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The Relationship between Childhood Bilingualism and Intelligence: A Review of the Psychological Literature

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The effect of bilingualism on intelligence is regularly debated by teachers, parents, and other laymen on the editorial pages of the *Japan Times*. In one of the latest exchanges, May 5, 2004, opponents of second language learning inferred that "learning a second language interferes with the ability to communicate in one's native tongue," whereas supporters claimed that "students who learn a foreign language at an early age are better at problem-solving, more creative, and achieve greater intellectual flexibility" (McAuley).

Since the assessment of intelligence and IQ is the domain of psychiatrists and psychologists, one might reasonably assume that such practitioners could settle the controversy. However, a wide range of opinions also exist within the medical community, as interviews by Stella Yamazaki of three psychiatric specialists in a recent nine month period revealed. In August, 2003, Dr. Timothy Lang, clinical psychologist at the Mayo System's Austin Medical Center in Austin, Minnesota asserted that second language acquisition was accompanied by a significant and permanent drop in IQ. In children this phenomenon was often the reason for learning disabilities. In April of 2004 Dr. John E. Huxsahl, child and adolescent psychiatrist at St. Mary's Hospital, Rochester, Minnesota, also part of the Mayo system, said that there was no evidence that acquiring a second language lowered IQ, although there might be a slight, temporary drop when a young child was regularly spoken to in a mixture of two languages, as bilingual mothers sometimes do. Only one month earlier, in March of 2004, Dr. Rieko Shiba, pediatric psychiatrist at the Shiba Clinic in Musashisakai, Tokyo stated that the effect of bilingualism on IQ varied, depending on the individual. Most children showed no ill-effects, but those with already lower than average verbal IQ scores were likely to experience substantial, permanent loss of verbal IQ points and become substandard speakers of both languages. All three practitioners maintained that their positions

were supported by current medical literature, but none could provide references. Dr. Lang, however, did cite a question on the Minnesota State Board examination for psychologists, indicating that young children, moved suddenly from a Language 1 to Language 2 environment, suffered significant loss in learning ability.

Could the current psychological literature really be supporting three such divergent stands? Moreover, could bilingualism be the cause of learning and language disorders? Only an examination of the literature itself would answer these questions. A search was performed of two data bases, Medline and Psyc INFO, at the University of Minnesota's Biomedical Library, Diehl Hall, one of the most comprehensive collections of medical literature available to Mayo doctors. These data bases were checked for literature from 1985 to March Week 5 2004 using the descriptors "intelligence and multilingualism" and "language disorders and bilingualism." For purposes of this article, a further search was later conducted on-line of the psychological literature through July, 2004 via APA Psyc ARTICLES DIRECT (http://www.psycinfo.com).

The searches of Medline, Psyc INFO, and Psyc ARTICLES produced 54, 36, and 10 citations respectively, but fewer than two-thirds of these had relevance to the topic of this paper. Only one of the articles directly addressed the relationship between bilingualism and IQ. The majority of the usable items were studies of the performance of monolingual and bilingual groups on specific cognitive tasks. The limited number of studies on our topic is probably due to the complex nature of both bilingualism and intelligence.

This leads us to a definition of bilingualism. According to Centeno:

> In its narrowest sense, bilingualism refers to the alternate use of two languages by the same individual (Mackey, 1962; Weinreich, 1953). Yet given the different modalities in which language performance can be assessed (i.e., reading, listening, writing, and speaking), the different linguistic levels (i.e., vocabulary, sentence comprehension and production, etc.), and the different contexts of language use (i.e., formal vs. informal, with a bilingual or monolingual interlocutor, etc.), proficiency in each language has to be described along these three dimensions: language modality, linguistic level, and context. The degree of ability in the assessed areas will place performance in the first (L1) and the second language (L2) along a continuum

ranging from minimal to native or near-native proficiency.

Many current researchers use similar definitions of bilingualism, though wording may vary.

Classifying bilingual subjects is not a simple matter. Many researchers use the following system developed by Cummins, which categorizes according to ability:

a) proficient bilinguals, those with high levels of proficiency in the two languages,

b) partial bilinguals, those with a native-like level of proficiency in one language and a lower level in the other, and

c) limited bilinguals, those with low levels of competence in both languages.

Since there is no one standard for measuring proficiency, the method of categorizing subjects must be determined by each researcher.

Childhood bilinguality also takes different forms, according to Schiff-Myers:

a) infant bilingualism, in which a child hears both languages from early infancy

b) childhood bilingualism, and

c) school-aged, second language acquisition.

Other classifications of bilingualism also exist, such as compound and coordinate bilingualism (McLaughlin), but are not pertinent to this discussion.

Also, there is the matter of intelligence, which many people equate with IQ or Intelligence Quotient. An IQ is a subject's average on a battery of tests involving memory, reasoning, definitions, numerical ability, and recalling facts. A person's level of success on these tests may vary, however, depending on whether or not he is healthy, well-rested, and confident at the time of the test. Someone whose native language is not English is also likely to score lower on English-based tests measuring verbal skills. In addition, the home environment of a child, nurturing versus abusive, enriching versus culturally deprived, can raise or lower his IQ score. The more experiences a child has, the greater the chance that his score will increase. A bilingual with limited experience living in a new culture, on the other hand, is likely to be disadvantaged. Furthermore, IQ tests, which are primarily designed to predict success in school, fail to measure some essential components of intelligence, such as creativity. Add to this the fact that there is "no agreement in the literature as to just what intelligence is" (Haugen), and it becomes clear that these tests "provide an incomplete picture of the many factors involved in intelligence"(McKeachie).

Given the complexity of determining level of bilingualism and intelligence, it seems remarkable that for our 1985 to July 2004 search period among our Medline cites we found no articles reporting a negative effect of bilingualism on normal IQ. A few studies showed monolinguals and bilinguals to perform equally well on certain cognitive tasks, but the majority of articles suggested a bilingual advantage. Among the most recent and notable are the following:

1993 Hsieh in testing Chinese-American children, age 9-12, found not only overall mean IQ but also left-brain sequential abilities to be greater among bilinguals.

1993 Durgunoglu concluded that first language learning and experience can help children in the early stages of reading a second language.

2003 Kourmi-Nouri found positive effects on both the episodic memory and semantic memory of bilingual children, due to their integration or organization of the two languages.

But the most persuasive data supporting a bilingual cognitive advantage come from more than twenty-five years of research by Ellen Bialystok of York University. Her findings are summarized below.

1988 Children given metalinguistic problems to solve, which made demands on analysis or control, outperformed monolingual children, and fully bilingual children did better than partially bilingual children with tasks needing high levels of analysis of knowledge.

1997 Task assessment of three groups of 4 and 5-year-old children, monolingual English speakers, bilingual French-and-English speakers, and bilingual Chinese-and-English speakers, showed that bilinguals understand the general symbol representation of print better than monolinguals.

2000 Preschool children fluent in English and Hebrew were separately tested in each language-speaking environment for: a) their understanding that a printed word retained its meaning, even when moved to a new location, and b) their judgment about word length, irrespective of the size of the item named. Bilingual children outperformed monolinguals on both tasks and in both settings.

2001 *Bilingualism in Development: Language, Literacy, and Cognition*. New York:

Cambridge University Press, a monograph, offers theories to explain these research results.

But Bialystok's most impressive work to date has been "Bilingualism, Aging, and Cognitive Control: Evidence from the Simon Task," 2004. Citing numerous studies showing that bilingualism in children is associated with more effective controlled processing, which suggests that constant management of two competing languages enhances executive functions (Bialystok, 2001), she sought to discover if this advantage persisted in bilinguals through old age. She tested groups of bilingual, middle-aged, and elderly adults on the Simon task, which is based on stimulus response compatibility and assesses the extent to which the proponent association to irrelevant spatial information affects participants' response to task-relevant nonspatial information (Bialystok, 2004). In layman's terms, this means the subject was asked to ignore distracting, extraneous spatial information presented during the test and choose the correct response to a stimulus. The more interference the extraneous information caused, the longer the subject's response time. Four-year-old bilingual children had been shown to outperform monolinguals on this task in a study a year earlier (Martin and Bialystok, 2003). Consistent with this test, results showed adult bilinguals also performed faster and more accurately than age-matched monolinguals. While both adult monolinguals and adult bilinguals responded more accurately than their respective children's groups, adult bilinguals exhibited the highest accuracy rate of any group.

This is a landmark study for two reasons. First, it is the strongest evidence to date that at least one intellectual advantage of bilingualism (less disruption by interference) is lifelong. Second, it presents a plausible theory for the fact that bilinguals outperform monolinguals on some cognitive tests but not on others:

> In general, tasks showing a bilingual advantage are characterized by the presence of misleading (usually perceptual) information and the need to choose between competing response options; tasks based more heavily on analytic knowledge or detailed representations of knowledge presented without a misleading context are solved equally well by monolinguals and bilinguals. This difference corresponds to the difference between control and representational processes, respectively. The

functions contributing to control include selective attention to relevant aspects of a problem, inhibition of attention to misleading information, and switching between competing alternatives. The functions involved with representation include encoding problems in sufficient detail, accessing relevant knowledge, and making logical inferences about relational information. Research by Bialystok has shown that bilingual children develop control processes more readily than do monolingual children but that the two groups progress at the same rate in the development of representational processes (for reviews, see Bialystok, 1993, 2001).

Why would bilingualism enhance the development of children's control processes? Evidence from psycholinguistic studies of adult language processing shows that the two languages of a bilingual remain constantly active while processing is carried out in one of them (Brysbaert, 1998; Francis, 1999; Gollan & Kroll, 2001; Kroll & Dijkstra, 2002; Smith, 1997). The joint activity of the two systems requires a mechanism for keeping the languages separate so that fluent performance can be achieved without intrusions from the unwanted language. Green (1998) proposed a model based on inhibitory control in which the nonrelevant language is suppressed by the same executive functions used generally to control attention and inhibition. If this model is correct, then bilinguals have had massive practice in exercising inhibitory control, an experience that may then generalize across cognitive domains. If the boost given by childhood bilingualism is sufficiently strong, bilingualism may continue to influence certain control processes throughout the life span.

If the current literature we have thus far examined supports the idea of a bilingual advantage or is otherwise noncommittal, how could Drs. Lang and Shiba claim support for their stands? The answer might lie in earlier published research on bilingualism. It was about ninety years ago when the topic first attracted interest in America.

Although the majority of studies published over the past ninety years have been neutral or positive regarding the influence of bilingualism on IQ or intelligence, a spate of negative articles were published during the post World War I and II periods when public sentiment

against foreigners was high. For a detailed review of this literature the reader is encouraged to see Haugen (1953) and Iiams (1976). The most negative claims for each period are listed below.

Goddard (1917) used an interpreter and the Alfred Binet intelligence test in English to assess the intelligence of new Jewish immigrants in America. He found 25 of 30 adult immigrants to be "feeble-minded" because of limited vocabulary. Garretson (1929) maintained that low performance of immigrant populations on IQ tests was due to intellectual inferiority. Rigg (1928), Manuel & Wright (1929), Seidl (1937), and Smith (1939) concluded that bilingualism suppressed intellectual development. Manipulating two languages caused a child uncertainty, confusion, and mental fatigue.

Eichorn and Jones (1952) reported that "several recent studies support…the adverse effect of bilingualism upon attained IQ." To describe the second language disadvantage that limited bilinguals face, Haugen (1956) repeatedly used the popular term "retardation."

It should be noted that these studies have been discounted by modern researchers on several grounds. First, they did not control for differences in bilingual competence. Proficient, partial, and limited bilinguals were indiscriminately grouped together. Socioeconomic factors were also ignored. Many of the immigrants were poor and had minimal schooling. But an even more serious criticism is that researchers' use of educational performance-based tests to compare native monolinguals and immigrant bilinguals gave a great advantage to the linguistically and culturally native group. As Graham had already observed in 1926, "intelligence tests are performance tests embodying those skills which their makers regard as important for success in their own culture." Such tests might predict the performance of students in the country's school system but could not assess the intelligence of a nonnative population.

The first study recognized as controlling for bilingualism, socioeconomic factors, and language/ acculturation was conducted by Peal and Lambert in 1962. They used middle-class, Canadian-born children who were native speakers of both French and English. They found that the bilinguals performed better on both verbal and nonverbal IQ tests than monolinguals and that they excelled in tests requiring mental or symbolic flexibility and the rearrangement of visual patterns.

Research thereafter focused on native bilingual populations. Another similar study by Lambert and Tucker in 1972 was followed by Landry's two years later. He found that bilingual 6th graders significantly outperformed their monolingual peers "on a test of divergent thinking ability that measured such aspects of cognitive functioning as fluency, flexibility, and originality."

In the past twenty-five years research has shifted from the use of verbal tests of educational performance to nonverbal, cognitive tasks. Neuropsychologists, such as Franco Fabbro are adding to this knowledge through electrophysiological and neuroanatomical studies of the brain functions of bilingual aphasics. Data collection methods include stimulation of the brain cortex during surgery and functional magnetic resonance imaging. Attempts are now underway to integrate the findings of neurophysiologists and research psychologists to produce a unified theory on the functioning of the bilingual brain.

At this point in our discussion the literature strongly supports Dr. Huxsahl's view that bilingualism has no adverse effects on IQ. Then how could other practitioners, like Drs. Lang and Shiba, continue to believe that bilingualism can reduce IQ? The answer lies in the literature of abnormal psychology and the articles we retrieved through PsyINFO. All of these articles concerned language impairment (LI), sometimes also called special language impairment (SLI).

As Hakansson defines it, "the diagnostic term language impairment implies that development of language significantly lags behind development in all other areas, such as nonverbal intelligence and motor and socioemotional abilities." He goes on to say that "children who are not monolingual speakers are usually excluded from research on language impairment and tend to be viewed as confounding data. Because of this there is very limited knowledge of the relationship between language impairment and bilingualism."

The limited literature on bilinguals with LI is also due to the difficulty of studying this population. They comprise a much smaller group than normal bilingual children and are harder to manage. It can be difficult to assess the exact nature and degree of impairment in one subject, let alone to collect large, culturally and clinically homogeneous groups of one kind. This problem is compounded by the fact that most LI research is now taking place in small EU countries, such as Sweden and Italy, where foreigners speak a diverse group of languages.

In Sweden alone there are about 140 different mother tongues spoken by students in the public schools (Hakansson).

Out of necessity research has been done on very small groups without regard to socioeconomic status or level of bilingualism. In one British study bilingual children are "defined as those who were exposed to a language (or languages) other than English at home. They may or may not actually be bilingual" (Crutchley, 1997). Some studies test bilinguals only in the dominant language of the country. Others do not use monolingual controls. Some rely primarily upon interviews of parents and teachers for data. Many are simply a series of case studies. Furthermore, this "research tends to be carried out in isolation" (Crutchley, 1997) so that there is seldom verification of others' conclusions nor progression of knowledge in any area. As one author states, "Work with the bilingually language-impaired is often regarded as a marginal aspect to the more general work with language disability" (Duncan).

Since second language learning is a much more formidable task for children with intellectual handicaps, there are rarely claims in this literature of the intellectual advantages of bilingualism. In fact, many writers caution against compounding such children's learning problems by introducing a second language (Toppelberg).

According to Crutchley (1997) bilingual children with LI share a number of characteristics which make them different from their monolingual peers.

1. They have complex problems with syntax and morphology but usually not with phonology or articulation.
2. They perform "significantly worse than their 'monolingual matches' on most tests measuring semantic/ pragmatic competence."
3. They exhibit more emotional/ behavioral problems during tests.
4. Their problems show little improvement in response to therapy, possibly because they are more severe upon admission or because the tests used to measure their progress discriminate against bilingual children.

Based on the above information, it would be easy to conclude along with Crutchley that "bilingualism may act as an 'aggrevating factor' in specific language impairment."

Although these days bilingualism is less often cited in this literature as the direct cause

of language impairment, it is still regularly suspected. This suspicion is also fostered by many hospital systems. Franco Fabbro as Consulting Neurolinguist at the Scientific Institute "Eugenio Media" in Bosisio Parini (Lecco), Italy, lists as one regular duty of neuropsychiatrists "a neurolinguistic assessment to verify whether bilingualism was the cause or one of the causes responsible for SLI" (2000).

If one accepts the premise that language learning begins at birth, this literature also gives some support to Dr. Lang's assertion that the sudden movement of a child to a completely different language environment inhibits his learning. Salameh (2002) studying bilingual children with LI in Sweden found that:

> Maternal change of country within 1 y in relation to birth ($p<0.0001$) was a strong predictor for increasing severity in L1. Becoming a refugee and the simultaneity of acculturation and motherhood seem to be potent mental stressors. From a developmental perspective, potentially dysfunctional parents are a significant source of stress, which affects the child's development.

In conclusion, the psychological literature of the past 30 years dealing with normal children and bilingualism has increasingly reported intellectual advantages. The research carefully matches subjects' level of language proficiency and socioeconomic status. The predominant use of specific cognitive tasks rather than standard IQ tests prevents verbal or cultural factors from influencing the results. This research is supported by the work of many neuropsychologists. The literature of abnormal psychology continues to suspect bilingualism as a contributing factor in LI, learning disabilities, and developmental delay. The literature in this area is sparce and the research limited to small groups without controls. Yet, its findings have the support of many medical institutions and practitioners. The reader is left to draw his own conclusions.

There is one important area in which the two branches of study do agree, however. That is on the early referral and dual-language assessment of any bilingual child suspected of having LI, learning disorders, or developmental disabilities. Parents, teachers, and even some psychologists often mistake the early signs of these disorders as part of the normal bilingual acquisition process. Compared to monolingual children, bilinguals tend to be underreferred to psychiatric services at an early age and overreferred at a later age with much more severe

symptoms which are less responsive to treatment. Inaccurate assessments are also often made because children are tested only in the language of the country and not in their first or native language. Not surprisingly, there is high absenteeism among such children in treatment programs and nonparticipation by their parents. Most bilinguals drop out of therapy. Clearly, whenever possible, therapy should be offered in the family's mother tongue (Grupta, Pert, Salameh 2002b, 2003; Toppelberg, Crutchley 2000; Fabbro 2000).

Much more research on the relationship of intelligence and bilingualism remains to be done in both the fields of normal and abnormal psychology, and many prejudices still endure. If one accepts Fabbro's (2000) definition of a bilingual as one who knows more than one language or dialect, he is correct in asserting that "most of the world is bilingual." It is hoped that this paper has helped the reader, whether bilingual or not, to understand the importance and complexity of the relationship between bilingualism and intelligence, and that it encourages further investigation in this area.

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