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Neuropsychological substrates of success and failure in childhood second language learning

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NEUROPSYCHOLOGICAL SUBSTRATES OF SUCCESS AND FAILURE IN CHILDHOOD SECOND LANGUAGE LEARNING

by

Margaret Humes-Bartlo

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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Abstract

NEUROPSYCHOLOGICAL SUBSTRATES
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by

Margaret Humes-Bartlo

Adviser: Loraine K. Obler, Ph.D.

The basic premise of this study is that neuropsychological profiles may successfully differentiate between good and poor language learners. It is proposed that a cluster of cognitive and linguistic skills may be identified as being advantageous or disadvantageous to an individual in learning a second language.

The causes for variation in the ease with which children learn languages may correlate with individual differences in brain structure. These differences may be caused by anomalies or lags in the development process.

The model for the study draws upon the Geschwind/Galaburda theory of the association between individual differences in cognitive skills and individual variation in neuroanatomical structure. The study expands this model to investigate second language learning ability.

Those with low ability for second language learning may

exhibit subtle language deficits in L1, coupled with above average abilities in mathematical reasoning and visuo-spatial construction. Conversely, students with high ability for language learning may exhibit better L1 skills and less ability in visuo-spatial skills than the low ability group.

Thirty third to fifth grade English learners of average intelligence and L1 ability were grouped into Fast and Slow groups based on years required to reach criterion on the school proficiency test. A battery of neuropsychological and linguistic tasks was administered.

Fast English learners were significantly better than the Slow learners only on a verbal analogies test, and had a trend toward higher scores on the Spanish vocabulary test. The results of these tests indicate that Fast English learners have more highly developed first language skills than Slow L2 learners. The Slow learners' lower scores on L1 tasks suggest a language processing system adequate for L1 but overloaded by L2.

A discriminant analysis procedure correctly assigned 90% of Slow L2 learners based upon the subjects' scores on six variables. The results of this study provide a neuropsychological framework for the study of second language learning aptitude, and underline the existence of individual differences in human cognitive skills among average subjects. More specifically for the field of second language learning, this study indicates that

differences in ability may be based on factors which have not previously been widely considered.

This work is dedicated

to

Margaret Humes Collins

and

Camilla Walker Dill

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A special thanks is due to Steve Kaye for his statistical guidance, availability, and pep talks.

To Allen, my husband, my thanks for his unfailing love, support, patience, and energy.

"We have room for but one language here, and that is the English language, for we intend to see that the crucible turns people out as Americans and not as dwellers in a polyglot boarding house."

Theodore Roosevelt, 1919.

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CHAPTER I

Introduction

This study deals with the neuropsychological substrates of aptitude in second language learning and, in particular, with the variation in ability and in cognitive profiles seen in good and poor learners of a second language. This is an area of research which has not been widely considered. Previous research is sparsely spread over several different disciplines: linguistics, neurolinguistics, education, and neuropsychology. It is my intent to draw together these separate fields of inquiry to create the background for a study of the neuropsychological bases of aptitude in second language learning.

In the first chapter the discussion will center around the concept that both first and second language learning are skills in which there is wide variation. A review of the research in the field of second language learning ability provides information about the skills which have been found to be advantageous in second language learning.

Since first language skills contribute substantially to the ability to learn second languages, it follows that variation in first language skill will to some extent predict variation in second language skills. Data from language disordered children, and children with language

abilities that outstrip their other cognitive abilities provide evidence that first language skills vary in quality and degree. A discussion about children who have had difficulty in learning a second language will present previous research and possible models for etiology.

In the next chapter, evidence will be presented that individual differences in linguistic behavior may be based upon individual differences in neuropsychological profiles. A review of the literature on aphasia and brain trauma demonstrates that subunits of language processing are subserved by regions of the brain which are roughly identifiable. Pre-surgical studies of electrical stimulation of speech regions of the brain have provided further evidence for the localization of language processing areas to separate areas of the temporal lobe. Recent electrical stimulation studies of bilinguals by Ojemann and colleagues (1978) have revealed language regions which are surprisingly similar to the language regions mapped for monolinguals.

In Chapter III, evidence that neuropsychological differences among normals may be attributed to neuroanatomical differences in the cerebral cortex will be discussed. There are vast individual differences in the neuroanatomy and cytoarchitecture of the cerebral cortices, especially in the language areas. Studies of cerebral

angiography and cerebral blood flow have shown large individual differences, although general brain structure and neuroanatomical landmarks may be similar. While structural differences are not necessarily representative of functional differences, studies of the brains of dyslexics to date have all found a common structural difference in the language region of the brain, suggesting that in at least some cases the relationship exists (Galaburda, 1983).

Since neuropsychological differences may be caused by neuroanatomical differences, and neuropsychological differences may underlie linguistic behavior, it follows that certain neuroanatomical differences may predict certain variations in linguistic behavior. Chapter 4 discusses Geschwind and Galaburda's (1985) recent theory, which developed this premise in a neuroimmunoendocrinological framework. They suggest a "pathology of superiority" based upon their hypothesis of selected hypertrophy and hypotrophy of adjacent and homologous brain areas. According to their theory, language disordered individuals with this etiology might be expected to manifest above average skills in areas unrelated to language. Conversely, siblings and other family members may have exceptional language skills, or may have different types of language disorders. Furthermore, since the

hypothesized origin of the unusual developmental pattern is excessive amounts of testosterone, or a hypersensitivity to normal fetal testosterone levels, a disruption of the immune system may occur, causing disorders such as allergies and asthma. Many current studies have provided empirical support for the Geschwind/Galaburda hypothesis (Benbow, 1988; Benbow, 1986,; Searleman & Fugagli, 1987; Schachter, Ransil, & Geschwind, 1987). Several recent studies (Novoa, Fein, & Obler, 1988; Desmarais, 1986, Schneiderman & Desmarais, 1986) have studied the presence of Geschwind factors in connection with the ability to learn a second language. Currently, few neuro-psychologically oriented studies of individuals with poor second language ability have been carried out (Fraser, 1980; Humes-Bartlo, 1985; Ioup,1987; McPartland, 1985; Klein & Pierpont, 1986).

Chapter V deals with the rationale of predicting linguistic behavior from a neuropsychological/ neuroanatomical model. If variation in neuroanatomical structure is associated with variation in linguistic behavior, it may be possible to predict linguistic behavior from a neuropsychological model. Subunits of linguistic behavior have been demonstrated through studies of aphasia, head trauma, and other acquired neuropsychological disorders to be subserved by certain regions of the

temporal lobe. The Geschwind/Galaburda hypothesis predicts that if temporal lobe development is disrupted or delayed, an adjacent or homologous area of the cortex is likely to suffer hypertropy or hypotrophy as well. The parietal lobe is adjacent to the temporal lobe, and previous empirical evidence provides support for its choice as an area likely to be affected by the same abnormal developmental process.

Since there is a relationship between cognitive function and neuropsychological structure, the disruption of the development of this second affected cortical area is likely to be manifested in unusually good or poor performance in the cognitive skill subserved by that area. Therefore, the present study predicts a double dissociation of skills in language ability and in some cognitive skills subserved by the parietal lobe, namely arithmetic and visuo-spatial construction.

Chapter VI presents a description of the current study, research aims and hypotheses, and method and materiáls for the experiment. The main results of the study are presented in Chapter VII, and discussed in Chapter VIII. Cognitive profiles of the Fast and Slow Learner groups are discussed, as well as directions for future research.

CHAPTER II

Individual Differences may be manifested in linguistic and cognitive behavior

Language Ability

Language aptitude may be described as a skill or ability in the processing of language. The concept of language ability has been studied more extensively in the context of the second language than the first. It is assumed that all normal humans learn a first language, barring severe environmental deprivation (as in the case of Genie, reported by Curtiss, 1987). As Lenneberg (1967) pointed out in an argument for the presence of a biological substrate for language, even some mentally retarded children can learn a first language. This statement, which has been frequently repeated in the literature on language learning, neglects to take into account the degree to which people are able to master a first language. There is wide variation in the ability of children and adults to read, write, and express themselves orally in their native language. Children with developmental language disorders and some autistic children may develop very few language skills. Other language disabled children may develop language skills which are adequate for communication, but inadequate for cognitive and academic purposes. Even among children without language disabilities, there is wide

variation in language skills. Clearly, verbal skills are not equivalently distributed in the population.

The degree of skill attained in first language is not usually referred to in the same terms used for discussion of skill in second language. However, when one considers the individual variation in degree of capability in communicating, reading, writing, and comprehending complex discussions in the first language, applicability of some aspects of second language theory to first language learning may be possible. For instance, Cummins' conceptualization of the basic communication level of language proficiency developing later into a level of cognitive/academic proficiency (Cummins, 1979) seems applicable to the study of quality of first language knowledge as well as second language skills, although we are unused to discussing first language skills in terms of proficiency levels.

Howard Gardner in his recent book Frames of Mind (1983), considers the degree of first language ability to be an innate skill which he calls a type of intelligence. He discusses seven types of intelligence including verbal, visuo-spatial, and logico-mathematical. One may have exceptional "intelligence" in one of the seven areas, yet be average in the other realms which Gardner describes. The model holds that language skill is dissociable from

other skills on the basis of single case and neuropsychological studies.

In order to take the position that even among monolinguals there are skilled and unskilled language learners, we must demonstrate that language is a skill which is dissociable from other cognitive behaviors. Components of language processing such as phonology, syntax, semantics, and pragmatics are acquired at different rates in children, and during different developmental periods. Language skills may be lost while other cognitive skills are retained, in individuals who have suffered a cerebral-vascular accident, or a traumatic injury to the area of the brain which subserves language (McFie, 1975; Heilman & Valenstein,1985). Subunits of language processing, comprehension and reception may be preserved or lost, indicating that these are discrete and dissociable skills. Observation of loss or sparing of functions which tend to occur together are good evidence that the brain regions subserving these skills are close topographically, or have strong neuronal connections. However, the literature remains unclear as to how closely the child's brain resembles the adult's brain in structure and in function.

Language may also appear as a "splinter" skill, one which appears in the absence of any other cognitive

ability, indicating that it can be considered a dissociable function. Susan Curtiss (1987) takes the position that language can be considered a special talent in two children whom she studied, whose other cognitive skills are moderately or severely retarded. The children are able to use perfect syntax and vocabulary, although in one case the child's statements have no reference to the situation, and in the other case fluent speech and correct syntax are accompanied by an obvious lack of understanding of the meanings of the words used. The presence of language skills which are far beyond the level of other cognitive abilities observed in these children provides further evidence that language can be considered a cognitive function which is dissociable from other cognitive functions.

The literature on individual differences also contributes to the evidence that language is a discrete and variable cognitive function. Individual differences in the verbal abilities of average individuals have been observed by Perfetti (1983) and by Hunt (1975).

Perfetti found that children and adults with higher reading and comprehension levels had stronger basic verbal skills than groups of slower readers, and Hunt found that individuals who score highly on standardized verbal tests are especially sensitive to the order of written or oral verbal information. Individuals who have high language

ability may be extra sensitive to just those cues which are important in imparting linguistic nuances.

The degree to which the first linguistic system is mastered thus may be considered a skill or ability, although it is not generally conceived of in this manner. Not all children achieve the same degree of mastery over their first language. It is logical that it would be unlikely for a child who has difficulty in acquiring L1 to excel at the acquisition of L2. It is far more likely to be the case that those who learn their own language incompletely will have difficulty in acquiring a second language.

Ability in second language learning

The study of variation in the ability to learn a second language has traditionally focussed upon the psychological and motivational parameters associated with success in classroom learning. Research, test development and extensive testing were carried out by John Carroll and by Paul Pimsleur in the period from 1950-1970. Both Carroll's Modern Language Aptitude Test (MLAT) (Carroll & Sapon, 1959), and Pimsleur's Language Aptitude Battery (Pimsleur, 1966) are still widely used for predicting ability in second language learning (Wesche, 1981).

Carroll and Pimsleur both conceived of language aptitude as consisting of multiple components. The general

component categories, represented to different extents in the two aptitude batteries, are the ability to associate sounds with unfamiliar symbols; a skill for the learning of linguistic rules; the ability to store and retrieve verbal information which may or may not be meaningful; and the ability to infer language rules for linguistic material. The components identified by Carroll and Pimsleur seem to tap discrete skills necessary for second language learning. Investigating another area important in second language learning, R.C. Gardner (Gardner,1960; Gardner & Lambert, 1972) provided evidence that motivation and attitude account for some of the variance seen in second language learning aptitude.

The Carroll and Pimsleur Batteries are still widely used as aptitude batteries. A study conducted by the Canadian Public Service reported that predictions of second language success based on scores on the MLAT and the Language Aptitude Battery, and on a personal interview concerning motivational and learning style factors reached 85-90% accuracy (Wells,1976).

Some components of language aptitude appear to be relatively unchangeable through formal training. Studies by Pike (1959) and by Politzer & Weiss (1969) indicate that phonetic coding and grammatical sensitivity may be more dependent upon individual aptitude in these areas than upon

instruction, indicating either a biological substrate for some components of second language learning and acquisition, or else a set of cognitive styles predisposing the learner towards effective or less effective processes to be employed in second language acquisition.

Variation in the ability of individuals to learn a second language is a major problem in the field of second language research. The rate of failure to achieve criterion in foreign language courses has been estimated to be about 15% at the elementary school level (Dunkel & Pillet 1957) 12% at the college level (Pimsleur, 1964), and 11% at the adult level (Wells, 1976), and Pimsleur (1964) estimates that the true total is between 10-20% of students.

There are several factors to consider in identifying poor second language learners and understanding the reasons for their failure. Individuals who are poor students in general, or who have low overall intelligence may make poor second language learners, especially in a classroom situation (Fraser,1980). Students with motivational problems may also show little progress in acquiring a second language as R.C. Gardner's work has shown (1960,1972). A third group of students may have serious processing difficulties in the first language which cause them difficulty in acquiring a second language. A fourth

group of individuals, who are of at least average intelligence and who are average students otherwise, seem unable to learn a second language. This last group of student is the one I will focus on in this study, since there is no apparent reason for their failure.

One of the difficulties in comparing studies of good and poor learners in the language aptitude literature is that talent may be defined differently by different researchers. Factors of phonology, syntax, semantics, and complex verbal reasoning may receive differential attention depending upon the interests of the researcher. For the purposes of the current study, and investigation of a population of immigrant Spanish-speaking English learners in an urban environment, talent will be defined as speed of acquisition of the components of language necessary to achieve criterion on the school-administered proficiency test, the Language Assessment Battery (Please see Appendix A for further information on the LAB). The study is not intended as an endorsement of the criterion test used by the school system, but rather as an investigation into the cognitive and linguistic abilities of a group partially defined by the criterion of this proficiency test.

Speed of acquisition is not intended to represent the only measure of talent or lack thereof in second language learning, but for the purpose of this study it represents a

quantifiable one.

Other researchers have targeted poor second language learners for investigation. Pimsleur, et al. (1964) found that poor second language learners lacked skills in "receiving and processing information through the ear". Skutnabb-Kangas (1981) refers to a group of children in whom neither language is well-developed as "double semilinguals". Her viewpoint is that semilingualism reflects not a language deficiency in the individual, but that it is a result of the linguistic oppression experienced by minority language groups.

A study by Trites & Price (1976) studied 32 seven and eight year old children who were experiencing difficulties in French immersion programs in the Ottawa, Ontario area. The researchers were interested in discovering whether the immersion failures could be identified as a group distinct from immersion successes and from learning disabled children. The children were compared on a number of cognitive and linguistic tasks. The immersion failures performed generally at a level between the immersion successes and the learning disabled children, supporting the theory that they represent a group that falls between the learning disabled and immersion successes on a language skill continuum.

The two immersion groups were not distinguishable on

the basis of overall intelligence, although the failure group tended to have an above average Performance IQ coupled with an average Verbal IQ. The success group showed no discrepancy between the Verbal and Performance IQ's. Other group differences included higher performance by the immersion successes on academic achievement tests, auditory and visual memory tests, fine motor skills, and behavior adjustment ratings. The authors concluded that "some children of above average potential and normal ability for school progress in native language, experience difficulty or fail in immersion programs, due to a mild specific maturational lag." Cummins (1978) criticized the Trites & Price study on theoretical issues, methodological design, and use of statistics, which compromise the usefulness of the results, however.

A study by Diaz (1985) compared bilingual kindergarten and first grade children who were high or low English proficient during two test periods on a variety of cognitive tasks. He found that the high English group had significantly better scores on a verbal analogies task at both Time 1 and Time 2. In addition, score on the verbal analogies task predicted Time 2 proficiency for the low English group. Diaz concluded that there is a strong relationship between the degree of bilingualism and cognitive variability in early stages of proficiency, but

this relationship is weak in children of high proficiency.

Diaz's groups were not controlled for the number of years they were exposed to English. The range of home language situations for bilingual children is large, and there could easily be wide variation in years of English exposure within each proficiency group. For instance, one child with two years of exposure to English may have passed Diaz's proficiency test, while another child with the same amount of exposure to English remained Spanish dominant. Since Diaz did not control for years of exposure to English, information about the cognitive variability among his high and low proficiency groups may be obscured.

The results of these two studies, taken together with other information about poor second language learners presented here, suggests that those who have difficulty learning a second language may have a mild language deficit in the first language. The immersion failures in the Trites & Price study performed at a level between the immersion successes and the learning disabled, had a lower Verbal than Performance IQ, and scored lower on verbal tests. The low proficiency students in Diaz's study showed a persistently lower score on verbal analogies in the first language, even when other scores rose. It is my contention that these students suffer from a weak language processing system, which may not interfere to a great extent with

academic performance in L1, but is overloaded by the demands of a second language.

Some of these students are capable of learning a second language at the level of Cummins' (1979) "basic interpersonal communication skills" when they must, such as in the case of immigrant children who must learn the host country's language in order to survive. English-speaking children born in the United States have a choice, since bilingualism is not as highly valued as it is in other countries. Among the native English-speaking children who drop out of high school language courses, eschew the elective language courses in college, and avoid the language requirement in graduate school in favor of a computer language are a percentage for whom attitude and motivation are not a factor until after they have tried and failed. I propose that this group of poor language learners possesses a cognitive profile which happens to be disadvantageous to language learning, and that it applies to children as well as to adults.

CHAPTER III

Structural Differences in the Human Brain may be Related to Individual Differences in Cognition

In order to discuss the possibility that good and poor second language learners possess different neuropsychological profiles, some information concerning the representation of language functions in the brain is necessary. Since the study of aphasia has provided some of the most important insights into the localization of language and other higher cortical functions, a review of this material is in order.

Paul Broca's discovery (Broca, 1865) that the left hemisphere is the seat of language in the human brain was the beginning of an understanding that certain cognitive functions could be localized to circumscribed brain regions. Subsequent research has shown that different types of acquired language disorders, called aphasias, may result after damage to certain areas of the brain.

The area surrounding the Sylvian fissure, called the peri-Sylvian area, is the brain region most important to the comprehension, processing, and production of language. Damage to the frontal area of this region, near the boundary of the posterior frontal lobe and the anterior temporal lobe, causes an aphasia characterized by non-fluent "telegraphic" speech, normal language comprehension,

and impaired repetition. Damage to the posterior end of the peri-Sylvian area, in or near Wernicke's area (the left posterior superior temporal gyrus), is likely to cause an aphasia in which word fluency is normal, but content is severely impaired, as is language comprehension. Other types of aphasia result from damage by stroke or trauma to other areas of the peri-Sylvian region.

Initially, the majority of aphasia research was conducted with males, since the greatest number of brain injured patients resulted from battle-inflicted wounds. 90% of the population is right-handed, including soldiers, thus neurological patients providing information for neuropsychological research were overwhelmingly male and right-handed. It was assumed by researchers that there "was no reason to believe that findings obtained with female patients would differ in any significant way" (Gardner, 1974) from the information obtained from male patients. Likewise, it was assumed, with scant evidence, that the brain organization of the left-hander was a mirror image of the right-hander's brain. That is, is was held that since the language representation of the right-hander was contralateral to his or her writing hand, the left-hander's right hemisphere must be dominant for language processing.

It was not until the last two decades that

overwhelming evidence has indicated that only a small percentage of left-handers are right hemisphere dominant for language, and that women seem to have a more bilateral representation of language function than men. Studies of normal men and women (usually college students) indicated that cerebral representation of language in women cannot be assumed to be identical to that of men (Lake & Bryden, 1976). Similar studies of left-handers demonstrated more bilateral representation of language than in right-handers (Milner, Branch & Rasmussen, 1964). Thus, it is evident that there is variation among groups in neuropsychological patterns of cerebral lateralization for language.

Judging from the inconclusiveness of the wealth of research on the language lateralization of bilinguals, high variation in organization may be found within this group as well (See Albert & Obler, 1978; or Galloway, 1981 for an extensive review of lateralization in bilinguals). Various studies have suggested increased left hemisphere lateralization for L2 as compared with L1 (Gordon, 1980): decreased lateralization for L2 as compared with L1 (Obler, et al., 1975; Maitre, 1974); and right hemisphere lateralization for L2, but left lateralization for L1 (Wechsler, 1977). Several authors have suggested that both languages are lateralized equally in the left hemisphere (Walters & Zatorre, 1978; Soares & Grosjean, 1981).

The possibility of increasing lateralization of L2, dependent upon stage of learning and familiarity with L1, has been proposed by Gaziel, Obler and Albert, 1978. Schneiderman & Desmarais (1988), in the context of a neurolinguistic theory of second language learning which incorporates Chomsky's concept of a Universal Grammar (Chomsky, 1980), also suggest the participation of the right hemisphere, at least in talented learners.

The suggestion that there is an interaction between language lateralization, language-specific structures (e.g. right-to-left reading in Hebrew), and individual cognitive styles has been made by Obler (1981). A predisposition toward the use of some cognitive/linguistic styles in second language learning may be instrumental in the utilization and continued neuronal development of certain brain regions devoted to language.

Currently, interest in the research of individual differences in the brain has grown. Neuropsychological research had traditionally focused on the similarities between the abilities of human subjects, but recent neuropsychological and neuroanatomical research has suggested that an important key to variation in cognitive function may lie in the differences between individuals which may be observed in neuroanatomical studies. This section will focus upon the studies which have demonstrated

it may be that differences in neuropsychological function, and in particular, linguistic behavior, may be attributed to neuroanatomical organization.

Electrical stimulation studies (Penfield & Roberts, 1959; Ojemann, 1979; Rapport, Tan, & Whitaker, 1983) have demonstrated that although brain regions subserving language are roughly predictable on the basis of neuroanatomical landmarks, such as gyri and sulci, the extent and boundaries of these areas vary from person to person. The subjects in these studies were neurosurgical patients under local anaesthesia. The electrical stimulation of cells functions like a reversible brain lesion, which disrupts cortical functions temporarily. This permits researchers to construct a cortical map of higher functions which are affected by the stimulation of certain areas of the brain. Another method, called the Wada test (Wada, 1949) temporarily paralyzes one hemisphere after sodium amytal is injected into the carotid artery. If the inactivated hemisphere governs language, the patient becomes temporarily aphasic for the duration of this "reversible lesion".

Rapport, Tan & Whitaker's (1983) study of bilingual and polyglot neurosurgical patients provided information concerning the cortical mapping of language functions when there is more than one language system. In general, two

languages seem to be mapped in much the same way that one language is. In most of the subjects, Broca's and Wernicke's areas appeared to serve all languages mastered by the patient. Wada testing also indicated unquestionable left hemisphere language dominance in all but three subjects. Of nine subjects (all right-handed) three showed possible bilateral language representation; two of the three were women. Ojemann (1978) reported on two case studies of electrical stimulation of the temporal lobe in bilingual patients. Both patients demonstrated left temporal lobe lateralization for both languages.

The results of electrical stimulation studies indicate that the left temporal lobe of the human brain, allowing for individual differences, may be expected to govern both first and second language in many adult bilinguals.

Other reports of individual differences observed in human brains lead to the speculation that differences in structure may predict differences in function. Significant differences in the size of certain regions of the brain was reported by Geschwind and Levitsky (1968). The planum temporale, a section of the temporal lobe, was found to be larger on the left side of the brain far more often than on the right side of the brain. This study reported the first evidence that size of a brain region could be correlated with function in the human brain, since the left hemisphere

is known to be the seat of language in most people. A less common pattern was also noted, in which some individuals had a larger right planum temporale. A third group, smaller still, showed equally sized plana on left and right. In two later studies, the brains of two dyslexics revealed that both had the uncommon pattern of equally sized plana in the left and right hemispheres, (Galaburda & Kemper, 1979;Galaburda,1983). The authors hypothesized the unusual pattern of neuronal organization might in some way be related to the etiology of the dyslexia.

Cytoarchitectonic studies by Galaburda, Sanides, & Geschwind (1978) have revealed enormous individual variation in the size, number and arrangement of neurons. One such study found that Albert Einstein's brain contained far more than the usual number of cortical neurons (Diamond & Scheibel, 1985). Galaburda & Kemper (1979) found that the brain of a dyslexic man had abnormalities of neuronal growth, in addition to an anomalous pattern of lateralization, especially in the peri-Sylvian region. Further individual differences in neuroanatomy have been noted in the configuration of the cerebral arteries (so that blood flow to certain brain areas varies) (Whitaker & Selnes, 1979). Sanides (1962, cited in Whitaker & Selnes,1979) found that the gyri and sulci of the brain correspond fairly closely to microscopic areas of distinct

types of neurons. The findings suggest that areas of the brain committed to subserving specific functions may have different types and arrangements of neurons.

In summary, the human brain has been found to show many individual differences. Not only are there hypothesized differences in language lateralization between males and females, and between right and left handers, but variation occurs in the neuroanatomical structures and microstructures of the brain. Although traditional neurology tends to regard only gross malformations (such as agenesis of the corpus callosum) as neurologically important, minor deviations in development and migration of neurons may be associated with neurodevelopmental disorders such as dyslexia, which although negligible to the neurologist, may be devastating to the individual.

CHAPTER IV

Linguistic and Cognitive Differences may be due to Neuroanatomical Differences

The suggestion that neuropsychological differences between individuals may result from variation in brain structure is one which Geschwind and Galaburda have recently developed in some detail (1985). Their elegant theory draws together evidence from neurology, endocrinology, immunology, and neuropsychology, stating that the influence of testosterone during fetal life affects the development of the left and right hemispheres of the brain differentially. They hypothesize that a fetal sensitivity to testosterone, or an excessively high amount of the hormone, can cause retarded development in the language areas of the left hemisphere. Previous research with rats and monkeys has shown that intrauterine cortical lesions result in excessive growth of regions which are adjacent and/or homologous to the damaged region (Goldman, 1978; Goldman-Rakic & Rakic, 1984) A similar process is hypothesized in humans. In this case,testosterone is considered to be the factor which causes the "lesion", or abnormal development.

Neuropathology of learning disorders

In the areas of excessive delay, there may be disturbed cytoarchitecture and evidence of abnormal cell

migration patterns. As a result of the slowed development of the temporal lobe of the left hemisphere, affected people would be expected to demonstrate elevated right hemisphere skills, as well as elevated functioning of unrelated but adjacently served areas of the left hemisphere. In affected individuals, there would be wide variation between skills subserved by those areas of the brain. A dissociation would be seen between, for instance, language skills, and visuo-spatial skills.

In support of the theory, Gordon (1980) found that a group of childhood dyslexics all exhibited superior performance on "right hemisphere tasks", as did nearly all of the group's first-degree relatives.

Pathology of superiority

Geschwind & Galaburda (1985) also describe a "pathology of superiority", which suggests that some minor malformations of the brain may be associated with exceptional talent, rather than disability. This outcome would be the expected result of adjacent and homologous areas of the brain overdeveloping in response to the delayed growth in the language region of the left hemisphere. Furthermore, the theory could explain the existence of idiots-savants, who, though severely retarded in most areas of functioning, possess one skill at which they excel. As an example of such a case, Selfe (1977)

reported that Nadia, a severely disabled autistic girl, was nevertheless a talented artist at the age of 5. Other cases of idiots-savants abound in the literature. Obler and Fein's book, The Exceptional Brain: Neuropsychology of Talent and Special Abilities (1988), presents a collection of articles about individuals with exceptional talent in various areas, ranging from chess to second language learning. The book focuses on Geschwind and Galaburda's theory of the pathology of superiority, and many of the contributions reflect serious consideration of the idea in the light of the different talents reported.

Anomalous lateralization

The delay in left hemisphere development would lead to a shift to decreased left hemisphere language dominance, as well as to a higher likelihood of being left handed. The slowed development of the left hemisphere could cause heightened right hemisphere involvement in language and other cognitive functions. This type of language lateralization pattern would be considered anomalous, since the majority of the population is left-lateralized for language. Such unusual developmental patterns have already been found in the brains of dyslexics (Galaburda & Kemper, 1979) who as a group are reported to have a higher degree of left handedness than the general population, although this statement has been disputed (Satz & Soper,1986). By

the same neurodevelopmental process, it would be expected, according to the model, that there should be a higher incidence of left handedness in individuals with both superior and below average cognitive performance than in the general population.

Immune disorders

Testosterone levels influence many systems in the human body, including the immune system. Testosterone is hypothesized to play a role in the suppression of the thymus, an organ which is important in developing antigen-recognizing lymphocytes. Lymphocytes are largely responsible for cell-mediated immunity, thus a process which resulted in the decreased production of lymphocytes could conceivably result in heightened incidence of immune disorders.

Based on the evidence of the relationship between testosterone production and the thymus, Geschwind and Galaburda (1985) suggest a connection between disorders with immune system origins, such as allergies, asthma, and migraine. The hypothesis explains the fact that many immune disorders seem to be sex-related, affecting one sex more than the other, or are reported by left handers more often than right handers (Geschwind & Behan, 1982; Geschwind & Galaburda, 1985). A connection between talent, handedness, and immune disorders has been reported by

Benbow (1986) who found a high frequency of asthma and other allergies, left or mixed handedness and myopia among a group of highly mathematically talented high school students.

Gender differences

The influence of testosterone differs in its effect on the developing brains of males and females, as it does in other areas of development. This may explain gender related differences in cognition reported in the literature (McGlone, 1976) as well as the overwhelming majority of males seen in almost every type of language disorders, (e.g., dyslexia, stuttering, and autism).

SECOND LANGUAGE LEARNING

Application of the Geschwind/Galaburda hypothesis to ability in second language learning has already received some attention. In the only three known cases of exceptionally talented second language learners in which these factors have been studied (Novoa, Fein & Obler, 1988; Desmarais, 1986), all three suffered from allergies, and two had a history of familial sinistrality, and/or were left-handed themselves. A pilot study by Klein & Pierpont (1985) found that subjects at either end of the ability scale for second language learning were positive for Geschwind factors, and a poor second language learner reported by Humes-Bartlo (1985) had a positive

family history for left handedness, language disorders, allergies, and migraine, as well as superior talent in mathematics. However, the findings of these studies remain difficult to evaluate because of the small sample size and lack of control groups.

Handedness

No systematic studies of handedness in second language learners have been conducted, but it may be that those learners on either end of the continuum of success in second language acquisition are overrepresented by left handers. There is some evidence for this point of view in the data from a study of children having difficulty in a Canadian French immersion program. A higher proportion of left handed children was found in the target group than in all control groups except reading disabled children (Trites & Price, 1976). A pilot study by Fraser (1980) found that left handers comprised 35% of a group of college students who were experiencing difficulty in college L2 courses (Fraser, personal communication, 1986), a significantly greater proportion of left handers than in the general population (11.8% according to Coren and Porek, 1981).

Gender differences

Gender differences have been reported in L2 learners as well: women are more likely to be successful second language learners than men (Ekstrand,1980), and males may

be more likely to have exceptional difficulty with foreign language learning. In the study mentioned above of children having difficulty in a French immersion program, males outnumbered females by more than 2:1 (Trites & Price,1976).

Summary

The Geschwind/Galaburda hypothesis provides many fascinating avenues for new research. Their model extends the traditional neuropsychological model that cognitive patterns may predict dysfunctional areas of the brain. The suggestion that disturbed neuronal migration and development may be instrumental in such disorders as dyslexia deserves attention in the future research of that field. For the purposes of this paper, the hypothesis provides a plausible model for the vast variation seen in cognitive skills, and for disabilities seen in certain cognitive areas. The next section will discuss the rationale for using a neuropsychological model to predict linguistic behavior.

CHAPTER V

Differences in Linguistic Ability may be Predicted from a Neuropsychological Model

Neuroanatomical lesions are routinely "predicted" based upon an individual's performance on a variety of neuropsychological tests. This practice is frequently used on neurosurgery wards to aid in the diagnosis of neurological disorders. Neuropsychological tests are also used in the diagnosis of learning disability, a disorder in which a person of normal intelligence exhibits difficulty in learning in certain modalities.

Dysfunction or malfunction of certain brain regions may be hypothesized based upon the pattern of cognitive skills and deficits which emerges from the testing. Processing difficulties may be seen in cognitive functions which are subserved by adjacent brain regions. For example, individuals who suffer from an expressive aphasia as the result of a stroke are likely also to suffer weakness or paralysis of the contralateral arm and/or leg, because of the close proximity of the brain region which subserves expressive speech, and that controlling motor function of the limbs. The tendency for cognitive functions subserved by regions in close proximity to be similarly affected or spared may be observed in the case of milder deficits as well.

Conversely, given information about damage to certain brain regions, a clinician may hypothesize about those areas of cognitive function which would be likely to be affected. Given these uses of neuropsychological testing, using a neuropsychological model to predict cognitive performance is logical.

Proposed Substrates

The model introduced by Geschwind and Galaburda (1985) for the neuropathology of learning disorders is taken to be an appropriate one for the study of ability in second language learning. Variation in language abilities has been found in at least one case to be associated with variation in neuroanatomical structure of the language areas of the brain (Galaburda & Kemper, 1979) although further research would be necessary to strengthen this claim. Second language ability is presumed to use regions of the temporal lobe similar to those utilized by first language processes (Ojemann, 1978; Rapport, et al., 1983).

The model states that disordered development of the temporal lobe would likely cause overdevelopment in adjacent and homologous areas. Therefore one area that would logically be at risk of being affected by the same pathological process would be the neighboring parietal lobe. In order to conform with Geschwind & Galaburda's conceptualization of such a process, the adjacent brain

area must be distinct in function and in structure from the surrounding areas.

The parietal area referred to has a cytoarchitectonic structure distinct from the temporal lobe, and is known to neuroanatomists as area 39 (Brodmann, 1909). Area 39 is known as a higher level "association area", in which the impulses from the various sensory regions overlap, providing, for example, the ability to associate sounds with images (Carpenter, 1978). Other functions subserved by the left parietal lobe in general include numerical calculation, left-right orientation, and the ability to transform spoken language into written language (Gerstmann, 1940; Heilman & Valenstein, 1985). Eidelberg & Galaburda (1984) studied nine normal brains and reported volume asymmetries in the angular gyrus, an area of the parietal lobe with distinct cytoarchitecture. They also found a correlation of size aymmetries between the parietal area and other areas of the left hemisphere, and postulated that areas serving similar functions may be linked developmentally. Drake (1968) found abnormal neuronal migration patterns in the parietal lobe of a child with a severe reading disability, providing further evidence for the involvement of the parietal lobe in abnormal neuronal development.

Dissociation of Skills

If a pathological process such as that described by Geschwind and Galaburda (1985) were to occur, the affected individual would be expected to exhibit a dissociation between those skills subserved by the overdeveloped brain region, in comparison with the skills subserved by the underdeveloped brain region. Thus, one would expect good verbal memory and speech sound skills from the over developed temporal lobe, while poor skill in arithmetic, writing and left-right orientation might result from an underdeveloped parietal area.

Such a dissociation of skills can be noted in the cognitive profile of CJ, the talented language learner studied by Novoa, Fein & Obler (1988), who possessed an excellent verbal memory (he could reproduce lengthy strings of verbal material without the need for a semantic strategy). In contrast to his other cognitive abilities, CJ was a slow reader and his associative language skills were somewhat depressed. CJ's arithmetic skills were also rather low in comparison to his other scores, especially considering his phenomenal memory, and he claimed that his right-left orientation skills were below average.

The two talented second language learners studied by Desmarais (1986) also exhibited significant dissociation of cognitive skills. Both were found to have verbal memories

in the Superior range, while other verbal skills were High Average, except on tests of creative language, and visual-spatial skills were merely Average. While it is not rare for individuals to possess dissociations between cognitive areas, it is highly improbable that three individuals sharing such an unusual cognitive talent should have such similar patterns of cognitive strengths and weaknesses.

Other evidence that the development of the parietal lobe may be negatively correlated with certain areas of the temporal lobe in some groups may be seen in studies of children with learning disabilities. Rourke & Finlayson (1978) found that a group of children with good reading ability and poor arithmetic skills performed worse on a visuo-spatial measure than a group with good arithmetic and poor reading skills. On a verbal and auditory processing task, the relationship was reversed. The results suggest that for some groups of learning disabled children, a double dissociation between verbal and arithmetic/spatial skills may be present. This pattern is in accordance with the Geschwind hypothesis, which states that there will be a dissociation of ability between the affected region and adjacent and/or homologous areas. Mathematic skills may be subserved by both the right hemisphere (Dahmen,et al., 1982; Dimond & Beaumont,1972) and by the left parietal area (Benson, 1972; Boller & Grafman, 1983), depending upon type

of task.

Model for the Present Study

The hypothesis that neuropsychological profiles will differentiate between exceptional and average learners may be tested in a straightforward manner. The premise is that in some groups, due to unusual growth patterns of the brain, the relationship between areas of the left temporal lobe and areas of the left parietal lobe will be negatively correlated, and that these relationships will be manifested behaviorally by a dissociation between linguistic and arithmetic/visuo-spatial skills.

The present study will investigate the cognitive performance, on a variety of neuropsychological tasks, of children who are learning a second language, in order to test the hypothesis that success in second language learning may be predicted by strength or weakness in certain patterns of cognitive skills. It is proposed that these patterns of cognitive skills are linked to unusual cerebral organization, as well as to neuroanatomical and neurophysiological structures.

It is proposed that aptitude in second language learning as measured by speed of learning, should be associated with poor abilities in other skills, namely functions subserved by adjacent or homologous brain areas. Specifically, since ability in second language learning is

thought to require at least adequate if not unusual development of language areas, those with high second language learning aptitude are hypothesized to show high first language verbal ability coupled with low or unremarkable ability in visuo-spatial and arithmetic skills. Conversely, those with poor second language ability, as measured by a slow rate of L2 learning, and compared with peers of comparable age and general intelligence level, should exhibit subtle language deficits in first language skills, coupled with above average abilities in mathematical reasoning and visuo-spatial manipulation. In sum, it is predicted that neuropsychological factors will accurately discriminate between those with high L2 learning aptitude (Fast Learners) and those without (Slow Learners).

CHAPTER VI

Description of the Study

Research Aims

Previous models of second language learning have not suggested what the neuroanatomical substrates for the talent might be. The present neuropsychological model for talent and lack of talent in second language learning incorporates the current knowledge about individual differences in language with the theoretical model of Geschwind and Galaburda (1985) concerning individual variation in neuronal migration. The central hypothesis addressed by this study is:

There is an identifiable cluster of cognitive, familial, and developmental factors that will reliably predict success or lack of success in the acquisition of a second language.

If the primary hypothesis is confirmed, then it can be assumed that children may be divided into two groups, those who are likely to succeed in the acquisition of English without much difficulty, and those who are likely to need more individual attention in acquiring English.

If there is a discrete pattern (or set of patterns) of individual learning style that is disadvantageous to the successful acquisition of a second language, and if this factor involves, at least to some extent, the individual's

cognitive integrity and performance, then this pattern or profile should be identifiable by objective means. Based on this assumption, the following results are expected:

1) Because of the general integrity, and possible hypertrophy of certain temporal lobe regions, the Fast Learners may excel in skills measured by tests such as:

a.The Rapid Automatized Naming Test (RAN), since it is a measure of the automaticity of native language

b.Analogias (Analogies) (Woodcock Psychoeducational Battery); since it is a measure of the child's ability to make verbal analogies in the native language

c.Auditory Discrimination Test; since it is a measure of the child's ability to discriminate minimal differences in phoneme pairs in the native language

d. Paired Associates (Wechsler Memory Scale; adapted Spanish version) : since it is a measure of the child's ability to organize meaningful and non-meaningful verbal associations in memory.

e. Digit Span (WISC-R); since it is a measure of rote auditory memory.

2) Because of the functions of the adjacent parietal lobe, and the proposed relative lesser degree of development of that area, and of the homologous right temporal area, as compared with the development of the temporal lobe, ease in language learning may be tempered by a lack of facility, in

the skills measured by the following tests:

a) Arithmetic (WISC-R); since it is a measure of facility and speed of mental calculation.

b) Memory for Designs (Wechsler Memory Scale); since it is a measure of memory and reconstruction of abstract geometric shapes (functions probably subserved by the right hemisphere).

c) Block Design (WISC-R); since it is a measure of visuo-spatial organization and construction.

Conversely, the Slow Learners are expected to perform well on the Arithmetic, Block Design, and Memory for Designs tests, and to perform worse than the Fast Learners on the language tasks. Hence a double dissociation of skills is proposed between the two language groups.

If there is an association between the presence of certain neuroimmunoendocrinological factors and dissociation of cognitive skills, then this association should be apparent by correlation of the familial factors and the pattern of scores on certain tests, and by comparing the Fast Learners and the Slow Learners on these factors.

If the factor of familial sinistrality is associated with lack of success in second language acquisition, then among the poor learners, the group of left handers and those with familial sinistrality should be proportionally

larger than in the general population (i.e. larger than 35%). Geschwind & Galaburda's (1985) theory would predict that those with superior talent would also exhibit an increased rate of non-right handedness and familial sinistrality. In the present study, it is assumed that the number of slow learners will be greater than the number of fast learners, and that those children of exceptional talent will have attained criterion by the time of the first proficiency test administration, and thus not be available as subjects. The fast learners would then represent individuals on the high end of the moderate scale, and would not be expected to exhibit an unusual rate of left handedness. On the other hand, there is no reason to assume a decreased number of poor language learners, since they would continue to be eligible for bilingual instruction.

The present study will investigate the cognitive performance of children who are in the process of learning a second language on a variety of neuropsychological tasks, in order to test the hypothesis that success in second language learning may be predicted by ability or disability in certain patterns of cognitive skills that are linked to anomalous language dominance.

Hypotheses

1. There is a difference between those children who become

English proficient (as measured by reaching criterion on the school-administered proficiency test) in three years or less, and those who take longer to learn English. These differences may be seen in the children's performance on cognitive and language tasks.

2. Specifically, it is hypothesized that there will be a dissociation of certain skills. Those with good language aptitude will perform well on other language tasks, while exhibiting visual spatial skills that are not exceptional. The reverse will be seen in those who are slow L2 learners. In other words, there should be an inverse relationship between language talent and visual spatial skills, when effects of age and intelligence are partialled out.

3. The Fast Learners will exhibit stronger left lateralization of L2 than the slow learners, because they are hypothesized to have a higher functioning left temporal region. The most highly talented of the Fast learners, however, may exhibit less lateralization of language skills in concordance with the "pathology of superiority" model.

4. There will be a higher incidence of familial sinistrality in the slow group of learners.

5. There will be more males in the slow learning group.

6. There will be a higher incidence of Geschwind factors among the Slow L2 learning group.

METHOD

MATERIALS: Screening Battery (All children)

1. Raven's Coloured Progressive Matrices (RCPM-short form)- The RCPM is a visual reasoning task in which the child chooses from a multiple choice array the analogous or logical design which will complete a visual pattern. The RCPM has been used as a culture-free intelligence test (Sattler, 1982) . It has been chosen for this study over the Wechsler intelligence scales because of its reputation for being culture-fair, and because of the ease and speed of administration.

2. Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981). This test and the Spanish adaptation are receptive vocabulary tests which require the child to choose the picture of the object the experimenter has named from an array of four pictures. It provides a measure of the vocabulary which the child understands. The PPVT is administered in English.

3. Test de Vocabulario en Imagenes Peabody, Adaptacion Hispano Americana (TVIP) The TVIP was constructed as a parallel to the English PPVT-R. The tests are similar but the items are not identical. Nevertheless, the children were always be tested on the PPVT-R first to minimize transfer from the Spanish version.

Full Battery (subjects meeting criteria of average IQ,

average L1 vocabulary):

1. Language Tests

a.The Rapid Automatized Naming Test (RAN) (Denckla & Rudel,1976) was given in a non-standardized Spanish adaptation. The RAN is a timed task in which the child names a small set of repeatedly presented familiar items on a card. The task is a measure of the automaticity of naming vocabulary (Appendix B).

b.Analogias (Analogies) Woodcock Psychoeducational Battery (Woodcock,1977) The task requires the child to find a word which will complete an analogous set. For instance, " Mother is to father as sister is to _____?".

c.Auditory Discrimination Test. This Spanish word-pair discrimination test was constructed by the author. The child hears a series of word pairs, taped by a native Spanish speaker, and is required to state whether they are the same. An effort was made to represent many contrastive phonemic sounds which are present in Spanish, e.g."macho/nacho" (Appendix C).

2. Memory Tasks

a. Verbal memory-Paired Associates subtest from the Wechsler Memory Scale (Wechsler & Stone,1945), translated into Spanish by the author. The examiner presents a list of pairs of easy or hard words, such as "bat-ball" (easy) or "rose-cabbage" (hard), which the child must recall

(Appendix D).

b. Visual memory-Memory for Designs subtest from the Wechsler Memory Scale (Wechsler & Stone,1945): The child is presented with 4 designs, one at a time. The child is shown each design for 10 seconds, after which he or she is required to draw the design from memory.

c.Digit Span (EIWN-R) (Wechsler,1974)-requires the child to repeat increasingly longer strings of orally presented digit sequences. The task measures rote verbal memory, which is said to be important in the process of language learning and acquisition.

3. Tests expected to dissociate from language skills:

a. Arithmetic (WISC-R)-the WISC-R subtest measures the child's ability to perform simple arithmetic tasks presented orally. For the purposes of this study, the subjects were permitted to use paper and pencil to calculate answers; thus the extra load on verbal memory was reduced.

b. Block Design (WISC-R)-The child is required to reproduce a geometrical design with blocks. The task measures visual-spatial organization and construction.

4. Lateralization Measure

Tapping interference task: Index finger tapping rates for each hand separately were obtained (using a snap action switch connected to a counter) to gain a baseline rate of

tapping; and while the child simultaneously performed a language activity, (describing a picture in L1 and L2). Differential tapping interference between hands in the two languages has been reported to correlate with different stages of second language learning, and is hypothesized to indicate discrete involvement of the two hemispheres in first and second language processing (Sussman, et al.,1982). Order of administration was: Baseline measure dominant hand, baseline non-dominant, Spanish description dominant hand, Spanish description non-dominant hand, baseline right, baseline left, English description dominant hand, English description non-dominant hand.

5. Handedness:

1.Harris Test of Lateral Dominance (Harris,1974):Dots subtest. Each child was given twenty seconds to place as many dots as possible in rows of squares. The subtest was carried out with each hand and the number of dots made with each hand was tallied.

2. Pantomime subtest: the child was asked to show how he would perform ten tasks (e.g.hammer a nail, brush teeth) (adapted from Healey, Liederman, & Geschwind,1986). The child's responses were assigned 1 point for answering "always right", 2 points for "either", and 3 points for "always left". Thus, a score of 10 would indicate a strong right-hander, while a score of 30 would indicate a strong

left-hander (Appendix E). Additional handedness information was obtained by parental report on the home questionnaire (below).

6. Familial Information:

Geschwind-Galaburda Questionnaire (adapted Spanish version by the author): the questionnaire asks for information regarding familial patterns of handedness, language learning, and autoimmune disorders (sent home with child) (Appendices F and G).

SUBJECTS

All children new to the New York City school system who have recently arrived from a country speaking a language other than English must take an English proficiency exam at the beginning of the school year. The test is then repeated in May, and those who pass go on to an English classroom. The Language Assessment Battery (LAB) (New York City Board of Education, 1982) serves as a measure of proficiency in the second language (Please see Appendix A for further information on the LAB) (Abbott,1985; DeMauro,1985; O'Brien,1985). The before and after scores of the children for L2 on this test provided a criterion measure against which to study neuropsychological profiles.

Permission was obtained from the New York City Board of Education to conduct testing in the public schools (Appendix H). Requests for parental permission in both

Spanish (Appendix I) and English (Appendix J) were sent home with children who were attending bilingual classes and who had received scores below the school's 21st percentile cutoff on the Fall administration of the LAB. The parents of those children who permitted their children to participate also received a release of information form giving or denying the researcher permission to release information about the child's test scores to the school (Appendix K).

Spanish-dominant children were chosen for the study, because of the large population of Spanish speaking children in New York City, and because of the availability of materials in Spanish. Neuropsychological measures were administered between the fall and spring proficiency testing dates. All children were tested individually in Spanish.

Those children who received parental consent to participate in the study and who met the criteria of age between 7 years,0 months and 11 years, 6 months; and at least one LAB score on record, were screened for level of intellectual functioning, using Ravens Coloured Progressive Matrices (Raven, 1947). The Ravens has been described as a culture-fair intelligence test (Sattler, 1982), and was used in this study as a gross measure of overall intellectual ability. Those children scoring more than one

standard deviation below the mean received no further testing.

The Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn,1981) was then administered to the remaining children to ensure that the child's dominant language was not English and to provide a measure of English proficiency in addition to the LAB. The Test de Vocabulario en Imagenes Peabody (TVIP) (Dunn, et al., 1986), the Spanish version of the PPVT-R, was then administered, in order to ensure that the subjects were functioning normally in their first language. Children who received TVIP scores which are more than one standard deviation below the mean received no further testing.

Thus, the preliminary subject pool of children in bilingual classes passed through several stages of criteria for participation in the study:

1.The child had been tested at least once on the LAB test.
2.LAB score below the 21st percentile
3.Parental permission obtained
4.At least Average intellectual functioning, as measured by Ravens Coloured Progressive Matrices
5.The child's Peabody Picture Vocabulary Test score was not higher than his or her score on the Spanish Peabody.
6.At least Average functioning in L1 (Spanish), as measured receptively by the Test de Vocabulario en Imagenes Peabody.

Subjects

The subjects in this study were taken from three schools in Spanish-speaking areas of lower socio-economic status in the New York City public school system. From an initial subject pool of 80 children who obtained parental permission to participate in the study, 8 were disqualified due to non-cognitive reasons (e.g.scheduling, school change, absence). 72 children were screened using the Ravens Coloured Progressive Matrices to estimate the children's level of general intelligence. 15 children (21%) were disqualified because of a significantly less than average performance on the RCPM.

Fifty-seven children took the Spanish and English vocabulary tests (TVIP and PPVT). 1 child was disqualified because of English dominance. 10 children (or 17%) with significantly below average Spanish vocabulary scores were also disqualified. Thus, a total of 25 (35%) were disqualified due to low general intelligence level, or Ll language impairment with average intelligence.

Forty-six children were tested on the Full Battery described above. One child was disqualified due to absence on the day of the school-administered English proficiency test, and thus was unclassified.

Twenty girls and twenty-five boys remained (third graders=19, fourth graders= 16, fifth graders=10). The

subjects' ages ranged from 8 years 10 months to 11 years 8 months, with a mean age of 9 years 10 months for the entire subject group. The full battery of tests, described above, was administered to these forty-five children.

The final subject group of forty-five children were separated into Fast and Slow Learner groups on the basis of their success or lack thereof in passing the proficiency test in less than three years.

Three years was chosen as the cutoff date for two reasons. First, Cummins' (1980) review of length of residence and bilingual proficiency studies found that on the average, immigrant students needed five to seven years to approach grade norms in L2 proficiency. Since the LAB is designed to measure those proficiency skills necessary for success in an English-speaking instructional environment (Abbott, 1985), a similar length of time to reach cognitive and academic linguistic competency (Cummins,1980) may be postulated for the population described here.

Second, the LAB is structured in three year levels (K-2, 3-5, 6-8,9-12). The choice of third to fifth graders as subjects limits the final LAB criterion test to one level for all subjects, and ensures a higher number of eligible subjects. No child who had already passed the test was included in the study, since passes were transferred to monolingual classes, thus the subject group included only

children who had taken the LAB test at least once, and had not yet passed it.

Subjects were tested before the spring administration of the LAB test. The experimenter was therefore blind to any information about which children had passed the proficiency test until testing and data entry had been completed.

Demographic Data

The subjects were all residents of one of three primarily Spanish-speaking neighborhoods of New York City. Based upon the data returned by 78% of the subjects' parents, 60% of mothers were unemployed, and 51% had 6 or less years of formal education. No fathers were reported to be unemployed, but 53% of fathers were reported to be employed (i.e. unemployed fathers left the question blank). 89% of the fathers who responded had completed at least 7 years of school, and 6 of the 19 respondents to the "father's education" question had completed high school.

Of the 45 subjects, 10 were born in New York City, 20 in the Dominican Republic, 8 in Puerto Rico, and 4 in other countries (Ecuador, Guatemala, Mexico, Honduras). Of the 10 subjects born in New York City, all parents were born in the Dominican Republic, except one couple born in Puerto Rico.

CHAPTER VII

Results

Hypothesis 1: There is a difference between those children who become English proficient (as measured by reaching criterion on the school-administered proficiency test) in three years or less, and those who take longer to learn English. These differences may be seen in the children's performance on cognitive and language tasks.

T-test differences between the Fast and Slow English Learners were significant only on verbal analogies, on which the Fast Learners (X=16, sd=2.63) outperformed the Slow Learners (X=13.1, sd=3.48) (Table 1). In comparison with the standardized population norms, neither group is significantly above or below the mean, thus the difference is a subtle, yet statistically significant one. Fast Learners also had a slightly but not significantly higher score in the Spanish vocabulary test (Fast X=75.8, sd=13.53; Slow=69.1, sd=7.72; p=.091). The results on these language tests indicate that the fast English Learners have more highly developed first language skills than the Slow English Learners, as hypothesized. The Slow English learners' low, but not pathologically low scores in L1 tasks suggest a language processing system which is adequate for L1 but is overloaded by L2.

The Slow English Learners had higher scores than the

TABLE 1

T-Test Results: Slow and Fast groups

	$\bar{x}$ (sd)	$\bar{x}$ (sd)	t
Ravens	24.4 (4.427)	24.4 (4.16)	.03
PPVT	52.6 (20.47)	51.9 (19.98)	.09
TVIP	75.8 (13.53)	69.1 (7.72)	1.75
RAN	33.6 (14.27)	28.8 (18.09)	.73
Verbal Memory	9.5 (1.65)	9.1 (2.40)	.47
Analogies	16.0 (2.63)	13.1 (3.48)	2.32*
Block Design	19.5 (12.67)	21.95 (8.36)	-.64
Auditory Discr	8.7 (1.49)	8.3 (0.80)	.96
Arithmetic	10.5 (2.55)	10.95 (2.16)	-.51
Visual Memory	7.6 (2.37)	7.15 (2.85)	.25
Digits Forward	4.9 (0.99)	5.1 (1.25)	-.44
Digits Backward	4.5 (1.4)	4.35 (1.49)	.26
Harris Tapping(D)	56.1 (12.96)	54.05 (11.74)	.44
Harris Tapping	44.2 (12.28)	41.5 (10.95)	.61
Age (months)	114.3 (10.45)	116.95(10.32)	.52

* = $p<.01$, 1 tailed.

fast Learners on Block Design (21.95 vs. 19.5), Arithmetic (10.95 vs. 10.5) and on Digit Span (the rote verbal memory task) (5.1 vs.4.9), but these differences were not significant. It is possible that a larger subject sample would produce more robust findings in this direction.

The Slow group did not have the predicted higher score on the task measuring memory for visual designs. Since this skill is thought to be subserved by the right hemisphere, it was expected that the Slow learners would do well and the Fast learners would do poorly on this task, but the data do not support this assumption.

Thus, although significant differences were seen between the two groups only on Spanish verbal analogies, t-test results are in the expected direction on all tests but visual memory.

Hypothesis 2: A negative relationship between language talent and visual spatial skills was hypothesized. Good performance on first language tasks, and unexceptional visuo-spatial skills were predicted for those with good language aptitude. The reverse was expected in those who are Slow L2 Learners.

This hypothesis was supported by the data. Discriminant analysis was used to statistically distinguish between the fast English Learners and the Slow English Learners, and to predict the group into which unassigned

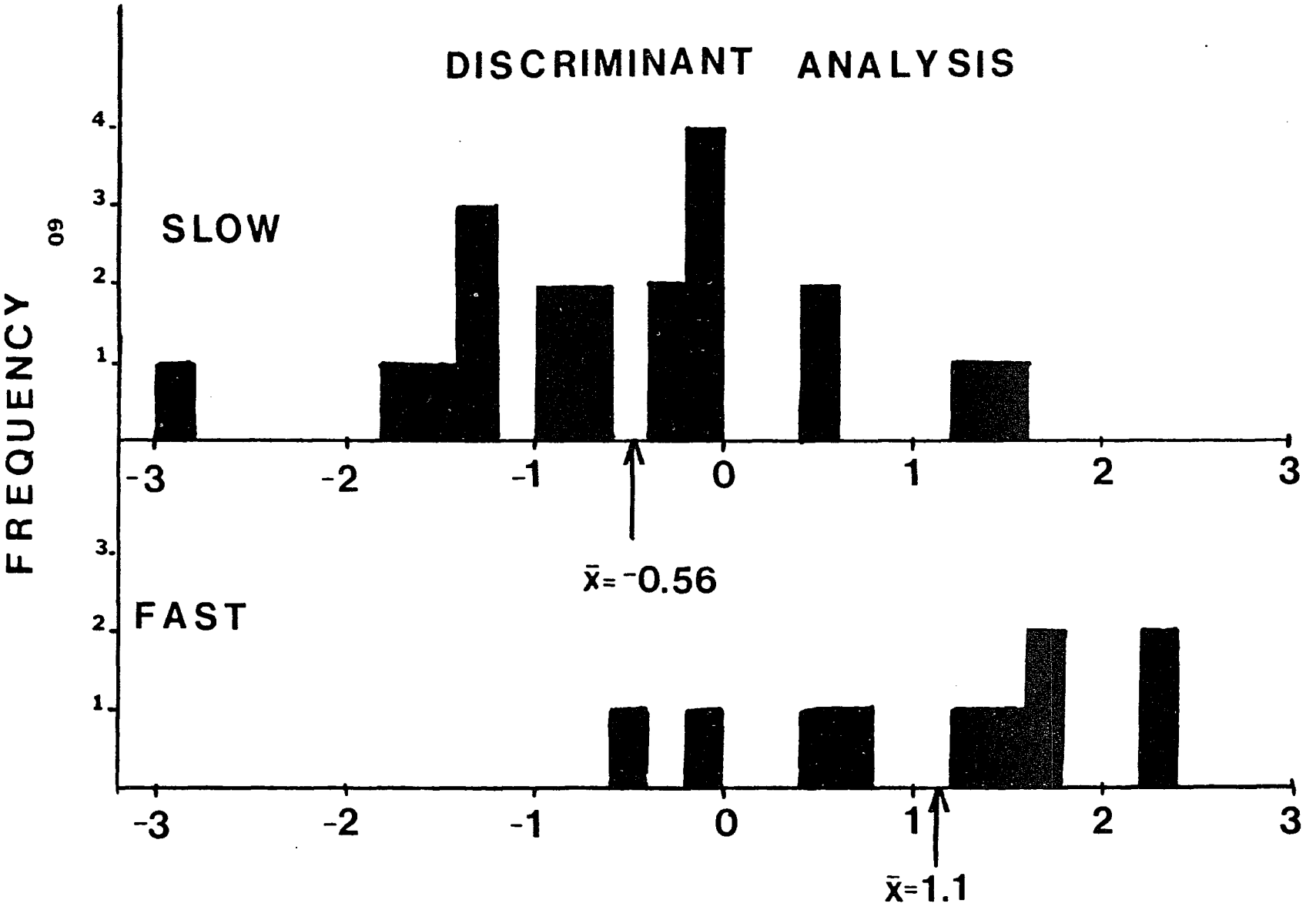

DISCRIMINANT ANALYSIS
FREQUENCY
SLOW
FAST
$\bar{x}$= -0.56
$\bar{x}$=1.1
-3
-2
-1
0
1
2
3
4
3
2
1

FIGURE 1

children would fall. The discriminant procedure weights and combines the scores of the variables on which the researcher believes the two groups are likely to differ (Nie, et al., 1975); in this case, on the cognitive variables outlined above. The method may be used both for the identification of the most highly discriminating variables in a battery and for classification of unknown groups.

One discriminant function was identified by the procedure (Figure 1). Each child was assigned a place on the discriminant function axis on the basis of the combination of test scores. Predictions were made about the group to which the child best belonged on the basis of a comparison with each group centroid (mean) (Table 3). Figure 1 graphically represents the Fast and Slow groups placed along the discriminant axis.

Six variables were identified as being significantly contributory to the discrimination of the Fast and Slow groups (See Table 4). The variables so identified were verbal analogies ($p=.0279$), arithmetic ($p<.0266$), auditory discrimination ($p<.0338$), block design ($p<.0380$), verbal associative memory ($p<.0380$), and English vocabulary ($p<.0480$). Using the children's test scores for these six variables, the discriminant procedure accurately predicted 83% of the 45 cases, including 90% of the Slow English

TABLE 2

Canonical Discriminant Function

Function	Eigenvalue	Canonical Correlation	Wilks' Lambda	D.F.	Significance
1	0.66701	0.63326	0.60	6	0.0467

TABLE 3

Group Centroids

Group 1 (Fast Learners)	1.11583
Group 2 (Slow Learners)	-0.55792

learners (Table 5).

The results are in agreement with the hypothesis. Verbal analogies, auditory discrimination, verbal associative memory and English vocabulary identified the

the Fast English Learners, while Block Design and Arithmetic scores more strongly identified Slow English group.

Hypothesis 3: It was predicted that the Fast Learners would exhibit stronger left lateralization of L2 than Slow Learners, as measured by the tapping interference task.

This hypothesis was not supported. No significant differences in the lateralization of L2 were found between the Fast and Slow English Learners on the tapping interference task (Table 6). In the Fast Learners, a mean percentage disruption (from baseline) rate of 16% was observed in dominant hand tapping rate while speaking English, while the Slow Learners exhibited a 17% disruption of tapping rate when speaking English ($p=.842$). Mean nondominant hand tapping disruption rates of 13% for the Fast Learners and 17% for the Slow Learners, while speaking English, were also observed. This difference was not statistically significant ($p=.231$).

Some interesting within-group differences were found. In Fast English Learners, tapping rate while speaking Spanish was disrupted significantly more when tapping with the dominant hand than while tapping with the nondominant hand ($p=.002$, 1 tailed) (Table 7). Fast Learners also showed trend toward more disruption of tapping of dominant hand while speaking Spanish than English ($p=.08$). Slow

TABLE 4

Significance Levels of Six Variables Identified by Discriminant Analysis

Step	Variable	Significance
1	Verbal Analogies	0.0279
2	Arithmetic	0.0266
3	Auditory Discrimination	0.0338
4	Block Design	0.0380
5	Associative Memory	0.0380
6	English Vocabulary(PPVT)	0.0480

TABLE 5

Accuracy of Discriminant Program in Predicting Group Membership

Actual Group	#Cases	Predicted Group Membership	
		Fast	Slow
Fast	10	7 (70%)	3 (30%)
Slow	20	2 (10%)	18 (90%)

TABLE 6

T-Test Comparison of Fast and Slow Groups' Mean Percent Change from Baseline on Tapping Interference Task

LANG	HAND	FAST $\bar{X}$	SD	SLOW $\bar{X}$	SD	T	SIG
Spanish	Dominant	25.4	18.2	18.7	12.1	1.05	.312
Spanish	NonDom	13.2	13.6	17.2	15.0	-0.73	.476
English	Dominant	16.4	8.6	17.1	11.9	-0.20	.842
English	Nondom	12.9	5.0	16.8	12.7	-1.23	.231

English Learners showed no significant differences in disruption rates across manual or language conditions (Table 8).

These results suggest that the Fast Learners are more highly lateralized for L1 than the Slow English Learners, as expected if the left hemisphere language region has experienced heightened neuronal development in comparison with the right hemisphere. A subgroup of highly talented learners with a lesser degree of language lateralization was not identified by the tapping interference task. However, one child in the Fast Learners group was identified as having scores on the tapping measure which were significantly different from her group mates. Her case will be discussed in more detail in Chapter VIII.

Hypothesis 4: There will be a higher incidence of left handedness and/or familial sinistrality in the Slow Learner group.

This hypothesis was not supported by the data. In the Slow English learning group, 5 children indicated familial sinistrality, while 7 indicated no history of left handedness in the immediate family (Table 9). In the Fast learning group, only one child was reported to be positive for family left handedness, while 5 children denied left handedness in the family. For the remaining 20 children, no information about familial sinistrality was provided.

TABLE 7

Paired T-Test of Percent Change from Baseline scores of Fast Group on Tapping Interference Task

LANG/HAND	MEAN % CHANGE	SD	SIG (1 tailed)
Span/Dom	25.4	13.6	0.0025**
Span/NDom	13.2	4.3	
Eng/Dom	16.4	8.6	0.08
Eng/NDom	12.9	5.0	0.05*

* p= .05

**p <.005

TABLE 8

Paired T-Test of Percent Change from Baseline scores of Slow Group on Tapping Interference Task

LANG/HAND	MEAN % CHANGE	SD	SIG (1 tailed)
Span/Dom	18.7	2.7	
Span/NDom	17.2	14.9	
			n.s
Eng/Dom	17.1	11.9	
Eng/NDom	16.8	2.7	

TABLE 9

Incidence of Familial Sinistrality
In Fast and Slow English Learners

	Fast	Slow	Total
FS+	1	5	6
FS-	5	12	18

x=.29 (df=1) with Yate's correction for continuity

n.s.

A chi square test, using Yate's correction for continuity because of the small N, was nonsignificant (x=.29).

Differences between the groups were not manifested for any of the factors such as allergies, migraine, or learning disabilities, associated with Geschwind's theory of unusual lateralization patterns. This may have been due to the rate of return of the questionnaires (77%) which reduced the possibility for robust differences.

Hypothesis 5: There will be more males in the Slow learning group.

This hypothesis was not supported by the data. (Table 10). In the Fast learning group, there were 4 males and 6 females. In the Slow group, there were 10 males and 10 females. A chi square value of .15 was not significant.

Summary

In summary, of the five hypotheses proposed for this study, two were supported by the data. On the basis of the scores on a battery of neuropsychological tests, Fast L2 Learners were correctly predicted 70% of the time, and Slow L2 learners were correctly assigned 90% of the time. The two groups showed the dissociation of cognitive skills hypothesized. The Fast Learners exhibited strengths in language and verbal memory related tasks, while the Slow Learners exhibited strengths in visuo-spatial tasks and mathematics.

TABLE 10

PROPORTION OF MALES TO FEMALES

IN FAST AND SLOW LEARNING GROUPS

	FAST	SLOW	TOTAL
MALE	4	10	14
FEMALE	6	10	16

$\chi^2 = .15$ (df=1) with Yate's correction for continuity

n.s.

TABLE 11

Comparison of Fast & Slow Groups with Population Norms

Test	Fast Group $\bar{x}$	Slow Group $\bar{x}$	Age $\bar{x}$	z
Ravens	24.4 (4.427)	24.4 (4.16)	28	-.67
PPVT	52.6 (20.47)	51.9 (19.98)	101.10	-3.23(F)
				-3.28(S)
TVIP	75.8 (13.53)	69.1 (7.72)	75.41	.037(F)
				-.594(S)
BD	9	10	9.9	-.430(F)
				.048(S)
Arith	10.5 (2.55)	10.95 (2.16)	10.2	-.444(F)
				-.074(S)
DigSpan	4.5 (1.4)	4.35 (1.49)	10.0	-.176(F)
				-.162(S)

(F)=Fast group z scores

(S)=Slow group z scores

BD=Block Design (scaled scores)

PPVT=Peabody Picture Vocabulary Test-Revised

TVIP=Test de Vocabulario en Imagenes Espanol

WISC-R subtests are scaled scores

CHAPTER VIII

Discussion

Cognitive Profiles

The main hypothesis of this study was supported by the data, that is, that there is variation in the ability of children to learn a second language, and that there are differences in the cognitive profiles of Fast second language learners and Slow second language learners. The data provide support for the concept of a group neuropsychological profile, with a double dissociation between language and visuo-spatial skills between the two groups.

Specifically, it appears that Fast language learners have a special facility for language, whether native or foreign. These children, because of a combination of verbal associative language skills, abstract verbal reasoning powers, and an ability to discriminate speech sounds, have a better basis on which to build a second language. The Slow language learners in contrast, exhibit average (or below average, in the case of those children excluded from the study) native language skills.

The presence of a significant difference between the performances of the Slow and Fast groups on the verbal analogies task suggests that the Fast learners are better

equipped to deal with language on a conceptual level. They are able to analyze a verbal problem and access the proper response, choosing between subtle nuances of meaning. Diaz (1985) found a similar difference between non-native English kindergarten and first graders who were High or Low English Proficient.

The cognitive tasks which tended to describe the Slow English learners were oral arithmetic and Block Design. Although the children in this group did not perform significantly better on these subtests than the Fast English learners did, the overall group means were higher, and these two tests were more instrumental in defining the Slow group in the discriminant analysis procedure. High scores on these tests suggest ability in visual organization and planning, as well as in concentration and sequential logical processes. The Slow English learners did not score higher than the Fast learners on any language test administered. However, it should be noted that, due in part to the selection criteria, the Slow English learners did not score significantly below the norm on any language test. Therefore, we cannot assume that the Slow group has a language impairment of any kind. A mild language weakness, which does not compromise L1, but is overloaded by L2 is hypothesized.

It is important to note that in comparing the two

subject groups with population means (Table 11), the data indicate that although the Fast learners have attained criterion on the LAB, and thus are no longer eligible for native-language academic instructive, their receptive English vocabulary is not significantly greater than the Slow English learners ($p=.09$), and both scores are significantly below age level in comparison with population norms. Scores in the Average range on the TVIP (Spanish vocabulary), on Ravens Coloured Progressive Matrices, and on WISC-R subtests Block Design, Arithmetic, and Digit Span indicate that low scores in the PPVT are probably due to paucity of English vocabulary. These data provide strong evidence for Cummins conceptualization of Basic Interpersonal Communicative Skills versus Cognitive/Academic Language Proficiency. Clearly, a 9 year old child with the English vocabulary of a 4 year old cannot be expected to succeed in an English-speaking classroom in which complex verbal reasoning in L2 is required.

As a word of caution to other researchers, it should be noted that children in English classrooms are not necessarily "bilingual" in the sense of possessing equivalent English and Spanish skills, and that subjects in Spanish-speaking classrooms should be controlled for IQ and language disorders, since difficulty in passing criterion

tests may be related to these factors (in this study, 21% of initial pool were below average IQ, and 17% of initial pool had presumed L1 language disorders).

Geschwind Factors

The hypothesis that a higher proportion of Geschwind factors would be found among the fastest and slowest learners was not supported. There is no doubt that this is partially due to the failure of children's parents to adequately comprehend and complete the questionnaires which requested information on Geschwind factors. Use of a written questionnaire is not recommended for use with this subject population. However, we will assume for argument's sake that, in fact, there was an extremely low incidence of Geschwind factors among the experimental population.

The pattern of cognitive variation observed in the current population was predicted partially on the basis of the hypothesis that the neurodevelopmental processes described by Geschwind and Galaburda were occurring. Given the negative findings with regard to the presence of Geschwind factors among the experimental group, how can the positive findings relating to the cognitive profiles of the two groups of English learners be explained?

Geschwind and Galaburda's hypothesis was (in part) intended to account for exceptional cognitive talents and disabilities present in the general population. Given the

small N of the current sample, it is unlikely that any of the individuals studied possess truly exceptional talent in language learning. For instance, a higher rate of left handedness might be found in a group of children with no previous English exposure who passed the proficiency test on the first try, as well as in the group of presumed language disordered children excluded from this study. The group described here is probably more representative of the general population in the range and variation of their cognitive profiles. However, the fact that the predicted dissociation of skills was observed in a group of children without exceptional talents suggests the presence of a Geschwind-type neurodevelopmental process in groups other than the cognitively gifted or disabled.

It is no surprise to any clinician that an individual may exhibit a wide range of variation of ability in different cognitive areas. Neuropsychological literature and clinical observation clearly support the presence of variation in cognitive skill in the general population. However, the results of this study suggest that individual variation in cognitive skills is systematic. Further validation of the cognitive profiles reported would be needed to study their use in prediction of language ability. Unfortunately, a majority of the children who were to comprise the validation group for this study were

no longer in attendance at the participating schools one year after the initial testing.

Normal prenatal hormone production may determine the extent of development that specific brain areas attain. The neurodevelopmental processes resulting in these variations may be similar to those which Geschwind and Galaburda (1985) describe, but the differences in the degree of development between discrete brain regions may be slight. Differential influences and resulting neurodevelopmental differences between the regions of the brain may be due to individual differences in the interaction between genetic, bioenviromental, and socioenvironmental factors.

Language Lateralization of Fast and Slow Learners

No difference was observed between the Fast and Slow learners on the verbal-manual interference task. The main findings from this task were that the Fast learners showed significantly more tapping decrement with the dominant hand than with the non-dominant hand while speaking either language, and greater decrement of dominant hand tapping while speaking Spanish than English. Thus, the Fast learners appear to be significantly more left lateralized for L1 than L2. The Slow English learners exhibit no significant differences in tapping decrement from baseline across all hand and language conditions. These results are

in accordance with the experimental model, which proposed that the fast learners possess left hemispheres that are uniquely developed for language functioning.

It is important to note that studies using tapping interference, dichotic listening, or tachistoscopic tasks do not provide conclusive evidence concerning language dominance patterns. Recently, Simon & Sussman (1987) have investigated some methodological and theoretical problems inherent in the dual task paradigm for identification of language dominance. They cite studies that raised the question of whether the task actually measures interference with the language dominant hemisphere processing of motoric output, or whether simple manual dominance issues are at stake.

A second part of the lateralization hypothesis stated above suggested that, based on the "pathology of superiority" theory (Geschwind & Galaburda, 1985), the most highly talented of the fast language learners might be expected to exhibit decreased language lateralization. One subject, whom we shall call "Rosa", was chosen from the group because of her extreme position on the discriminant function scale. Where the group centroid (mean) for the fast group is 1.11583, Rosa's score is 2.3508.

A note of caution is necessary regarding the use of individual tapping interference data, which is too variable

to generalizae to group function. The individual cases reported here are not intended to provide evidence of laterality, but suggestions for the direction of future research.

Rosa's tapping decrement from baseline (percent change) is significantly different from other fast English learners. Specifically, she exhibited significantly less change from baseline when speaking Spanish and tapping with the dominant hand than the mean. In contrast, she exhibited significantly more change from baseline than the fast group mean when tapping with her dominant hand and speaking English. When tapping with her non-dominant hand, Rosa showed less change from baseline than the group means, but this was not significant.

Rosa's data suggest that for her, L2 may actually be more strongly left lateralized than L1. Rosa's apparent left lateralization for L2 accords with the original hypothesis concerning greater lateralization of L2 in fast learners because of heightened left hemisphere development, but not with the studies of other talented learners, who exhibited decreased lateralization in L1 and L2. The two talented language learners studied by Desmarais (1986) exhibited possible bilateralized language skills on dichotic listening tasks.

Rosa is a strongly right-handed child with no left-

handed family members. The only notable factor in Rosa's family history is that her mother experiences especial difficulty in learning other languages. This evidence concurs with the theory that relatives of highly talented individuals may have disabilities in identical cognitive skills. Rosa, on the other hand, passed the proficiency test on her second attempt, during her first year in the U.S.A. Rosa's findings are consistent with previously studied talented learners except for the strong left lateralization of L2. Since talented child language learners have not yet been studied on lateralization tasks, it may be that a developmental process is occurring.

Given the finding that English may be left lateralized for Rosa, perhaps the idea proposed by Gaziel, Obler, & Albert (1981) of changing stages of lateralization based upon stage of learning is possible, although in this case Rosa might be expected to have decreasing left dominance for English with increased proficiency. An explanation for Rosa's pattern of tapping interference remains tenuous, but the possibility remains that she represents the small percentage of talented language learners with anomalous language dominance.

An outlier on the other end of the discriminant function scale is "Carlos", a member of the slow English learner group with a score of -2.8025, where the group

centroid is -0.55792. Carlos also had tapping decrement scores which were significantly different than the group means. When tapping with his dominant hand and speaking Spanish, Carlos exhibited significantly less change from baseline than group-mates. When tapping with his non-dominant hand and speaking English, Carlos exhibited significantly less change from baseline tapping than other group members. Carlos also exhibited less change from baseline than group-mates when tapping with his dominant hand and speaking English, and when tapping with his non-dominant hand and speaking Spanish, but these differences were not significant. Thus, Carlos, like Rosa, appears to be less highly lateralized for L1 than his group-mates. However, in contrast to Rosa's data, Carlos does not exhibit strong lateralization for L2 either. A fourth-grader, Carlos passed the proficiency test after taking it five times in four years.

The individual findings from these two group outliers suggest that they may be subtly different from their group-mates in terms of cerebral lateralization for language, and that they may represent the most and least talented in language learning. The finding that neither child shows strong lateral dominance for L1 is notable.

A finding of stronger than average left lateral dominance for L2 for Rosa, the more talented learner,

suggests that a greater degree of left hemisphere control over L2 may be advantageous for faster learning. Perhaps fast language learners are able to utilize left hemisphere learning strategies more effectively in language learning than slow learners, who may have similar cerebral language organization, but lack the linguistic awareness or the cognitive/linguistic flexibility to choose an effective learning strategy. The use by talented language learners of differential learning strategies based upon hemispheric style has been suggested by Schneiderman & Desmarais (1988).

Abstract Verbal Reasoning and Metalinguistic Awareness

In future research on the factors that correlate with the particular ease or difficulty experienced by an individual in learning a second language, higher level conceptual language will need to be more thoroughly evaluated. The experiment described here utilized an analogies task in which the child was required to supply an appropriate word for a missing item in two parallel relationships. For example, presented with the question, "mother is to father as grandmother is to...?", the child should answer, "Grandfather".

Children in the fast learning group tended to evaluate the relationship between the first pair, and to come up with a word which would approximate the same

relationship for other pair. Slow English learners, in contrast, appeared to lack an understanding that a particular relationship between the word pairs was required. For example, given the following item: "Mouth is to speak as eye is to _____?", one slow English learner replied,"Nose", treating the item as an associational task, as a younger child might do, rather than considering the functional relationships involved.

It would be interesting to investigate in future research the depth of the good learners' mastery over complex verbal relationships. This is of particular interest since C.J., the exceptionally talented learner studied by Novoa, Fein & Obler (1988), appeared to have some difficulty in abstracting verbal categories.

C.J. had a superior knowledge of vocabulary words, like the present study's good learners, and he understood subtle nuances of meaning. However, C.J.'s cognitive strength lay in the acquisition of new codes, rather than in the higher conceptual manipulation of verbal stimuli. Indeed, C.J. had a tendency to be idiosyncratically attentive to the form of language rather than meaning. For example, he said that work and play are alike because both "have four letters", missing the point of the abstract conceptual problem altogether.

It is difficult to reconcile the apparently

contradictory evidence presented by comparison of the cognitive profiles of C.J. and the present subject population. However, differences in methodology, test instruments, age of subjects, and degree of talent are undoubtedly important factors. If other adult good and poor learners are considered, the view becomes a bit less clouded.

In Ioup's (1987) study of college-aged language learners, Jeanne, an unsuccessful learner, was found to have difficulty learning new vocabulary, a rather poor verbal memory, and poor spelling skills. On the other hand, she was of average intelligence, scored in the average range on Ravens Progressive Matrices, and performed better than Ioup's successful learner on a visual completion task. This pattern of cognitive skills jibes neatly with the profile of the slow English learner group in the present study.

On the other end of the talent scale, Minh (Ioup 1987), AB and YZ (Desmarais,1987) and C.J. (Novoa, Fein & Obler,1988) all exhibited excellent vocabulary skills, superior verbal memory functions, and all did poorly on the Words In Sentences subtest of the MLAT. Fast learners in the present study also had good vocabulary and verbal memory skills.

Words In Sentences, a subtest of the Modern Language

Aptitude Test (Carroll & Sapon, 1959) that requires the subject to make grammatical analogies, has been considered to be a test of grammatical sensitivity (Carroll, 1981). The test might be considered a measure of metalinguistic awareness, since examinees must identify the analogous part of speech in the sentence provided, attending to the relationship the target word holds with the remaining words in the sentence. In a pre-test example, the sample sentence, "MONEY is his only object" must be compared with the underlined choices in the following sentence, "Not so many years ago, most farming was done by hand". Since "farming" performs the same function in sentence 2 as "money" does in sentence 1, "farming" is the correct choice.

Apart from the written presentation of Words In Sentences, and the provision of possible choices, the subtest appears to tap functions similar to those tapped in the Woodcock Analogies test, used in the present study, and the Stanford-Binet (1972) test of opposite analogies (The princess is beautiful, the monster is _____."), used by Diaz (1985). In both the fast learning group described above, and in the group of high English proficient children studied by Diaz, scores on verbal analogies were significantly higher than in the slow learning and low proficiency groups.

Other researchers, including Diaz, have noted the importance of a metalinguistic awareness of language in bilinguals. Cummins (1978, p. 127) describes this skill as the ability to "look at language rather than through it to the intended meaning". Studies by Ianco-Worrall (1972) and Ben-Zeev (1977) noted that bilingual children seem to be better equipped than monolinguals to see language objectively, to focus on the structure of language.

The poor performance of the talented learners reported by Novoa, Fein & Obler (1988), and by Desmarais (1986) on a metalinguistic task contrasts with the better performance by the Fast learner group on a similar task in the current study, and with the performance of the subjects reported by Ben-Zeev (1977) and Ianco-Worrall (1972). The variation in findings could be due to the age differences of the subject populations, but it is also possible that the Fast learner group described in this study, the high proficiency group described by Diaz (1985), and the bilinguals described by Ianco-Worrall (1972) may be placed on a language skill continuum between the talented learners and the slow learners. Those subjects excluded from the current study due to language disorder in L1 would fall to the left of the Slow learners on the continuum.

If this were the case, one could consider the paradoxically poor performance of the exceptionally

talented learners on metalinguistic awareness tasks as an result of the overdevelopment of that skill. They do indeed, as Cummins (1980) stated, look at language rather than through it to the intended meaning. While this ability may help the talented learners to acquire a new language rapidly, as a new code, the skill may actually become an obstacle to verbal problem solving behavior, in which form must be ignored and meaning is important.

We are left with the question of whether a sophisticated understanding of the relationships between words in a semantic context is a necessary skill for the talented or above average language learner. In immigrant school children, learning a second language within a school environment (but not necessarily in an exclusively formal manner), this skill appears to be advantageous for rapid L2 acquisition.

For adults, learning a foreign language without childhood background in other languages, a superior verbal memory, an interest in language, and the ability to retain new vocabulary appear to be the most important cognitive skills. Further research with larger subject populations of children and adults, and standardized batteries, will help to elucidate the relationship between specific language skills and talent in second language learning.

The study reported here has presented cognitive

profiles of fast and slow learners of English in a neuropsychological framework. However, the limitations of the experimental design confine these results to the specific population from which the subjects were drawn. The results may hold true only for a lower socioeconomic group of inner city Spanish-speaking children. Second, the nature of group scores is that individual differences are often obscured. The test results indicate variation in group cognitive skills that may not hold true for individual English learners. Finally, the cognitive profiles presented here for a group of 7-12 year olds may not be applicable to adult learners of English (or to learners of other languages). The processes of increased neuronal maturation, continued academic experience, and practice in the performance of various cognitive tasks may cause major differences in the experiences of adult versus child language learners.

TABLE 12

Within-Groups Correlation Matrix

POOLED WITHIN-GROUPS CORRELATION MATRIX

	RAVENS	PPVT	TVIP	TAPDOM	TAPNON	AUTONAME	MECHSMEM	ANALOGY	GD	GF	GS
RAVENS	1.00000										
PPVT	0.42016	1.00000									
TVIP	0.36067	0.25422	1.00000								
TAPDOM	0.24508	0.27119	0.21062	1.00000							
TAPNON	0.37919	0.25473	0.20650	0.83455	1.00000						
AUTONAME	0.05372	0.07622	0.25400	0.42948	0.51774	1.00000					
MECHSMEM	0.27664	0.10541	0.28468	0.35637	0.37930	0.42928	1.00000				
ANALOGY	0.21761	0.29341	0.49967	0.27775	0.30199	0.25927	-0.05153	1.00000			
GD	0.51576	0.36128	0.26155	0.17590	0.18441	0.19064	0.47779	0.29802	1.00000		
GF	0.26400	-0.00483	0.12412	0.21762	0.41382	0.15048	-0.12068	0.15809	-0.05006	1.00000	
GS	0.11764	0.05908	0.05257	0.13174	0.17936	0.36713	0.30702	0.27197	0.15761	0.22219	1.00000
AUDISCR	0.24352	-0.19748	0.59851	-0.02758	-0.04495	0.14511	0.15731	-0.14009	0.07018	0.05440	-0.00107
ARITH	0.49515	0.50756	0.40941	0.35567	0.41731	0.24670	0.11066	0.46812	0.13631	0.31242	0.15052
MAND	0.27495	0.03246	0.00753	-0.04114	0.15479	0.24500	-0.00518	0.19216	0.12492	0.52011	0.19541
MVISMEM	0.20593	0.53201	-0.02579	0.17527	0.16951	0.12922	0.34779	0.26092	0.50157	-0.07525	0.33095

	AUDISCR	ARITH	MAND	MVISMEM
AUDISCR	1.00000			
ARITH	0.02608	1.00000		
MAND	-0.03245	0.01671	1.00000	
MVISMEM	-0.19768	0.20795	0.12256	1.00000

CORRELATIONS WHICH CANNOT BE COMPUTED ARE PRINTED AS 99.0.

APPENDIX A

LANGUAGE ASSESSMENT BATTERY (LAB) - 1982

New York City Board of Education: Internal Memo

The Office of Testing in the Division of Curriculum and Instruction of the New York City Board of Education has developed a completely new edition of the Language Assessment Battery, LAB-1982. This was undertaken as a result of needs expressed by professional staff in the field who reported that the earlier edition, LAB-1976, not only had been overused but, also, was an inappropriate measuring instrument for required purposes. Both LAB-1982 and LAB-1976 were designed to comply with the Aspira Consent Decree which mandated the creation of an instrument to identify non-native speakers of English who lack sufficient proficiency in English to participate effectively in an English-speaking instructional environment and who are, therefore, eligible and entitled to a specific bilingual or English-as-a-Second-Language education program. The new edition, LAB-1982, however, is designed also to comply with other legal mandates, including the Lau guidelines. LAB-1982 continues to measure four content areas (speaking, listening, reading and writing) in both English and Spanish. The Spanish version, which is not a translation, was developed concurrently with the English and closely parallels it. It was designed to identify language dominance of Hispanic students whose English proficiency is limited. In each language, LAB-1982 provides for four levels (K-2, 3-5, 6-8, 9-12) and two parallel forms at each level. Results are reported as raw scores and grade percentiles. All subtests except speaking are group administered and items are in multiple-choice format.

It should be noted that while the content areas measured in LAB-1982 (listening, reading, writing, speaking) remain the same as in LAB-1976, there have been major changes in how the areas are measured as well as changes in test administration procedures. This resulted largely from the use of an integrative rather than a discrete point approach to the measurement of language proficiency. The latter takes language apart and measures its discrete individual segments whereas the former combines language segments into large units and measures the ability to make use of these larger language elements in the context of normal communication. As a result, all the items are new, none having been carried over from LAB-1976.

Content changes in the Listening Test at Levels I and II consisted of replacing picture vocabulary with pictorial items dependent upon sentence comprehension and at Levels II, III and IV of replacing minimal pairs with dictated questions and a listening cloze procedure. In the Reading Test, the traditional paragraph and question format was replaced by a reading cloze procedure. The Writing Test which continues to resemble a language usage test now contains constructions that follow curriculum.

Administrative changes are most extensive at Level I. In LAB-1982, kindergarten students now take only the combined Listening/Speaking test while grade 1 and 2 students take both the combined Listening/Speaking and combined

Reading/Writing tests. Also at Level I the listening, reading and writing items are presented in a format that permits small group administration in order to reduce teacher administration time. In the individualy administered Speaking Test, at all levels, a response is now scored separately for relevance and for grammar.

Pilot testing was conducted in the fall of 1981. The English version of the pilot test was administered to an English-proficient sample of students and to a limited-English-proficient sample of students who were non-native speakers of English and whose home languages included languages in addition to Spanish. The Spanish version was administered to a Spanish-proficient sample of students. Samples were selected to be representative of the populations of interest. In order to provide sufficient "floor" so that reliable measurement of the limited-proficient students would result, the test was designed to be very easy for English-proficient students and of average difficulty for the limited-English-proficient students.

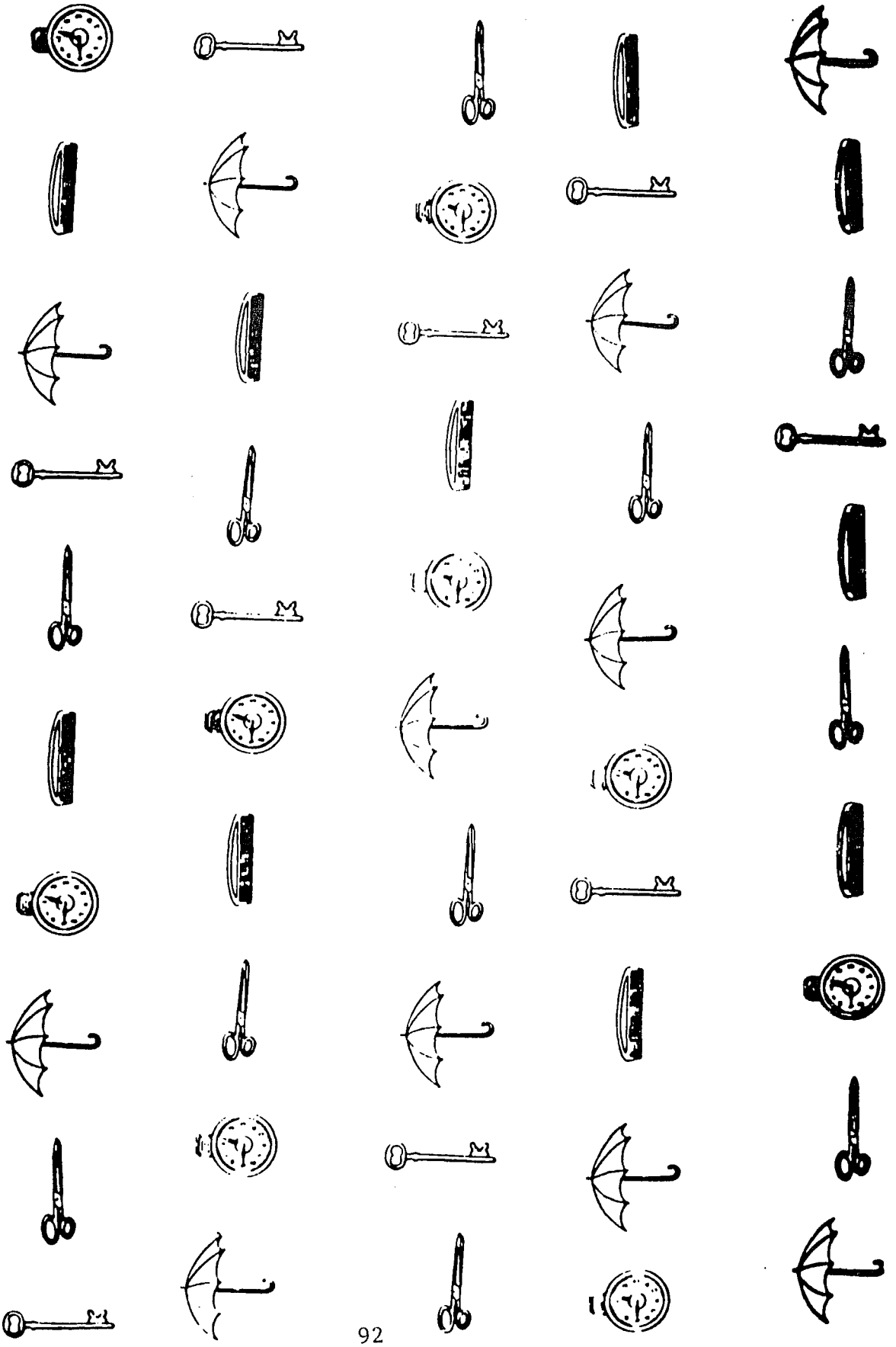
Final Forms A and B of LAB-1982 were based upon data from the pilot testing and have been administered to all pupils of limited-English-proficiency in the New York City Public Schools: Form A in Spring 1982 and 1984 and Form B in Spring 1983. For both Forms A and B, spring and fall grade norms have been developed for subtests and total test. At present, however, total test norms for grades 3-12 exclude Speaking. It is planned that norms will be developed for Speaking and Total Test including Speaking. The grade norms were generated for each of the groups mentioned above: English-proficient students on the English version, limited-English-proficient students on the English version, and Spanish-proficient students on the Spanish version. Scores for LAB-1982 are reported as raw scores and percentiles. Scale scores are in process of being developed.

In the New York City Public Schools System, LAB-1982 is used both for entry into and exit from bilingual and ESL programs. New entrants to the NYC school system whose home language is other than English are tested with the English version at the time of entry - usually fall. Any such student who scores at or below the court-mandated criterion score on the English-proficient norms is entitled to bilingual or ESL services. All students in ESL or bilingual programs are tested every spring. Any such student who, in the spring testing, scores above the court-mandated criterion score on the English test is no longer entitled to services and may move into general education classes.

Because Hispanics constitute about three-quarters of the non-native speakers of English in the New York schools, a parallel test was developed in Spanish. The results are used primarily for instructional purposes. There are very different instructional implications for a student who is a proficient reader in his or her own native language, but is a deficient reader in English compared with a student who cannot read well in either language. It is hoped that LAB-1982 versions in other languages may eventually be developed.

MMA:rt

APPENDIX B



APPENDIX C

AUDITORY DISCRIMINATION
(Humes-Bartlo, 1986)

ex. lo-le
ex.dar-par

1.macho-nacho
2.carta-tarta
3.nos-nos
4.beber-deber
5.si-se
6.lave-llave
7.caro-paro
8.lago-lago
9.falta-salta
10.como-coma
11.claro-claro
12.dia-guia

APPENDIX D

Paired Associates (Wechsler Memory Scale)
(trans. Humes-Bartlo,1986)

1.metal-hierro
2.nene-llora
3.moler-oscuro
4.norte-sur
5.escuela-bodega
6.rosa-flor
7.arriba-abajo
8.correr-onza
9.fruta-manzana
10.repollo-pluma

APPENDIX E

HANDEDNESS ITEMS

(Adapted from Healey, Liederman, & Geschwind, 1987)

1. Show me how you write.
2. Show me how you draw a picture.
3. Show me how you throw a ball.
4. Show me how you play tennis.
5. Show me how you cut with scissors.
6. Show me how you cut with a knife.
7. Show me how you hammer a nail.
8. Show me how you brush your teeth.
9. Show me how you snap your fingers.
10. Show me how you comb your hair.

APPENDIX F

GRADUATE CENTER OF THE CITY UNIVERSITY OF NEW YORK
FORMULARIO DE SALUD Y MANO DE PREFERENCIA

1. Nombre del niño_____Sexo_____

Fecha de nacimiento_____

2. Lugar de nacimiento_____Grado_____Años en E.U.A.___

3. El niño usa la mano derecho/a____izquierda_____ambos_____

4.Por favor llene la información sobre los hermanos del niño/a.

Nombre	Edad	Grado	escribe con la mano derecha surdo/a ambidextro	talentos especiales o dificultades

Historia de la familia: Las preguntas 4 al 14 se refieren a los padres naturales (biológicos) del niño/a. Si Ustedes no son los padres naturales, por favor llene esta sección lo mejor que puedan.

5. Fecha y lugar de nacimiento de la madre_____

6. Ocupación de la madre_____

7.Educación de la madre (marque nivel mas alto completado e indique idioma de la educación).

Educación	Idioma usado
a.___Doctorado o maestría:Matéria_____	_____
b.___completó universidad	_____
c.___universidad:algunas clases	_____
d.___completó colegio superior(bachillerato)	_____
e.___no completó colegio superior	_____
f.___completó escuela secondaria	_____
g.___no completó escuela secondaria	_____

8.Primer idioma que la madre aprendió_____
Segundo idioma aprendidò _____a los_____años.
Otros idiomas_____ Años en los E.U.A._____

9.Fecha y lugar de nacimiento del padre_____

10.Ocupación del padre_____

11.Educación del padre (marque nivel mas alto completado e indique idioma de educación).

Educación	Idioma usado
a.___Doctorado o maestría:Matéria_____	_____
b.___completó universidad	_____
c.___universidad:algunas clases	_____
d.___completó colegio superior(bachillerato)	_____
e.___no completó colegio superior	_____
f.___completó escuela secondaria	_____
g.___no completó escuela secondaria	_____

12. Primer idioma que el padre aprendió_____
Segundo idioma aprendido_____ a los_____años.
Otros idiomas_____ Años en los E.U.A._____

13. Padre escribe con la mano:
a.derecha_____
b.izquierda___
c.ambos_____

14.Madre escribe con la mano:
a.derecha_____
b.izquierda___
c. ambas_____

15. En el hogar, se habla: solo español____
español más que inglés___
inglés más que español___
solo inglés___

INFORMACIÓN MEDICA

16. Embarazo: Por favor marque todos los síntomas occuridos durante el embarazo con su hijo/a_____.

a.____incompatabilidad Rh
b.____naucias y vomito excesivo
c.____accidentes
d.____manchando o sangrando. Cual mes?____
e.____enfermedades infectuosas,influenza
f.____dolor de cabeza
g.____presion alta
h.____rayos-x
i.____toxemia
j.____sarampion
k.____esfuerzo fisico
l.____presiones emocionales
m.____problemas medicos no relacionados al embarazo
n.____medicamentos(prescripción, sin prescripción, vitaminas)

17. Parto:

a.____sin complicaciones
b.____operación cesaria
c.____niño/a nació pies primero
d.____ gemelos
e.peso del niño/a al nacer_____
f.___ el doctor usó pinzas
g.___cordón umbilical alrededor del cuello
h.____ictericia
i.____otras complicaciones
_____

18. Etapas de desarollo: Trate de recordar lo mejor que Ud. pueda, a que edad empezo su niño/a hacer lo siguiente?

a. caminar solo/a_____
b. usar solo palabras ____

c. hablar en frases _____
d. Empezó a hablar su primer idioma_____a los_____años
e. Empezó a hablar su segundo idioma_____a los_____años

19. Ha tenido su niño/a dificultad con lo siguiente?

a. hablar____
b. entender____
c. leer_____
d. recordar____
e. matematicas____
f. habilidad motórica (montar biclета)_____
g. dibujar/escribir_____

20. Cree Usted que su niño aprende nuevos idiomas:
mejor que otros niños____
ordinario-como otros_____
peor que otros niños_____

21. Cree Usted que su niño se divierte en el aprendizaje de nuevos idiomas mucho__, normal___, o no mucho__?

22. La madre del niño aprende otros idiomas facilmente___, con dificultad___, o normal__?

23. El padre del niño aprende otros idiomas facilmente__, con dificultad___, o normal__?

23. Sufre Usted o algun miembro de su familia de alérgias?

	Miembro de la familia
asma	_____
romadizo (hayfever)	_____
otra	_____

24. Ha sufrido su nino/a o algún miembro de familia de lo siguiente?

	Miembro de familia
inhabilidad severa con las matematicas	_____
dyslexia (problemas con la lectura)	_____
deletreo pobre	_____
problemas de dormir	_____
ataques (como epilepsia)	_____
dolores de cabeza severos	_____

jaquecas (dolor de cabeza severo que ocurre usualmente en un lado de la cabeza, precidida por un aura, y asociado con sensibilidad a la luz).

_____

25. Hay talentos especiales en su familia? Si hay, nombre el talento e indique cuales miembros de su familia los tiene.

(Por ejemplo, "Talento artistico: niño en el estudio, madre, y tio materno")._____

_____

_____

26. Hay alguna otra información sobre talentos, inhabilidades, uso de mano, alérgias y segundos idiomas que Usted quiera agregar, que el formulario no cubrió?_____

_____

APPENDIX G

GRADUATE CENTER OF THE CITY UNIVERSITY OF NEW YORK
HEALTH & HANDEDNESS QUESTIONNAIRE

1. Child's name_____Sex_____Birthdate_____

2. Birthplace_____Grade_____Years in U.S.A_____
(Country)

3. Handedness: Right___Left____Ambidextrous_____

4. Please fill in for the child's brothers and sisters.

Name	Age	Grade	Right or Left-handed ambidextrous	Special talents or difficulties

FAMILY INFORMATION Questions 5 through 15 refer to the child's natural (biological) parents. If you are not his natural parents, please fill in this section to the best of your knowledge.

5. Mother's birthdate_____Birthplace_____
(country)

6. Mother's occupation_____

7. Mother's education(check highest level completed and indicate language of education):

Education	Language
a.___Graduate training. Subject_____	_____
b.___Completed college	_____
c.___Some college	_____
d.___Completed high school	_____
e.___Some high school	_____
f.___Completed 9th grade	_____
g.___Completed less than 7th grade	_____

8. Mother's first language_____
Second language_____ at ____ years. Others_____.
Years in U.S.A._____

9. Father's birthdate_____Birthplace_____.
(country)

10. Father's occupation_____

11. Father's Education (check highest level completed and

indicate language of education):

Education	Language
a.___Graduate training. Subject_____	_____
b.___Completed college	_____
c.___Some college	_____
d.___Completed high school	_____
e.___Some high school	_____
f.___Completed 9th grade.	_____
g.___Completed less than 7th grade	_____

12. Father's first language_____
Second language_____ at ____ years. Others_____
Years in U.S.A._____

13. Father is:
a.___right-handed
b.___left-handed
c.___ambidextrous

14. Mother is:
a.___right-handed
b.___left-handed
c.___ambidextrous

15. At home do you speak : Only Spanish___
More Spanish than English___
(please mark one) Spanish and English equally___
More English than Spanish___
Only English____

MEDICAL INFORMATION

16. Pregnancy: Please check any of the following which occurred during the pregnancy with your child _____

a.___RH incompatibility
b.___excessive nausea and vomiting
c.___accidents
d.___spotting or bleeding.What month?____
e.___flu or infectious disease (which one?)_____
f.___headaches
g.___high blood pressure
h.___X-rays
i.___toxemia
j.___German measles
k.___physical strain
l.___emotional strain
m.___medical problems not related to pregnancy
n.___medications(prescription,non-prescription,vitamins)

17.Delivery:

a.___No complications
b.___Caesarean section
c.___Breech
d.___Multiple births
e.Birthweight_____
f.___Forceps used
g.___Cord around neck
h.___Jaundice
i.___Other complications:_____

18. Developmental milestones As closely as you can recall, at what age did your child begin to do the following?
a.Walk alone_____
b.Use single words_____

c.Speak in sentences_____
d.Learned first language _____at _____years/months
e.Learned second language_____at_____years/months

19. Has your child had difficulty with any of the following?

a.speaking_____ e.mathematics_____
b.understanding____ f.riding a bicycle_____
c.reading_____ g.drawing/writing_____
d.remembering_____

20. Do you think your child is a good__,average__, or poor__ language learner?

21. Do you think your child enjoys learning his second language a lot__, somewhat__, or not very much__?

22. Is the child's mother a good__,average__, or poor__ language learner?

23. Is the child's father a good__, average__, or poor__ language learner?

24. Do you or any of your family members suffer from any allergies?

	self	family member(which one?)
Asthma	_____	_____
Hayfever	_____	_____
other (list type)	_____	_____

25. Has your child or another family member suffered from any of the following?

	family member
stuttering	_____
severe math disability	_____
dyslexia	_____
very poor spelling	_____
sleep disorders	_____
seizures	_____
severe headaches	_____
Migraine headaches (severe headache usually occurring on one side of the head, preceded by an aura, and associated with sensitivity to light).	_____

26. Are there any special talents in your family? If so, name the talent and indicate which family members have them.

---

27. Are there any other points about talents, disabilities, handedness, allergies, and second languages which you feel the questionnaire did not cover?_____

APPENDIX H

New York City
Board of Education

110 Livingston Street
Brooklyn, New York 11201

Nathan Quinones
Chancellor

Louise Latty
Chief Executive for Instruction

Office of Educational Assessment
Richard Guttenberg
Director
(718) 596-4045

August 21, 1986

Ms. Margaret Humes-Bartlo
Storms Island
Hewitt, New Jersey 07421

Dear Ms. Humes-Bartlo:

I am happy to inform you that your proposal to investigate second language acquisition in a neurological framework has been approved by the Office of Educational Assessment with the following conditions.

1. Approval by this office does not guarantee access to any particular school or child. It is your responsibility to make appropriate contacts and get the required permissions and consents before initiating the study. Participation in your research must, of course, be strictly voluntary. The following written consents are required.

   a. Principals who agree to participate must sign the enclosed Research Application Form. In some districts, the superintendent must also sign. You should check with each principal to determine if the superintendent's signature is also required in that district. The signed form(s) should be returned to this office.

   b. Before involving any child in your study or collecting student data, you must obtain written parental consent.

   c. In addition to the above written consents, all participants (e.g., teachers, guidance counselors, children) must be informed that they are not required to participate in the study, and that there are no consequences for non-participation.

2. Your report of the study should not include the identification of any school, student, or staff member. A coding system should be used if necessary.

3. Please send a copy of your final report to this office; we are most interested in the results of your research.

Sincerely,

Richard Guttenberg

RICHARD GUTTENBERG
Director, O.E.A.

RG:mo
Enclosure

APPENDIX I

GRADUATE CENTER OF THE CITY UNIVERSITY OF NEW YORK

A los padres de:_____:

Nosotros estamos estudiando como aprenden los niños un segundo idióma. Nos interesa descubrir las habilidades, como la memória o la concentración, que ayudan a los niños aprender el Inglés o el Español.

Quisieramos darle a su hijo/hija varias pruebas que nos ayudarían entender como el/ella aprende usar el Inglés. Las pruebas consisten en mirar dibujos, juntar rompecabezas, y contar cuentos. La mayoría de los niños se divierten con los materiales y la atención personal, pero si su hijo/hija decide que prefiere descontinuar la sesión, se le permitirá irse sin restricción. La participación de su hijo en el estudio es voluntario. Abajo Usted puede dar o negar su permiso, marcando y devolviendo este papel.

Todos los niños en el estudio pasarán una prueba de una media hora de duración, y varios niños regresarán dentro de tres semanas, para una sesión adicional de 60 minutos más. No es posible saber antes, cuales niños regresarán para la segunda parte.

Los resultados de las pruebas pueden ayudar a los padres y a los maestros,ya que dan información sobre la manera en que el niño aprende. Los resultados de las pruebas se mantendrán confidenciales, y no seran disponibles a la escuela sin el permiso escrito de los padres. El nombre de su hijo/hija se mantendrá confidencial. Solamente la estudiante doctoral que conduce las pruebas lo sabra.

Si Usted da a su hijo/hija el permiso de participar en este estudio, por favor firme esta hoja, y devuelvala a la escuela con el/ella. Una lista corta de preguntas sobre la salud de la familia sera enviada para que Usted las conteste. Sus respuestas se mantendrán confidenciales, y serán leidas solamente por los miembros del grupo de investigación.

Si Usted tiene mas preguntas sobre el estudio, llame por favor a la Profesora Obler, al (212)-790-4586, o a la Señora Meg Humes-Bartlo al (201)-728-8764.

(Por favor marque si Usted da o no da permiso)
Yo doy mi permiso_____
Yo no no doy mi permiso_____
para que mi hijo/a tome parte en el estudio de la Profesora Obler. Entiendo que el nombre de mi hijo/a será en todo caso mantenido confidencial, y que los resultados de las pruebas serán interpretados solamente en el contexto del estudio, y que no serán disponibles a la escuela sin mi permiso escrito.
Nombre de padre o madre _____

Firma _____Fecha_____
Yo quiero____no quiero___que los resultados de mi hijo/a sean mandados al dirección_____

_____
Yo prefiero el cuestionario español____ inglés_____.

APPENDIX J

GRADUATE CENTER OF THE CITY UNIVERSITY OF NEW YORK

Dear Parents of _____:

We are studying how children learn English and Spanish. We are interested in cognitive skills such as memory which may help children to learn a second language.

We would like to give your child some tests which would help us to understand how he or she learns. The tests involve looking at pictures, answering questions, assembling puzzles, and telling stories. Participation in the study is voluntary. You can give or refuse your permission by marking and returning the bottom half of this paper.

All of the children in the study will take a half-hour test, and the some will return for an additional 60 minute session. It is not possible to tell beforehand which children will return for the 60 minute session. Most children enjoy the tests, but they are free to leave if at any time they do not want to continue.

The results of the tests could be helpful to the child's parents and teachers by helping them understand how he or she learns. The child's name will be kept confidential at all times. The results of the tests will be confidential, and will be released to the school only if the parents request this in writing.

If you give your permission for your child to participate in this study, by signing and returning this slip, a brief questionnaire will be sent home for you to fill out. Your answers will be kept confidential and will only be read by members of the research team.

If you have any further questions about the study, please call Professor Obler at 212-790-4586, or Ms. Meg Humes-Bartlo at 201-728-8764.

(please check one)
I give my permission_____
I do not give my permission_____
for my child,_____ to participate in the research study being conducted by Professor Obler. I understand that my child's name will at all times be kept confidential, that the results will be interpreted in the context of the study, and that no results will be released to the school without my prior written permission.

Name of parent_____

Signature_____ Date_____
I want___I do not want____ information concerning my child's results sent to me at _____

_____

I prefer the English____Spanish_ __questionnaire.

APPENDIX K

CITY UNIVERSITY OF NEW YORK
Department of Speech & Hearing Sciences

Estimados padres:

Muchas gracias por haber dado a su hijo o hija el permiso de participar en nuestro estudio sobre como los niños aprenden un segundo idioma. Si Usted quiere que la escuela reciba los resultos de las pruebas que hicimos, marque la linea al lado de la palabra "SI" abajo, y firme aqui_____

Yo quiero que la escuela recibe los resultos. SI____NO_____

Si Usted dijo que NO quiere que la escuela reciba los resultos, ¿quiere Usted recibirlos? SI____NO_____

Por favor, mande este papel, en el sobre proveido, a la escuela con su hijo o hija. ¡Muchas Gracias! Meg Humes-Bartlo

CITY UNIVERSITY OF NEW YORK
Department of Speech & Hearing Sciences

Estimados padres:

Muchas gracias por haber dado a su hijo o hija el permiso de participar en nuestro estudio sobre como los niños aprenden un segundo idioma. Si Usted quiere que la escuela reciba los resultos de las pruebas que hicimos, marque la linea al lado de la palabra "SI" abajo, y firme aqui_____

Yo quiero que la escuela recibe los resultos. SI____NO_____

Si Usted dijo que NO quiere que la escuela reciba los resultos, ¿quiere Usted recibirlos? SI____NO_____

Por favor, mande este papel, en el sobre proveido, a la escuela con su hijo o hija. ¡Muchas Gracias! Meg Humes-Bartlo

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