

***New Methodologies for Studying the Relationship of
Bilingualism and Cognitive Flexibility***

KENJI HAKUTA

Yale University

■ The turn of the century saw the introduction of psychometric tests of intelligence to the United States, mostly due to the efforts of H. Goddard and L. Terman. Both of these psychologists were hereditarians, who believed that the genetic composition of individuals was the primary determinant of performance on these tests. A major thrust of work in those dark days was directed toward showing that individuals from certain racial groups (primarily Southern and Eastern Europeans) were of inferior intelligence; together with the assumption that this was due to their genes, certain social policies such as the restriction of immigration were effected (see Gould 1981).

There was, however, a major stumbling block in reaching these conclusions from the data that existed (mostly results of massive IQ testing of World War I recruits): many of the testees were not native speakers of English, yet they were tested in English. Thus, whether these individuals were suffering from a "language handicap" in testing became a major issue. Hereditarians, such as Terman's student Kimball Young, argued that there was no language handicap. Those in favor of environmental determinants of IQ stressed the language handicap.

The social context in which this early research on bilingualism and intelligence was conducted is radically different from the context of the more recent studies of the matter, basically modeled after Peal and Lambert's (1962) well-known study. These different contexts are primarily responsible for the differences in the focus of the research and the methodologies adopted. From our current perspective, the methodology of the earlier research was wildly deficient, failing to control for a variety of obvious variables such as socio-economic status (SES). But the earlier researchers assumed that low SES was the *result*, not the cause, of inferior performance on IQ tests, so this questionable methodology passed the inspection lines of science (a review of this history will appear in Hakuta, forthcoming).

We contemporary researchers are not, however, so objective either. I think

it would not be too far from the truth to say that most researchers engaged in the problems of bilingualism today have a favorable attitude toward it. Thus, the Peal and Lambert findings that bilingualism seems to have a *positive* effect on performance on intelligence tests (we will hereafter call it *cognitive ability*) are consonant with our beliefs. But there are actually some profound methodological difficulties in the standard design, some of which were pointed out quite early by John Macnamara (1966). More recently, MacNab (1979) has forcefully criticized the inferences drawn from the studies, given their methodology (also Hakuta and Diaz [in press] develop an independent but similar line of argument). The difficulties need to be addressed, even if the results agree with our biases.

So what is this methodology that is so questionable, and what are the problems? The methodology is simple. Like the early line of research, a group of bilinguals and a group of monolinguals are compared. However, the bilingual group is defined according to various criteria as those who are equally proficient in both languages. To obtain the results, the two groups are simply equated on SES and a few other relevant variables. Usually, the bilinguals outperform the monolinguals (for recent reviews, see Cummins 1976, Diaz 1983).

What are the difficulties? For one thing, these studies are between-group comparisons, and one should always be concerned about whether the differences that are found are indeed because of the supposed treatment variable, which is bilingualism, or whether they are due to some other unsuspected factor that had not been controlled for. And since there are in fact a potentially infinite number of dimensions along which two groups can differ, if indeed a difference is found, it is not always possible to know exactly how to interpret it. If our work could be performed in the ideal experimental laboratory, we would randomly assign subjects to either a "bilingual" group or a "monolingual" group, but that is not the way bilingualism distributes itself in the real world.

A second concern is the problem of cause and effect. With a few exceptions, these studies observed children at only one point in time, rather than longitudinally. So, the inference on the direction of causality that was being drawn (i.e., that "bilingualism causes cognitive flexibility") was unsupported. It could just as easily be the other way around, that children who are more "cognitively flexible" become bilingual. Indeed, the results from the longitudinal studies that are available are ambiguous (see review by MacNab 1979).

A third concern is one of experimenter bias, a well-documented problem in behavioral research. Essentially, it is not too difficult for subjects in research studies to perceive the intentions and biases of the experimenter, and to act accordingly. Thus the experimenter, even unknowingly, can influence the results in his or her desired direction. This problem can be attenuated to a large degree by the use of a "blind" procedure, where the experimenter is kept ignorant of the group to which the subject belongs. Such has not been the case, apparently, in previous research.

These problems can all be overcome, or at least minimized. For one thing, the problem of comparability can be solved by looking within a group of

bilinguals who vary in their degree of bilingualism. The cause-effect problem can be illuminated by studying subjects longitudinally. And the experimenter bias problem is minimized if blind procedures are used in a within-group comparison.

Our study (funded by the National Institute of Education, in collaboration with Aida Comulada, New Haven Public Schools) conforms to these three characteristics. We are studying several cohorts of low SES Puerto Rican elementary school children, roughly 300 in all, in the bilingual program in New Haven, over a period of two to three years. We have measures of their Spanish and English vocabularies (validated against other language measures), and several indicators of cognitive ability, including the Raven's Progressive Matrices Test, and a test of judgment of grammaticality in their dominant language, Spanish. Children are repeatedly tested.

The results are still best considered preliminary (reported in Hakuta and Diaz, in press) since we are just completing the final year of data collection. However, they are encouraging. Using multivariate statistical analyses, we have shown that degree of bilingualism is positively related to performance on a variety of cognitive measures. For example, the correlation between our measure of degree of bilingualism and the Raven's test, controlling for extraneous variables, ranges between .20 and .40. Furthermore, there are preliminary indications (although anyone familiar with the problems of analyzing data should sense the warranted caution) that the direction of causality best supported is from bilingualism to cognitive ability.

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Author's Address: Department of Psychology, Yale University, Box 11A Yale Station
New Haven, CT 06520-7447.