Release from proactive interference in compound and coordinate bilinguals*

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The primary purpose of this experiment was to test compound and coordinate bilinguals, using the release from proactive interference technique, the release being associated with a change in the language of presentation. It was expected that coordinate bilinguals would show considerable release but that compound bilinguals would not.

This experiment applied the Wickens (1970) PI release technique for studying encoding to gain insight into the functional distinction between compound and coordinate bilinguals, as suggested by the research of Lambert and his associates (for example, Lambert, 1969). In the proactive interference (PI) release technique, a series of trials using the Brown-Peterson short-term memory distractor paradigm is presented with materials which are homogeneous with regard to some encoding attribute. On each trial, S is required to remember a short list of items, frequently three words, for a few seconds while performing a task that minimizes rehearsal of the items. Typically, recall is close to perfect on the first trial but becomes progressively worse over the first three or four trials and remains at asymptote for subsequent trials. In other words, PI builds up. If a list of words from a different encoding category is introduced on a later trial, there is an immediate and sizable improvement in recall: that is, there is a release from PI. Wickens (1970) has argued that release from PI can be used as evidence that the category presented during the buildup of PI and the category used on the release trial are perceived as being psychologically dissimilar. The technique has been used as a kind of projective device for determining how materials are encoded and stored in memory. For example, considerable release from PI results when recall of words in one taxonomic class on the first few trials is shifted to recall of another taxonomic class. Wickens (1970) has reviewed the experimental literature regarding encoding attributes as inferred from release or failure to release in this situation.

Goggin & Wickens (1971) found that release occurred for bilinguals when shifting from recall of words presented in one language to recall of words presented in another language. According to the Wickens logic, this result implies that the bilingual encodes words by language and that the words remain in memory with the presentation language as an encoding attribute.

Lambert (for example, 1969) has performed a number of experiments that suggest that bilingualism lies along a continuum from compound to coordinate language systems. For the extreme coordinate bilingual, the two languages are functionally independent, while for the extreme compound bilingual, the two languages interact. Such a distinction is intuitively appealing, since the operational definition of a compound bilingual is one who has learned both languages simultaneously at an early age in a common context (for example, in the home), while the coordinate bilingual has learned one language at an early age in one context and the second language at a later age in a different context (for example, at school). Experiments using a variety of techniques with persons selected to be extreme compound or extreme coordinate bilinguals have provided results that are consistent with the view that compound and coordinate language systems have quite different functional properties.

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METHOD

Design

The design required the selection of 64 extreme compound and 64 extreme coordinate bilinguals. These two types of bilinguals were subdivided into control (no shift in language) and experimental (shift in language) groups. The shift in presentation language occurred on Trial 4, after all Ss had been tested for recall on words presented in a common language for Trials 1-3. Nonshift Ss were kept on the same language for all four trials (either English or French), and shift Ss changed language on Trial 4 (either English to French or French to English). In order to determine the effect of the language in which the interpolated rehearsal-prevention task was performed, Ss were further subdivided into groups that performed the distractor task in English or French. Four orders of word lists were selected in such a way that each list occurred once on each trial. A complete replication required four Ss in each treatment combination. Two replications were run by two Es. This design, therefore, included two levels of E, two levels of type of bilingual, four levels of shift or nonshift in language of recall items on Trial 4, and two levels of interpolated-distractor language as between-Ss variables and four trials as a within-Ss variable.

Subjects

The 128 bilingual Ss were recruited from classes at Carleton University, Ottawa University, and the LaSalle Academy High School, as well as from the Ottawa community in response to advertisements in local newspapers. All Ss were paid $1 for participating. Information about Ss was obtained in a preexperimental questionnaire that was also used to classify Ss along the compound-coordinate continuum. Mean values for ability to read, write, and comprehend the second language were based on a self-rating on a 7-point scale, with 7 indicating "very good." Persons who did not rate themselves at least 4 on all three criteria were not included in the experiment. None of the differences in self-rating between compound and coordinate bilinguals were significant by t test ($\alpha = .05$). In addition to the self-rating information, the two bilingual Es talked to all Ss in

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both languages by telephone, or in person, prior to the experiment to insure fluency in both languages. Fifty-four compound and 40 coordinate bilinguals indicated that French was their maternal language.

A person was classified as a compound bilingual if he learned both languages at home prior to the age of 6. Coordinate bilinguals used in this experiment learned one language at home prior to age 6 and the second language outside the home (primarily at school) after age 6. Lambert (for example, Segalowitz & Lambert, 1969) has indicated that this is a simple and reliable means of differentiating bilinguals, although it misses certain aspects of the compound coordinate distinction.

Material

Twelve words in English and in French, from the taxonomic category "body parts," were formed into the following eight triads: skin-heart-tooth, peau-couer-dent; back-thigh-mouth, dos-cuisse-bouche; eye-thumb-hip, oeil-pouce-hanche; knee-head-foot, genou-tête-pied. All aspects of the experiment were presented visually by a 35-mm slide projector, except the distractor task materials, which were displayed by means of a Super 8 motion picture projector.

Procedure

All Ss practiced the interpolated distractor task for eight trials. This task required Ss to add two digits, call out their sum, and state whether the sum was odd or even. Two digits were presented every second for 10 sec. Half of the Ss were required to respond in English and half in French. Following practice on the distractor task, Ss were given four trials of practice on the complete Brown-Peterson task, with animal names as recall material. Presentation was in French for two trials and in English for two trials. This practice was followed by the four experimental trials.

The procedure on each experimental trial was the same for all Ss. A blue slide, shown for 2 sec as a ready signal, was followed by the three words in the appropriate language. These words were visible for 1.7 sec while S read them aloud. Upon removal of the words, the digit pairs appeared and S performed the distractor task until three question marks appeared on the screen. After 11 sec, the three question marks were replaced by a single question mark for 7 sec. Ss were required to attempt to write down the three words during this 18-sec recall period. There was an intertrial interval of 10 sec, during which S turned the page of his response booklet.

RESULTS

There were significant main effects only for trials and for the presentation language conditions. The critical Trials by Presentation Language by Type of Bilingual interaction was significant by conventional F test [$F(9,288) = 1.99$, $p < .05$] but was not significant by conservative test (Geisser & Greenhouse, 1958). Recall dropped rapidly from Trial 1 to Trial 3, with no systematic differences between compound and coordinate bilinguals over these trials. Probability of recall of words without regard for order (item scores) was .85 on Trial 1, .67 on Trial 2, and .65 on Trial 3; thus, there was a buildup of PI. On Trial 4, both shift groups recalled more than nonshift control groups. Probability of recall was .79 vs .58 for compound bilinguals and .77 vs .64 for coordinate bilinguals. According to planned orthogonal comparisons, the superiority of shift to nonshift recall was significant for both compound and coordinate bilinguals ($t = 3.26$ and 2.01, respectively). Furthermore, the amount of release was comparable for compound and coordinate bilinguals ($t = 0.86$). The critical value of t in all cases was 1.97 at $\alpha = .05$.

The only other significant effect was an unexpected Interpolated Task Language by E/Replication interaction [$F(1,96) = 4.44$, $p < .05$]. With the English-dominant E, recall was better when the interpolated task was performed in English, while with the French-dominant E, recall was better with the interpolated task performed in French.

One point of interest, not directly related to the PI release aspect of the experiment, was the effect on recall when S was trying to remember words presented in the same language as the distractor task or in the other language. On the basis of results available on the effect of similarity on retroactive interference (e.g., Postman, 1971), we expected lower recall with the same language rather than with different languages. If anything, the results were in the opposite direction.

DISCUSSION

Since both types of bilinguals showed PI release, the study replicates and extends the findings of Goggin & Wickens (1971) with a number of methodological and procedural changes. Since compound and coordinate bilinguals did not show differential release, the results fail to support the hypothesis of functional differences between the two types of bilinguals with the Brown-Peterson task. At least three explanations may be advanced to account for this finding. First, it is possible that the bilinguals used in this experiment were not extreme compounds or coordinates. Lambert, in his investigations (for example, Lambert, 1969), often used the same carefully selected Ss. Consequently, he was more likely than the present investigators to have had pure compound and pure coordinate bilinguals. Intensive interviewing of Ss, as Lambert has done, may be necessary in order to obtain bilinguals at the extreme ends of the compound-coordinate continuum. If, in fact, pure compound bilinguals are as rare as this possibility implies, the generality and usefulness of the distinction should be reevaluated. Second, it is possible that the PI release technique is not sensitive enough to detect differences between compound and coordinate bilinguals. If the compound-coordinate distinction is real, these results suggest that release with a language shift may not reflect the operation of separate memories for the two languages as proposed by Goggin & Wickens (1971). The release could, for example, be attributable to a phonemic shift which is confounded with the language shifts. Third, the compound-coordinate distinction, which rests on a fragile empirical foundation (see Lambert, 1969), may be wrong.

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