satiation condition. The fact that the mean for the Cross-satiation condition is larger than that for the Different-word control condition (Table 2) may be due to a combination of both these factors. Evidence to be presented later will support this possibility.

Dissipation condition. The dissipation scores presented in the lower half of Table 2 show that the compounds have significant negative scores for the words used under all three conditions. This means that the satiation effect induced under the treatment conditions did not dissipate, but persisted for the 30-minute interval period. In the previous experiment with monolinguals, Lambert & Jakobovits (1960) interpreted negative means under the Dissipation condition as an indication of the persistence of the inhibition of the representational mediation processes developed during treatment conditions. This explanation alone is not adequate in the present context,

since it appears that the inhibition of representational processes as a result of repetition is only slight. Furthermore, the negative mean under the Dissipation condition for the Satiation words is actually larger than the mean under the Satiation condition, indicating even a greater satiation effect under the Dissipation condition than under the treatment condition (Table 2).

Some clue to the solution of this problem comes from the results obtained with the coordinate group. It can be seen from Table 2 (lower part) that all three means under the Dissipation condition are smaller than those under treatment conditions (upper half). In other words, there is a marked tendency for both groups to give more neutral ratings at the end of the experiment (Dissipation condition) than at the beginning (Normal semantic differential condition) under otherwise identical conditions. A factor of fatigue or generalized satiation at once suggests itself. It is possible that as a consequence of repeating larger numbers of words, the connotative meanings of all words are reduced in intensity toward neutrality or meaninglessness. Also, the rating of a word on a particular scale involves decision making; if the Ss become bored with the task, they may avoid the trouble of making a decision by pointing

to the middle position of the scale, which is, as it were, a "non-compromising" response.

This explanation does not account for the significantly larger negative mean for the compounds as compared with the coordinates under the Dissipation condition for the Cross-satiation words. Two factors may contribute to this effect. The first is the inhibition of the decoding process during the Cross-satiation condition which persists. The second factor is the inhibition of the representational mediation processes during repetition of the translated equivalent word under the Cross-satiation condition which, persisting over time, would contribute to the proportionately larger negative mean under the Dissipation condition for the compounds.

It follows from this discussion that in a bilingual experimental context in which the compound bilingual is forced to switch abruptly from one language to the other (in the present study, English and French ratings were randomly mixed), he behaves less efficiently than a coordinate bilingual as is reflected in his generalized tendency to Satiate cross-linguistically. Such a notion is contrary to the theoretical formulations of Ervin & Osgood (1954) who take the position that compounds, being translators during acquisition, should

be able to function more efficiently on a translation test than coordinates. There is no sufficient evidence at the present to resolve this difficulty: in the results reported by Lambert et.al., (1958), compound bilinguals failed to do better than coordinate bilinguals on a translation task. Further experiments are needed to throw some light on this issue.

SECOND TESTING

It was decided to retest the compound group with the hope that some of our hypotheses would be verified. The following changes were introduced: (1) In order to test the hypothesis that the satiation effect exhibited by the compounds under the Different-word control condition (see Table 2, upper half) was due to language switching and consequent inhibition of the decoding process of the other language, we introduced a second Different-word control condition in which the word repeated and the word rated were in the same language but were still semantically unrelated. For example the word "smoke" was repeated for 15 seconds, followed by rating of the word "money" (the French pair was "paysan, vérité"). In the present case, there is no language switching and supposedly no inhibition of a related decoding process, so that no satiation effect should be manifested. (2) In order to minimize any satiation effect due to fatigue and generalized satiation, the experiment was reduced to about half the length of the first testing by eliminating the administration of the relative fluency and dominance measures, the biographical questionnaire, as well as the Dissipation condition. Further-

more, only two words (instead of four) were used for the Satiation condition. The Cross-satiation condition and the original Different-word control condition (different language) remained unchanged. There were then 80 ratings (see below) in all during this second testing as opposed to 140 in the first. Fatigue effects were investigated further by changing the order of the conditions, administering the Cross-satiation and Different-word control conditions first, and the Satiation condition last. If fatigue contributes to the satiation effect, then greater negative means for the Satiation condition should be observed when the satiation treatment is given at the end of the experiment (as in the present case), and smaller negative means for the other two treatment conditions should be obtained since they now come at the beginning of the experiment.

To summarize, then, the order of procedure during the second testing of the compound group was as follows: (1) Normal semantic differential condition: "father, garçon, cuisine, house, fleur, hate, money, vérité" (40 responses in random order); (2) Cross-satiation condition (same as before), Different-word control (different language, same as before), and Different-word control same language: "smoke,

money", "paysan, vérité" (30 responses in random order); (3) Satiation condition: "father, garçon" (10 responses in random order).

The retest was given about five weeks after the first testing, and only those Ss were retested who did not remember the purpose of the experiment when interrogated at the beginning of the second testing period. Of the 15 compounds previously tested, 12 met this criterion.

Table 3 presents mean-polarity difference scores and their standard deviations, and gives tests of significance for departure from zero. Also shown are tests of significance of difference between first and second testings. Let us first compare the means between the two testings. As predicted, the means for the Cross-satiation and Different-word control (different language) conditions are both smaller in the second testing than in the first, and while only one of these differences reaches statistical significance, this finding supports the hypothesis that fatigue contributes to the satiation effect. Furthermore, even though the mean for the Satiation condition for the second testing is somewhat smaller than that for the first testing, it departs significantly from zero, whereas it did not in the first testing. There is therefore an indication that

the satiation treatment is comparatively more effective in the second testing, where it came at the end of the testing period, which may be considered as further support for the hypothesis that fatigue contributes to the satiation effect. (Remember that, although both means are expressed as an average over two words, the overall amount of satiation treatment in the second testing was only half (two words) of that in the first testing (four words), and this may account for the smaller absolute value of the mean). This significant negative mean also suggests that under fatigue conditions balanced bilinguals behave more like monolinguals by exhibiting the satiation effect.

Correlated t-tests of significance of difference between the means of the three conditions of Satiation, Cross-satiation, and Different-word control (different language) conditions, failed to reach statistical significance, and this finding is a replication of that in the first testing. Once again the results suggest that compounds will satiate in a language-switching context no matter what treatment is given.

Although the mean for the new Different-word control (same language) condition is negative, it does not depart significantly from zero. If this finding is compared to the

significant negative mean on the original Different-word (different language) condition in the first testing (Table 2, upper half), it would seem that the hypothesis of satiation due to language switching is substantiated. The results are equivocal however since no significant difference was found between the two types of Different-word control conditions in the second testing (Table 3).

An explanation is then needed for the fact that no satiation effect has been observed on the Different-word control (different language) condition during the second testing where it should have been obtained in accordance with the hypothesis that language switching will cause compounds to behave in a manner similar to semantic satiation. In fact, the pattern of results in Table 3 suggests that cross-satiation takes place for compound bilinguals with semantically related words (Cross-satiation condition) but <u>not</u> for semantically unrelated words. The finding is ambiguous since there is no reliable difference between the conditions of Different-word control (different language) and Cross-satiation. One might conclude that when fatigue is high (as presumably in the first testing) the language switching mechanism is particularly pronounced but in the case of less fatigue (as in the second

testing) the switching mechanism is less pronounced. Another explanation for the larger negative mean for the Cross-satiation condition as compared with the Different-word control (different language) condition is that two factors contribute to the satiation effect in the former condition, but only one in the latter. In addition to the language switching mechanism and consequent inhibition of the decoding process, a factor which operates in both conditions, there is in the Cross-satiation condition the additional effect of the inhibition of the representational mediation processes during repetition in the case of related words. While this last effect may be small in the case of balanced bilinguals, it nevertheless plays its part as is shown by the negative (albeit insignificant) mean of the Satiation condition for the compounds in the first testing (Table 2).

Another difficulty is the fact that we do not know the effect of familiarity with the experiment during the second testing upon the variables which we are investigating. It would seem necessary to repeat the experiment with a new group of bilinguals in order to observe more precisely the various factors which have suggested themselves in the present study. Until then, the language switching mechanism hypothesis

for the compounds remains a tentative explanation only. Two things, however, clearly emerge from the data presented here: one is that bilinguals who are separated into two groups on the basis of their language acquisition-usage history behave in quite a different manner with respect to semantic satiation, and second, both groups differ in their responses to semantic satiation from monolinguals.

CONCLUSIONS

We have set out to develop a behavioral test which would differentiate compound and coordinate bilinguals who have been so classified on the basis of how they learned and used their two languages. The test we have used in this study successfully differentiated the two groups, but oddly enough, it seems to measure something more and different than we had anticipated. We expected that the degree of functional dependence or independence of a bilingual's two language systems would determine the occurence of semantic cross-satiation. Our control condition, however, suggested that this phenomenon exhibited by compound bilinguals was due to the language switching involved in our test. We have retested the compound sample but failed to find unequivocal confirmation of our hypothesis, and we are now in a position where we have to design new experiments to carefully test our new hypotheses--a familiar situation to investigators in the field of psychology. It is clear, however, that whatever is measured by our test, it is a potential differentiator between compound and coordinate bilinguals, and in this respect, the study has been successful.

There are now three behavioral measures which have

been shown to differentiate the two groups of bilinguals as classified on the basis of their language acquisition-usage history. The first two were demonstrated in another study (Lambert, et.al, 1958). They are: semantic separation (restricted to compounds and "bicultural" coordinates), and associative independence of translated equivalent words. The third measure, as demonstrated in the present study, is semantic cross-satiation. (A fourth measure of "semantic generalization" is now being investigated in our laboratory). The next step indicated is to administer all of these measures to a group of bilinguals and compare their scores on them. We may find, for instance, that certain bilinguals will score similarly on all measures (e.g. greater semantic separation, greater associative independence, no cross-satiation: the coordinate profile), while others may not do so. If this were the case, it would be an indication that the compound-coordinate dimension is a continuum rather than a dichotomy. It may also prove possible to find a meaningful relation between particular experiences of bilinguals as revealed by the language acquisition-usage history and scores on the various tests (or the pattern of scores on them).

SUMMARY

The purpose of this study was to develop a behavioral test which would differentiate compound and coordinate bilinguals who have been so classified on the basis of a language acquisition-usage history. The test used was semantic cross-satiation which may be described as the satiation of the meaning of a word in one language when its translated equivalent word in the other language is continuously repeated by a S for a period of 15 seconds. The satiation of meaning was recorded as a decrease in the intensity of ratings on the semantic differential. The results indicated that: (1) coordinates do not satiate under any condition, (2) compounds tend to satiate under all conditions, and (3) both types of bilinguals tend to satiate less than monolinguals when tested under comparable conditions. Consideration of control conditions used suggested the interpretation that the semantic cross-satiation exhibited by the compound group was attributable to the language switching involved in the situation (i.e. repetition of a word in language A followed by rating of

another word in language B). A hypothetical mechanism was suggested in which the decoding process for language B would be in an inhibited state for compound bilinguals while language A is being used.

REFERENCES

Ervin, Suzan, M. The verbal behavior of bilinguals: content differences in TAT stories told by adult French bilinguals in French and in English. Paper delivered at a convention of the American Psychological Association, September 3, 1955.

Ervin, Suzan, M., & Osgood, C.E. Second language learning and bilingualism. In C.E. Osgood and F. Seboek (Eds.), Psycholinguistics. J. abnorm. soc. Psychol., Suppl., 1954, 139-146.

Goldstein, K. Language and language disturbances. New York: Grune & Stratton, 1948.

Hebb, D.O. The organization of behavior. New York: John Wiley & Sons, 1949.

Hebb, D.O. A textbook of psychology. Philadelphia: W.B. Saunders Company, 1958.

Hull, C.L. Principles of behavior. New York: Appleton-Century-Crofts, 1943.

Jenkins, J.J. Degree of polarization and scores on the principal factors for concepts in the semantic atlas study. Report No. 1, Univ. of Minnesota, 1959, (mimeo.).

Jenkins, J.J., Russell, W.A., & Suci, G.J. An atlas of semantic profiles for 360 words. Amer. J. Psychol., 1958, 71, 688-699.

Jenkins, J.J., Russell, W.A., & Suci, G.J. A table of distances for the semantic atlas. Amer. J. Psychol., 1959, 72, 623-625.

Lambert, W.E. Measurement of the linguistic dominance of bilinguals. J. abnorm. soc. Psychol., 1955, 50, 197-200.

Lambert, W.E. Developmental aspects of second-language acquisition: I. Associational fluency, stimulus provocativeness, and word-order influence. J. social Psychol., 1956, 43, 83-89.

Lambert, W.E., Havelka, J., & Crosby, C. The influence of language-acquisition contexts on bilingualism. J. abnorm. soc. Psychol., 1958, 56, 239-244.

Lambert, W.E. & Fillenbaum, S. A pilot study of aphasia among bilinguals. Canad. J. Psychol., 1959, 13, 28-34.

Lambert, W.E., Havelka, J., & Gardner, R.C. Linguistic manifestations of bilingualism. Amer. J. Psychol., 1959, 72, 77-82.

Lambert, W.E., & Jakobovits, L.A. Verbal satiation and changes in the intensity of meaning. J. Exper. Psychol., 1960, (in press).

Leischner, A. Über die Aphasie der Mehrsprachigen. Archiv für Psychiatrie und Nervenkrankheiten, 1948, 180, 731-775.

Milner, P.M. The cell assembly: Mark II. Psychol. Rev., 1957, 64, 242-252.

Osgood, C.E. Method and theory in experimental psychology. New York: Oxford University Press, 1953.

Osgood, C.E., Suci, G.J., & Tannenbaum, P.H. The measurement of meaning. Urbana: Univ. of Illinois Press, 1957.

Roberts, M.H. The problem of the Hybrid language. Journal of English and Germanic Philology, 1939, 38, 23-41.

Saer, Hywella A. Experimental inquiry into the education of bilingual peoples. Education in a changing commonwealth. London: 1931, 116-121.

Ščerba, L.V. Očerednyje problemy jazykovednija. U.S.S.R. Academy of Sciences, Izvestija, Section of Literature and Language IV (5), 1945, 173-186.

Weinreich, U. Languages in contact. New York: Linguistic Circle of New York, 1953.

Wertheimer, M. The relation between the sound of a word and its meaning. Amer. J. Psychol., 1958, 71, 412-415.

TABLE 1

Schematic Representation of the Procedure

Condition	Description	Words used	Examples*
Normal semantic differential	Ratings given under normal (non-treatment) conditions	"father, cop, ville, city, boy garçon, cuisine, house, fleur, hate"	"father" : "house" :
Satiation	15-second repetition of a word followed by rating of that word	"father, cop, garçon, ville"	(father): "father" (garçon): "garçon"
Cross-satiation	15-second repetition of a word followed by rating of its translated equivalent	"cuisine, house"	(kitchen): "cuisine" (maison): "house"
Different-word control	15-second repetition of a word followed by rating of an unrelated word	"fleur, hate"	(sky): "fleur" (bateau): "hate"
Dissipation	Ratings given under normal (non-treatment)conditions	"father, cop, garçon, ville, city, boy, cuisine, house, fleur, hate"	"father" : "house" :

*In these examples, the word in parenthesis is repeated for 15 seconds and the word in quotation marks is rated. The colon indicates that rating follows.

TABLE 2

Average Change in Polarity Over the Sum of Two Words and Five Scales for the Compound and Coordinate Groups

Condition	Compounds (N=15)			Coordinates (N=16)			t-Test for Signif. Betw. Groups
	$\bar{X}$	SD	t[a]	$\bar{X}$	SD	t[a]	
Satiation[b]	-1.30	2.92	1.66	0.61	1.89	1.23	1.67
Cross-satiation	-2.80	3.77	2.77*	0.87	3.59	0.93	2.61*
Different-word cont.	-2.53	3.02	3.12**	1.12	3.83	1.13	2.81*
Dissipation[c] for Satiation words	-1.86	2.16	3.16**	-0.53	3.44	0.59	1.22
Dissipation for Cross-Satiation words	-2.87	2.84	3.73**	0.06	3.28	0.07	2.49*
Dissipation for Different-word control words	-2.13	3.17	2.48*	-0.31	4.79	0.25	1.18

[a]t-Test of significance for departure from zero.

[b]The scores under this condition are given as an average over two words in order to make them comparable to the other scores.

[c]Negative scores indicate a persistence of the satiation effect or a lack of dissipation.

*Significant beyond the 5% level of confidence, two-tailed test.

** Significant beyond the 1% level of confidence; two-tailed test.

TABLE 3

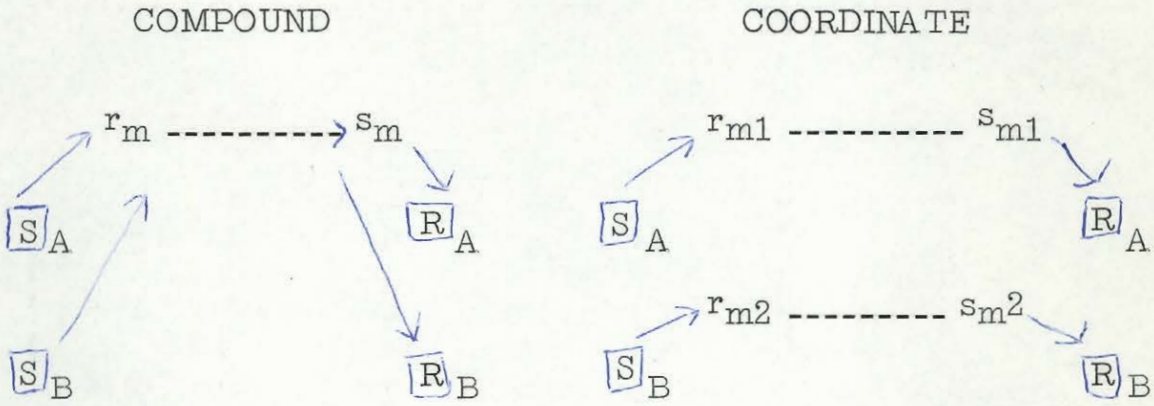
Comparisons Between First (I) and Second (II) Testings for the Compound (N-12) Group

Differences between conditions	Left hand side of pair	Right hand side of pair			Correlated t-test for Signif. Between Two Testings
	$\bar{X}$[a]	$\bar{X}$	SD	t[b]	
Cross-satiation I - Cross-satiation II	-3.50	-1.66	1.85	2.96*	1.61
Different-word control I (different language)	-3.00				
Different-word control II (different language)		-0.25	2.28	0.36	3.19*
Satiation I[c] - Satiation II	-1.62	-1.25	1.45	2.84*	0.41
Different-word control II (different language)	-0.25				
Different-word control II (same language)		-0.50	3.11	0.53	0.86
Different-word control II (different language)	-0.25				
Cross-satiation II		-1.66	-	-	1.84
Different-word control II (same language)	-0.50				
Cross-satiation II		-1.66	-	-	1.13

[a]These scores are not the same as in Table 3 since three Ss were dropped.
[b]t-Test of significance for departure from zero (for second testing only).
[c]Calculated for the two words "father, garçon" only in order to make it comparable to the second testing.
*Significant beyond the 2% level of confidence, two-tailed test.

FIGURE 1

Schematic Representation of Compound and Coordinate Language Systems.

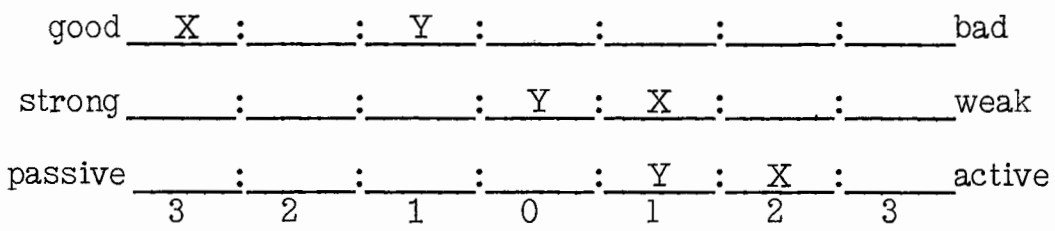


In the compound system, the signs in language A (S_A) and the signs in language B (S_B) are associated with (conditioned to) the same representational mediation process or meanings ($r_m \dashrightarrow s_m$) which is also associated with two sets of linguistic responses (R_A and R_B). In the coordinate system, different processes or meanings are associated with the signs in the two languages. (Reproduced from Ervin & Osgood, 1954, Fig. 16, p. 140).

FIGURE 2

Illustration of a Semantic Profile

Father



S rates the concept "father" by indicating on each scale the position he considers most appropriate. The polarity score in the present example is 6 for the X ratings and 2 for the Y ratings. The polarity-difference score for this example using one concept and three scales is thus -4, indicating that the second ratings (Y's) moved 4 scale units closer to the zero point.

Fig. 3. Arrangement of the apparatus showing E (in white) exposing a scale by means of the Kardex folder, S rating a word, and the finger-key automaticity measure (centre).

APPENDIX

LANGUAGE ACQUISITION-USAGE QUESTIONNAIRE

1. Where did you learn your French? English?

   country, province _____ home _____ school _____

   street _____ work _____ trips _____ other _____

2. How did you learn it?

   through another language _____ directly _____ other _____

3. Under what circumstances have you used it?

   exclusively, for how long _____ at home only _____

   at work only _____ in school only _____ on trips only _____

   other _____

   both languages in the same situation (home, work, etc.) _____

   and for how long _____

Note for scoring:

A. The bilingual is to be classified as a coordinate if:

1) he has learned the two languages in two different cultural contexts (province or country);

2) he has learned the two languages in separate settings (e.g. one at home and the other at work);

3) he has used either language exclusively for a period of at least one year;

4) he habitually uses one language in one setting (e.g. at work), and the other in a different setting (e.g. at home).

B. The bilingual is to be classified as a compound if:

1) he has learned the second language through the intermediary of the first (the so called "indirect" method);

2) he has learned both languages in the same setting (e.g. at home);

3) he has used both languages indiscriminately in the same setting for a period of at least one year.

A bilingual who is a coordinate through language acquisition may still be classified as a compound if he has had "compound" or fused experiences (as in Note B3). Similarly, a bilingual who is a compound through language acquisition may be classified as a "coordinate" if he has had coordinate or separate experiences (as in Note A3, 4).