

Subtractive Bilingualism and the Survival of the Inuit Language: Heritage- Versus Second-Language Education

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A longitudinal study examined the impact of early heritage- and second-language education on heritage- and second-language development among Inuit, White, and mixed-heritage (Inuit/White) children. Children in an arctic community were tested in English, French and Inuttitut at the beginning and end of each of the first 3 school years. Compared with Inuit in heritage language and mixed-heritage children in a second language, Inuit in second-language classes (English or French) showed poorer heritage language skills and poorer second-language acquisition. Conversely, Inuit children in Inuttitut classes showed heritage language skills equal to or better than mixed-heritage children and Whites educated in their heritage languages. Findings support claims that early instruction exclusively in a societally dominant language can lead to *subtractive bilingualism* among minority-language children, and that heritage language education may reduce this subtractive process.

The role of educational institutions in maintaining and enhancing minority languages has become a hotly debated issue in North America. Perhaps the most familiar example surrounds bilingual instruction for Spanish speakers in the United States (Ruiz, 1988). However, the issue extends to a wide variety of minority-language groups. The arguments of

many English-only advocates are guided by the view that the school's primary responsibility is to prepare children to function in the dominant society. However, an increasing number of minority-language groups are rejecting this assimilationist position, believing instead that the school should reflect and support the heritage cultures of the children it serves. The points in favor of this position include the maintenance of minority languages and cultures, improvement in school retention and academic success among minority children, inclusion of parents and the minority community in the educational process, and the need for schools to reflect broader societal values of diversity and multiculturalism. In fact, some groups are now demanding, in the strongest terms, that public education acknowledge and respond to their demands for greater inclusion of their heritage languages (see Cummins, 1989).

However, even when this demand is apparently being met and the children's heritage language is used in classroom instruction, the explicit intent of many programs is to use the children's heritage language primarily to ease the transition into the dominant language and culture (DeVillar, 1994; McLaughlin, 1985; Romaine, 1995; Ruiz, 1988). Heritage-language education is seen as a temporary "transitional" phase that assists the child's assimilation to the educational context and into the societally dominant language (usually English).¹ This emphasis on transition into the dominant

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¹ It should be noted that the term *dominant language* has also been used at the individual level to refer to the language in which an individual is most proficient (i.e., "Her dominant language is French"). In this article, we will use the term *dominant language* only at the societal level, to refer to the language or languages associated with power and prestige within the mainstream soci-

language and a focus on preparation for participation in the dominant culture, although well-intentioned, can lead to negative depictions of the child's heritage language and culture and threatens the child's linguistic heritage. There are serious potential cognitive and emotional risks for individual children that arise from this disapprobation of their ingroup (Cummins, 1989; Wright & Taylor, 1995) and from the loss of their heritage language. Forgotten in these discussions, however, are groups for whom replacement of their heritage language with the societally dominant language (English) also spells the end, the death, of the heritage language itself and by extension represents a serious threat to their cultural existence.

Prototypical of this case are indigenous groups. As the languages of Native American or Canadian First Nations children are replaced by English, these languages are irretrievably lost. This raises the stakes for the language debate in education. The issue is not only the impact of heritage language loss on the individual child, his or her family, and community, but on an entire people. For many indigenous groups, this issue is already decided. Most of the hundreds of languages spoken in pre-Columbus North America have been lost or now teeter on the brink of extinction (Foster, 1982; Priest, 1985). However, there do remain a few Native groups for whom the heritage language is both vibrant and functional. For these groups, formal education's role as an agent of linguistic conversion raises pressing concerns, with the future of their heritage language and culture hanging in the balance.

The Case of Inuit in Nunavik

The present research investigates the issue of language of instruction and heritage language development among children in one such group. Compared with most Native communities in North America, the intrusion of mainstream society has been very late in coming for the Inuit of Canada's Eastern Arctic. One of these isolated groups is the people of the vast area of Arctic Québec known to its inhabitants as *Nunavik*.² Their geographic isolation and the recency of direct intrusion of mainstream Canadian-U.S. culture accounts, in part, for the strength of traditional cultural values and the vibrancy of the language (Inuttitut) among the Inuit of this region. In fact, Inuttitut in Nunavik has been described by researchers as one of the few indigenous languages that has the potential for long-term survival (Foster, 1982; Priest, 1985).

Despite this optimistic profile, there is evidence of a growing intrusion of the dominant mainstream languages—

English and French—into the daily lives of the Inuit of Nunavik (Dorais, 1989; Taylor & Wright, 1990). In addition, the linguistic history of most other North American Native groups demonstrates the vulnerability of Inuttitut as English is increasingly used. Thus, maintaining the strength of the Inuttitut language has become a serious concern for the Inuit of Nunavik. It is not surprising that formal education has been recognized as pivotal to this goal.

The present research investigates language development of children in one of the larger communities in Nunavik through their first 3 years of formal education (kindergarten through grade 2). Using a series of measures of language ability and repeated test occasions, Inuit children receiving instruction almost entirely in Inuttitut are compared with Inuit children receiving instruction almost entirely in one of two societally dominant second languages (English or French). In addition, Inuit children's language ability is compared with that of a sample of mixed-heritage (Inuit-White) children whose first language is English and a sample of White Francophones.

This particular community provides a unique opportunity to construct a research design that addresses many of the criticisms of comparative field research. First, the size and geographic isolation of the community results in a homogeneity of social experiences (outside the classroom) among Inuit children that is impossible in research in most other field settings. Inuit children in the three programs are not distinguishable on the basis of socioeconomic status, neighborhood, or cultural history. Although exposure to mainstream Canadian-U.S. television (primarily English and some French) is considerable, there is relatively little variation in amount of exposure to TV across children in the three language programs (Taylor, Wright, Ruggiero, & Aitchison, 1992). Second, the heritage- and second-language programs are offered in the same school. Third, the linguistic outcomes of heritage-language instruction are compared with the outcomes of instruction in two distinct mainstream, dominant languages (English and French). This multiple comparison allows for increased confidence that differences between heritage language and dominant language education do not result from the unique historical or linguistic characteristics of one particular dominant language, usually English. Fourth, comparisons between the three groups of Inuit children are supplemented with comparisons with both mixed-heritage children and a sample of White children living in the same community. Fifth, multiple test occasions (a total of six test occasions over the 3 years) and multiple cohorts (children entering kindergarten in four successive years) removes potential confounds associated with specific teachers, classroom groups, or pedagogical and historical peculiarities that might arise from the use of a single measurement occasion or a single cohort.

ety. In most North American contexts, this is English. In the present context, this is both English and French.

At the individual level, we use the term *heritage language* to refer to the language that the child has acquired first, usually in the home or community. In the present case, the heritage language of all of the Inuit children included in the study is Inuttitut. Also, we use the term *second language* to refer to any language other than the individual's heritage language. Thus, *second language instruction* refers to instruction in a language other than the child's heritage language.

² Note that this area is not part of the newly formed Canadian territory of Nunavut. Although Inuit are also the majority population of Nunavut and there are some social and political connections between these two regions, the Inuit of Nunavik are governed by the province of Québec.

Subtractive Bilingualism

Most Inuit are keenly aware of the reality that proficiency in a mainstream language (English or French or both) is an important key to future opportunities and success even in Nunavik. However, for most Inuit the maintenance of their heritage language is a nonnegotiable necessity. The position that the goal of maintaining the heritage language is equivalent to the goal of learning a mainstream language is reflected in the self-proclaimed mandate of the local Inuit school board "to develop a curriculum that embraces and preserves native traditions, culture and language, and prepare students for active participation in the modern world" (Kativik School Board, 1985, p. 11).³ A central premise of this mandate is that fluency in a second language can and must be acquired without replacing heritage-language competencies. The failure of other Native groups to demonstrate this pattern of second-language acquisition focuses attention on the construct of "subtractive" (as compared with "additive") bilingualism (Lambert, 1977; Lambert & Taylor, 1983; Taylor, Meynard, & Rheault, 1977). In cases of true bilingual fluency (i.e., additive bilingualism), a second socially relevant language is added to the individual's linguistic repertoire. The inclusion of the second language does not reduce or disrupt, and may even enhance, proficiency in the heritage language (Genesee, 1987). This is the pattern shown by most majority-language children (i.e., Anglophone children in North America) who receive instruction in a second language (Lambert, Genesee, Holobow, & Chartrand, 1993). The pattern demonstrated by most Native people and many immigrant and minority-language groups is one in which the heritage language is gradually replaced by a more prestigious and powerful second language (Hakuta, 1987; McLaughlin, 1985). In young children, this subtractive form of bilingualism is demonstrated when increasing acquisition of the dominant language corresponds with a slowing or even reversing of development in their heritage language (Lambert & Taylor, 1983; Wong Fillmore, 1991).

The greater the difference in the social status, institutional dominance, and numerical superiority between the two languages, the greater the subtractive power of the dominant language. The case of English and indigenous languages such as Inuttitut in Arctic Québec may be the clearest example of this type of inequality between languages. Here, the subtractive power of English can be like a "steamroller" (Lambert & Taylor, 1991) that simply pushes the child's heritage language aside. In these cases, the subtractive process can be associated with considerable emotional, cognitive, and developmental risks (see Cummins, 1989; Skutnabb-Kangas, 1981; Wong Fillmore, 1991; Wright & Taylor, 1995). In addition, acquisition of and competence in a second language has been tied to heritage-language proficiency. Poor heritage-language development can adversely affect acquisition of the second language (Cummins, 1989; Lambert, 1983; Skutnabb-Kangas, 1981). Thus, a highly subtractive context encountered at a young age should not only slow the development of the child's heritage language but could also lead to difficulties in acquisition and mastery of a second language (Lambert & Taylor, 1983).

In response to the risks associated with the subtraction of heritage language, Cummins and Swain (1986) proposed a "threshold hypothesis" and a related principle of "first things first." The threshold hypothesis proposes that to avoid the subtractive effects of second-language instruction, the child must acquire and maintain a threshold level of proficiency in the heritage language. Following from this argument, the principle of "first things first" proposes that effort must be made to ensure that the heritage language is adequately developed before second-language acquisition becomes the focus. Recently, several authors have proposed that adequate development of the heritage language may need to include literacy skills as well as oral and aural skills, to avoid the subtractive bilingualism profile (Carlisle, 1994; Lambert, 1991; Swain et al., 1991).

School policies and practices in the first few years have been named as primary culprits in this subtractive language profile (Cummins, 1981, 1989; Hakuta, 1987; Wong Fillmore, 1991). The accusation is that placing minority-language children in a school where a high-prestige, socially powerful, dominant language such as English is the exclusive language of instruction sets these children on a path toward subtractive bilingualism (Cummins, 1989; Lambert & Taylor, 1991). Thus, the first intention of the present research was to determine whether exclusive instruction in a dominant language would result in a subtractive bilingualism pattern and conversely whether instruction exclusively in the heritage language would attenuate or prevent this negative effect on children's heritage-language development.

Conversational and Academic Language Proficiency

In considering the subtractive process from the perspective of the threshold hypothesis, conceiving "language proficiency" as a unitary construct may be far too restrictive. This is made especially apparent by Swain's (Swain et al., 1991) findings concerning the importance of the literacy-oral distinction. At a minimum, it would appear that there is a need to distinguish between the language competencies necessary for communication in informal everyday conversations and those needed to participate in formal communications involving abstract and cognitively complex language. Bruner (1975), Cummins (1981), Donaldson (1978), Johnson (1991), McLaughlin (1985), Olson (1977), Snow and her colleagues (Davidson, Kline, & Snow, 1986; Snow, Cancino, DeTemple, & Schley, 1991), and others have argued that the context-embedded communications of day-to-day interactions make fundamentally different demands than do discussions of abstract ideas, reading a difficult text, or

³ A landmark agreement with the Canadian government in 1975 (the James Bay Agreement) gave the Inuit of Nunavik considerable economic, cultural, and educational autonomy. Over the following decade, an independent school board was created (the Kativik School Board), which has a very strong Inuit presence in the administration and makes a real effort to have Inuit culture reflected in the educational process. Its annual report of 1985 represented a significant document for this newly formed institution. The mandate (described in that report) remains the active statement of the school board's position and objectives.

preparing an essay. This distinction is also consistent with Vygotsky's developmental differentiation between language used for social communication and that used as a medium for organizing thought and ordering the components of an abstract and decontextualized symbol system (Vygotsky, 1934/1962).

A number of terms and models have been proposed to describe this general distinction, and there is debate about whether there are truly distinguishable forms of language proficiency (see McLaughlin, 1985). The "two forms of language proficiency" might be more appropriately understood as the ends of a continuum or perhaps two separate continua (or even three or more distinct continua, see Biber, 1986). Thus, any brief discussion of this distinction will certainly obscure the underlying complexity. Also, we recognize that any labels we choose to represent these different forms or levels of language proficiency will necessarily provide an imperfect representation of them. Nevertheless, we have settled on the terms used by Cummins (1989): *conversational* and *academic* proficiency. However, we should clarify that although the term *academic* may imply as much, academic proficiency is not limited to school-based skills and knowledge. Also, the term is not meant to imply that speakers of a given language cannot achieve high levels of academic proficiency without attending "school." In fact, we would predict that many Inuit elders who have never set foot in a "school" would demonstrate strong academic proficiency in Inuittitut.

In general terms, conversational proficiency is the type or level of proficiency required to carry on contextualized day-to-day verbal interactions with other native speakers. Academic language proficiency, on the other hand, allows for communications in decontextualized settings that require manipulation of abstract forms of the language. These two types or levels of language proficiencies differ primarily in terms of the degree of linguistic-cognitive complexity required and level of context support. First, a person who has strong academic language proficiency is able to use that language to analyze her or his own thoughts and to use the language in cognitive problem-solving. Those with conversational ability may appear quite fluent in interactions that require relatively simple, repetitive, and automatic language processing. Second, interactions requiring conversational proficiency involve "context embedded" communications in which the situation or context provides much of the meaning. In this case, where the communication takes place, who the other person is, the other person's gestures and expressions, what the communicators are doing, and the other activities happening around them provide a great deal of information about the meaning of the communication. The individual need not rely solely on the words being used to understand the meaning of the conversation. Conversely, academic language proficiency allows for smooth and effective functioning when the communication is "decontextualized." Here language is used to describe and manipulate abstract ideas when the surrounding context provides little or no clue as to the meaning of the communication.

Clearly, the linguistic demands made by specific communication episodes requiring conversational or academic

processing can vary (Cummins & Swain, 1986), and many interactions will require a mixture of academic and conversational proficiency. Nonetheless, conversational proficiency generally is found to be developmentally prior (Vygotsky, 1934/1962) and acquired more quickly (Cummins & Swain, 1986) than academic proficiency (Collier, 1989).

We propose that its later development and slower acquisition make academic language proficiency particularly vulnerable to subtractive bilingualism. When entering a dominant-language classroom, minority-language children likely arrive with some level of conversational proficiency in their heritage language. However, these children are likely to have much lower academic proficiency in their heritage tongue. If instruction in a dominant language reduces the use of the heritage language in other areas of the child's life (e.g., at home, with friends, in the community), there is likely to be less chance that academic proficiency in the heritage language will be advanced. Thus, the second intention of this research was to examine the value of the conversational-academic language proficiency distinction for understanding the process of subtractive bilingualism.

Summary

In summary, the present research uses a unique and well-controlled research setting to examine the effects of dominant-language versus heritage-language instruction on the linguistic development of minority-language children. If receiving the initial years of formal instruction exclusively in a dominant language results in a pattern of language proficiency indicative of subtractive bilingualism, two primary hypotheses should receive support.

Hypothesis 1: In the first 3 years of formal instruction, there should be a slowing or disruption in the development of Inuittitut proficiency among Inuit children in the English and French programs.

Hypothesis 2: The disruption of heritage-language proficiency demonstrated by Inuit children in the English and French programs should be attenuated or avoided by Inuit children who receive their initial 3 years of formal instruction in their heritage language.

In addition, on the basis of Lambert and Taylor's (1983, 1991) theories and on evidence of an association between heritage-language proficiency and second-language acquisition (see Cummins, 1989), a third, more speculative prediction was made concerning the development of second-language proficiency: If the pattern of second-language acquisition is truly subtractive, disruptions in the development of the heritage language should be accompanied by slower or incomplete acquisition of the second language.

Hypothesis 3: Inuit children who are educated in a societally dominant second language (English or French) should show slower progress in the acquisition of that second language than should mixed-heritage children (native speakers of English) who are educated in a second language.

To test these three hypotheses, four separate comparisons will be made. In Comparison 1, heritage-language (Inuittitut) proficiency scores of Inuit children educated in English and

French will be compared with Inuttitut proficiency scores of Inuit children educated in Inuttitut, on six occasions during their first 3 years of formal education. This comparison will provide a partial test of both Hypotheses 1 and 2. If the Inuttitut scores of Inuit children in English and French instruction become increasingly divergent from the Inuttitut scores of Inuit children in Inuttitut instruction, this would provide initial support for the claim that dominant-language instruction disrupts heritage-language development or the claim that heritage-language instruction attenuates or prevents this disruption.

To further investigate Hypothesis 1, Comparison 2 contrasts the Inuttitut scores of Inuit children in the French and English programs with the English scores of mixed-heritage children in the Inuttitut and French programs. As described earlier, second-language instruction need not be subtractive. We have predicted that the subtractive pattern is particularly likely when minority-language children are educated exclusively in a dominant language. English is the first language of all mixed-heritage children used in our sample. Thus, this second comparison includes two groups of Inuit children educated in a dominant language (Inuit in English and French instruction) and two groups of children who speak a dominant language and are being educated in a second language (mixed-heritage children in Inuttitut and French). Hypothesis 1 predicts that over time the Inuttitut scores of Inuit children in the English and French programs will show more disruption than the English score of mixed-heritage children in the Inuttitut and French programs, even though both Inuit and mixed-heritage children are receiving instruction in a second language.

To further investigate Hypothesis 2, Comparison 3 contrasts the Inuttitut proficiency scores of Inuit children in the Inuttitut program with the English proficiency scores of mixed-heritage children in the English program and with the French proficiency scores of Francophone children in the French program. If heritage-language education attenuates or prevents the pattern of subtractive bilingualism that results from second-language instruction, Inuit children educated in Inuttitut should show proficiency in their heritage language that is consistent with the heritage-language proficiency of native English speakers or native French speakers educated in their heritage language.

Hypothesis 3 proposes that education in a dominant language should also lead to only partial proficiency in the second language among the minority-language children. To test this hypothesis, Comparison 4 contrasts the scores of Inuit children in the English and French programs on the language of instruction (English or French) with the scores of mixed-heritage children in the Inuttitut and French programs on the language of instruction (Inuttitut or French). This comparison contrasts the acquisition of second language (the language of instruction) by two groups of minority-language speakers (Inuit in English and French) and two groups who are dominant-language speakers (mixed-heritage children in Inuttitut and French), all of whom are being educated in a second language.

Finally, this study also investigates whether the subtractive effects of dominant-language instruction have a dispro-

portionate impact on academic over conversational language proficiency. Categorizing any given task or test as one that taps entirely "conversational" or "academic" proficiencies presents difficulties. Thus, we view this aspect of the research as primarily exploratory. However, for each of the four comparisons, we have divided the tasks that make up our measure of general language proficiency into tasks that appear to represent conversational language proficiency and those that are more consistent with academic language proficiency.

Method

Study Overview

The study used a longitudinal design including six test occasions: one at the beginning and one at the end of each of the first 3 years of school (kindergarten through grade 2). To obtain an adequate sample and to avoid potential confounds associated with a design using a single class per cell, we included students entering kindergarten over a 4-year period. Thus, the study comprised four cohorts: all children who began kindergarten in the fall of 1989, 1990, 1991, and 1992.

The Community

The community that served as the focus for this study is located in the region of northern Québec, Canada, known to its inhabitants as Nunavik. This vast arctic region contains 14 isolated communities, and this study was conducted in the largest of these communities. The population of 1,400 is approximately 80% Inuit, 12% Francophone, and 8% Anglophone (Taylor & Wright, 1990).

The Inuit of Nunavik remained extremely isolated from the mainstream Canadian-U.S. society until as late as the mid-1950s, and the communities of Nunavik remain relatively isolated even today. They are accessible only by air, and many Inuit residents have never seen an urban center. Despite increased intermarriage, social contact between the Inuit and Qallunaat (the Inuit term for Whites) remains limited, and most Inuit children have little direct interpersonal contact with Qallunaat prior to entering school.

More than 90% of the Inuit from this region claim Inuttitut (the Inuit language) as their first language. Compared with virtually all other Native languages in North America, in Nunavik Inuttitut remains a highly functional and vibrant language. Despite these optimistic claims, concerns have been raised about the extent to which the growing Qallunaat population exerts economic and political control over the lands and the people of Nunavik, and with this comes a related concern about the erosion of the Inuttitut language.

Programs and Participants

School board policy allows parents to register their children in one of three language programs in kindergarten: Inuttitut, English, or French. All instruction and most classroom materials are in the language of that program. The school board has invested considerable resources to provide books and other materials in Inuttitut for the Inuttitut language program and to provide materials that reflect Northern-Inuit culture in all three languages (Taylor, 1990). However, Qallunaat teachers in the English and French programs make use of mainstream Canadian-U.S. materials, most of which reflect mainstream White culture. Some Inuit teachers will on occasions use English materials (i.e., films, posters) in the Inuttitut

program. However, in the Inuttitut program, the language of the classroom is almost exclusively Inuttitut. In Grade 3, the Inuttitut program is terminated and children enroll in either English or French.

The participants included every child who entered kindergarten over the 3-year period from 1989 to 1991 and approximately half the children entering in 1992. Thus, data were collected from four cohorts. Turnover rates among Qallunaat and Inuit teachers were quite high. Thus, over the 4-year period during which testing took place, there were changes in teachers in all three language programs. The exact ethnic composition of the classes in each language program differed in each of the four cohorts. However, in every case, French classes contained a mixture of Inuit, Qallunaat, and mixed-heritage children, while the Inuttitut and English classes contained a mixture of Inuit and mixed-heritage children.

Together the four cohorts comprise 140 children. However, children who were absent for any of the six test occasions or who moved from one language program to another during the 3-year period were dropped from the analyses. Thirty-eight children were excluded because they left the community, were absent for at least one test occasion, or switched from one language of instruction to another. In addition, six children who represented groups too small to include in the analyses were also removed from the sample (e.g., 2 Inuit children were native speakers of English; 2 mixed-heritage children were native speakers of French; and 2 of the Qallunaat children were native speakers of English). Thus, the final sample comprised 96 children (47 boys and 49 girls). Children's ages when entering kindergarten ranged from 4 years and 10 months, to 6 years and 7 months, with a mean of 5 years and 6 months.

Inuit sample. The final sample comprised 63 Inuit children. For all of them, Inuttitut was their first or heritage language. Thirty-two were enrolled in the Inuttitut program, 14 in the English program, and 17 in the French program.

Mixed-heritage sample. The final sample included 25 mixed-heritage (Inuit and Qallunaat) children. For all of them, English was their first or heritage language. Eight were enrolled in the Inuttitut program, 10 in the English program, and 7 in the French program.

Qallunaat sample. The final sample included 8 Qallunaat children, all native French speakers. All were enrolled in the French program.

Testers and Training

Each test was administered by one of six trained testers: two native speakers of each of the three languages. Although several testers were fluent in more than one language, each administered tests only in their first language and used only their first language throughout the testing session. All of the testers were experienced educators with long-term involvement in Nunavik schools. The three senior testers, one in each of the three languages, were special education and curriculum specialists with extensive training and experience in testing. These three testers served as part of the advisory group that assisted in the development of the language tests and were very familiar with the test materials. They worked closely with the project supervisor (Stephen C. Wright) to standardize procedures across the three languages and to ensure that instructions and tester-child interaction patterns were as equivalent as possible. Finally, they observed each other in their initial test sessions and discussed any differences. These three testers worked at the school board office (in Montreal, Quebec) and were not familiar with the children in the sample.

The three additional testers were teachers in the school. These three testers were extensively trained by the three senior testers and the study supervisor. Considerable time was taken not only to

explain the details of each task but to educate these new testers in the appropriate testing practices and protocols. Each of these new testers observed their same-language partner for at least four test sessions. Finally, each new tester was observed by their same-language partner for at least four test sessions, and his or her performance was evaluated after each test session. Although this second group of testers were residents of the town, the English and French testers taught grade levels well above those of the students in our sample and had no direct contact with any of the project participants. The Inuttitut teacher taught Grade 1, but she did not test her own students or any students who had been in her class in previous years.⁴

Procedures

Each child was tested in all three languages on each of the six test occasions. Children were taken from their classes during regular instruction and tested individually in a quiet location (usually the school library). The order of the language test was determined randomly, and in most cases children did not receive more than one language test per day.⁵

Materials

Each language test involves a battery of tasks designed to assess general language competencies and language skills appropriate for the children's age and grade level. The present research context raises several unusual concerns related to the development of language assessment tests. In addition to the usual concerns for adequately testing the child's language capabilities, all materials had to be appropriate to the culture and context of Nunavik. In addition, the specific tasks and their instructions had to be equivalent across three languages. Third, the tests had to be comprehensive enough to assess native speakers adequately while being sensitive enough to detect the language skills of children in their second or even third language. Finally, the battery of tests had to be flexible enough to measure language development over a lengthy and developmentally rich period of the children's education.

The first two concerns made most standard language measures unusable. Both the content and style of most standard tests make them culturally inappropriate for children living in Nunavik. In addition, it would be impossible to create French or Inuttitut equivalents of most of these tests. For this reason, the tasks used were developed specifically for this project by a panel including the study's supervisor and a group of Inuit, Anglophone, and Franco-phone teachers and educators at the Kativik School Board. First, a list of possible tasks was generated, and the panel determined whether each task was consistent with the linguistic and cultural expectations of children in the target age group. Then potential items were created for each task. Some items were translated from English or French, but others were initially in Inuttitut. For example, all of the stories were Inuit stories taken from another area of the Arctic. So, although they were Inuit stories told to young

⁴ Because each child was tested by only one tester in each language, it was not possible to compute interrater reliabilities between testers. However, *t* tests comparing same-language testers indicated no significant effects of tester for any of the measures in kindergarten or Grade 1. Unfortunately, information about tester was not recorded on the Grade 2 data.

⁵ On several occasions, a child was absent from school for a part of the testing period. In these cases, it was sometimes necessary for them to be tested in two languages on the same day. However, these cases were rare.

children, it was very unlikely that the participants had heard them before. Following the generation of items, focused discussion and ratings of the materials by the panel, in combination with back-translation techniques using the school board translators, ensured that the tests were as equivalent as possible across the three languages.⁶ In addition, these consultations ensured that the materials and requirements of the tests adequately reflected the Nunavik cultural experience and the linguistic expectations of children in this age group. For example, all members of the panel agreed that a native speaker of 7 or 8 years of age should know most of the vocabulary items and should understand the Grade 2 story in his or her heritage language. These tests were, therefore, uniquely tailored for the needs of this study and the children in this community, and are as close to equivalent across languages as is possible.

To test both native speakers and initial learners, each test was composed of a large number of tasks covering a range of skills and difficulty levels. Each language test took an average of 45 min per child. Also, to match the children's expanding knowledge, new tasks were added each year.

The tests measured the child's ability to both generate and comprehend language. Many of the tasks allowed the child to first attempt to generate a verbal answer. If his or her answer was incorrect, or if the child was unable or unwilling to generate an answer, the child was asked to identify the correct answer from an array of choices. The first case requires verbal generation; the second requires comprehension of the word, phrase, or sentence.

The kindergarten language test. The kindergarten language test consisted of 16 tasks. The child's vocabulary was assessed through tasks that require the child to name (generation) or identify (comprehension) colors, shapes, numbers, parts of the body, birds, land animals, sea life, clothing, modes of transportation, actions, and household and community activities. In a task designed to measure verbal fluency, children were asked to list as many objects as they could that were members of two categories: food and animals.

A series of sentence comprehension items were used in which the tester read a sentence and the child was asked to select from an array of four pictures the one that corresponded to the sentence. To test comprehension of more complex language, the tester told the child a short story and posed several questions. The questions varied in difficulty from basic comprehension and recall to queries requiring inferences about ideas not directly presented in the story. The tester posed the question and awaited a response. If the child did not respond, the question was asked again and the prompt "(child's name) can you tell me the answer?" was added. Acceptable answers were predetermined when the tests were created. In some cases, several answers were considered acceptable. Testers were required to make some degree of subjective interpretation to decide whether the child's response met the criteria.

Early literacy was assessed by having the child identify the Inuit syllabics and the letters in the English and French alphabet.

In the last task, the child was presented with a large drawing depicting an Arctic scene and people engaged in a variety of activities. Using a series of specific prompts, the child was encouraged to describe the scene and talk as long as possible within a limit of 4 min. Using 11-point Likert-type scales, the tester then rated (a) the amount of vocabulary the child used, (b) the difficulty and sophistication of the words used, and (c) the grammatical complexity and accuracy of the child's speech.

Finally, the tester made ratings of the child's general comprehension during the entire test. As with the ratings of the child's speech, 11-point Likert scales were used to describe the quantity, quality, and sophistication of the child's comprehension.

The Grade 1 test. In Grade 1, four modifications were made to the test package. A new story was used and two new literacy tasks were added. In the first, the children were asked to read a series of sight words taken from the Grade 1 curriculum in each language. The second was a sentence completion task requiring the children to read an incomplete sentence and select from four alternatives the word that correctly completes the sentence. The last addition was a series of 20 "general knowledge" questions, ordered on the basis of difficulty. The task was discontinued when the child gave three consecutive incorrect answers (or was unable to provide an answer to three successive questions).

The Grade 2 test. Three modifications were made to the Grade 2 test. First, a new story was used. Second, 10 additional sight words were added from the Grade 2 curriculum. Finally, a sentence reading task was given in which the child was asked to read several sentences aloud. The tester recorded the number of errors and rated reading fluency on a 5-point scale.

General, academic, and conversational language skills. Three measures were constructed from the tasks that make up the language tests. The measure of general language proficiency included all tasks in each grade level test. The child's score on each task was converted to a percentage (i.e., a score bound by 0 and 100). These task percentages were averaged, with each task given equal weight, to produce the general language proficiency score (this score is also bound by 0 and 100).

The other two measures are based on the distinction between "academic" and "conversational" language proficiency. The tasks included in the measure of academic language proficiency were the top 30% in terms of difficulty of the child-generated vocabulary items, the story comprehension questions that required the child to make inferences (these were "how" and "why" questions that required the child to consider information not in evidence), all literacy tasks, and 25% of the general knowledge questions requiring the greatest level of inference or abstract linguistic skills.⁷

The measure of conversational proficiency consists of the vocabulary recognition items (i.e., point at the picture), simple context-embedded generated vocabulary, the verbal fluency measure, sentence comprehension, and the more concrete general knowledge items.

Results and Discussion

The results and discussion will be organized around the four main comparisons, with discussions of the relevance of each comparison for one or more of the three primary hypotheses (described at the end of the introduction). For each comparison, separate analyses were performed on each of the three measures of language proficiency (general,

⁶ Backtranslation alone has been criticized as inadequate because it lacks checks on the conceptual validity of the translated words (see Bontempo, 1993). However, in the present case all final translations were reconsidered by our advisory panel, which included two French-English bilinguals and two English-Inuit bilinguals. There was discussion about the conceptual equivalence of each item, and many items were dropped from the final test package because a conceptual equivalency could not be agreed upon. Although it is likely true that absolute equivalence of measures across languages is not possible, we believe that the process we have used brings us as close as possible to this goal.

⁷ These Vocabulary and General Knowledge items were selected collaboratively by the project supervisor and the senior testers.

Table 1
Comparison 1: Mean Inuit Language Proficiency Scores (General, Conversational, and Academic) of Inuit Children in Each of Three Language of Instruction Programs Across Six Test Occasions

Test occasion	Language of instruction			$F(2, 60)$	p	η^2
	Inuttitut ($n = 31$)	English ($n = 14$)	French ($n = 17$)			
Section 1: General language proficiency						
1. Kindergarten, fall	39.04	37.38	36.56	0.57	<i>ns</i>	.02
2. Kindergarten, spring	58.53 _a	48.12 _b	48.20 _b	8.12	<.01	.21
3. Grade 1, fall	57.55 _a	46.25 _b	46.84 _b	8.77	<.001	.23
4. Grade 1, spring	72.05 _a	56.13 _b	57.54 _b	16.24	<.001	.35
5. Grade 2, fall	75.70 _a	55.41 _b	56.30 _b	23.62	<.001	.44
6. Grade 2, spring	82.99 _a	60.14 _b	65.18 _b	35.87	<.001	.54
Section 2: Conversational language proficiency						
1. Kindergarten, fall	33.17	31.64	28.97	1.51	<i>ns</i>	.05
2. Kindergarten, spring	51.47 _a	42.28 _b	39.84 _b	7.37	<.01	.20
3. Grade 1, fall	54.80	47.80	47.74	2.59	<i>ns</i>	.08
4. Grade 1, spring	64.95 _a	56.93 _{a,b}	57.45 _b	3.09	.05	.09
5. Grade 2, fall	67.91 _a	59.08 _{a,b}	59.43 _b	3.75	<.05	.11
6. Grade 2, spring	73.41 _a	61.04 _b	62.40 _b	11.49	<.001	.28
Section 3: Academic language proficiency						
1. Kindergarten, fall	15.83	14.27	14.95	0.36	<i>ns</i>	.01
2. Kindergarten, spring	30.55	27.79	25.00	1.54	<i>ns</i>	.05
3. Grade 1, fall	30.33 _a	20.29 _b	22.27 _b	5.92	<.01	.16
4. Grade 1, spring	55.48 _a	31.18 _b	35.94 _b	20.52	<.001	.41
5. Grade 2, fall	55.72 _a	28.60 _b	32.48 _b	24.58	<.001	.45
6. Grade 2, spring	69.44 _a	34.90 _b	44.42 _b	39.59	<.001	.57

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure.

academic, and conversational). Finally, because these composite measures of language proficiency mask the results of specific measures that might be of interest to researchers in this area, subsequent independent analyses will be presented for the vocabulary, story comprehension, and (in Grades 1 and 2)⁸ literacy tasks.

Comparison 1: Heritage-Language Proficiency of Inuit Children in the Inuititut Program Versus Inuit Children in the English and French Programs

Hypothesis 1 predicted that Inuit children educated in English or French would show disruptions in their development of Inuititut proficiency. In addition, Hypothesis 2 predicted that Inuit children educated in their heritage language (Inuititut) would experience no disruption in their heritage language development. The initial test of these two hypotheses involved comparing the Inuititut scores of Inuit children educated in English or French with the Inuititut scores of Inuit children educated in Inuititut.

General Inuititut proficiency. A multivariate analysis of variance (MANOVA) was used to assess differences across language of instruction on general Inuititut proficiency among Inuit children, with the six test occasions as dependent variables. This analysis yielded a significant overall effect of language of instruction, $F(12, 110) = 5.81$, $p < .001$ ($\eta^2 = .38$).⁹ The mean scores, univariate F statistics,

and effect size statistics are presented in Section 1 of Table 1. Univariate tests at each test occasion yielded a significant effect of language of instruction at Test Occasions 2 (kindergarten spring) through 6 (Grade 2 spring). Post hoc pairwise comparisons¹⁰ indicated that on all five of these test occasions Inuit children who received instruction in Inuititut scored significantly higher than children in the English or French programs.

Several important points are apparent in the pattern of results shown in Section 1 of Table 1. First, when entering kindergarten, children in the three language programs demonstrated near-equal Inuititut proficiency. Thus, the large differences between the three groups at later test occasions cannot be explained by differences in initial language proficiency. Second, children in the Inuititut language program showed significantly larger gains in Inuititut than did children in the other two programs, such that by the end of

⁸ We have used only Grade 1 and 2 for this analysis because the only literacy test used in the kindergarten test was recognition of the alphabet (in English and French) and syllabic symbols (in Inuititut). We did not think that this represented a real test of literacy, and to report it as such would be misleading.

⁹ Wilkes-lambda test statistics are reported for all multivariate F s.

¹⁰ The Student Newman-Keuls procedure was used for all post hoc pairwise comparisons.

Grade 2, the differences between the three groups were producing very large effect sizes.¹¹

This finding provides initial support for both Hypotheses 1 and 2. Education in a dominant second language appears to have a negative impact on the development of the heritage-language proficiency. In addition, the strong performance of the Inuit children educated in Inuttitut can be interpreted as evidence that heritage-language instruction may prevent these disruptions to the heritage language. Thus, this first comparison provides some initial evidence of a pattern of "subtractive bilingualism" among Inuit children educated in English and French.

To examine the differential effect of language of instruction on conversational and academic proficiency in Inuttitut, separate analyses were performed on Inuit children's conversational proficiency and academic proficiency scores.

Conversational Inuttitut proficiency. A MANOVA was used to assess differences across language of instruction on conversational Inuttitut proficiency among Inuit children, with the six test occasions as dependent variables. This analysis yielded a significant overall effect of language of instruction, $F(12, 110) = 2.39, p < .01$ ($\eta^2 = .21$). The mean scores for each test occasion, univariate F statistics, and effect size statistics are presented in Section 2 of Table 1. Univariate tests yielded a significant effect of language of instruction at Test Occasions 2, 4, 5, and 6. Post hoc pairwise comparisons indicated that on all four of these occasions, children in the Inuttitut program scored significantly higher than children in the French program, and on Test Occasions 2 and 6, children in the Inuttitut program scored significantly higher than children in the English program.

Academic Inuttitut proficiency. A MANOVA was used to assess differences across language of instruction on academic Inuttitut proficiency, with the six test occasions as dependent variables. This analysis yielded a significant overall effect of language of instruction, $F(12, 110) = 5.30, p < .001$ ($\eta^2 = .36$). The mean scores, the univariate F statistics, and the effect size statistics are presented in Section 3 of Table 1. Univariate tests yielded a significant effect of language of instruction at Test Occasions 3 through 6, and post hoc pairwise comparisons confirmed that on all four of these occasions, children in the Inuttitut program scored significantly higher than children in the French and English programs.

Both the conversational and academic measures (Sections 2 and 3 of Table 1) demonstrate that Inuit children educated in a societally dominant second language show a lag in Inuttitut proficiency compared with those educated in their heritage language. However, these separate analyses also show that the effects of language of instruction are stronger for academic language proficiency than they are for conversational proficiency. This point is most easily apparent in the pattern of effect sizes (presented with the F statistics in the last column of Table 1). The effect sizes for the differences between the three language programs tend to increase across the six test occasions for both conversational and academic proficiency. However, the clearest trend is seen in the academic proficiency measure.

Analyses of specific tests. Three separate MANOVAs were used to test for differences across the three language programs, specifically on tests of vocabulary, story comprehension, and literacy (in Grades 1 and 2). The analysis for the Vocabulary test yielded a significant overall effect of language of instruction, $F(12, 110) = 4.45, p < .001$ ($\eta^2 = .38$). The mean scores, univariate F statistics, and effect size statistics are presented in Section 1 of Table 2. Univariate tests yielded a significant effect of language of instruction at Test Occasions 2 through 6, and post hoc pairwise comparisons confirmed that children in the Inuttitut program scored significantly higher than children in the French and English programs on all five of these test occasions.

The analysis for the Story Comprehension test yielded a significant overall effect of language of instruction, $F(12, 110) = 1.96, p < .05$ ($\eta^2 = .21$). The mean scores, the univariate F statistics, and the effect size statistics are presented in Section 2 of Table 2. Univariate tests yielded a significant effect of language of instruction at Test Occasion 6, and post hoc pairwise comparisons confirmed that children in the Inuttitut program scored significantly higher than children in the French and English programs on this final test occasion.

The analysis for the Literacy tests (Grades 1 and 2) yielded a significant overall effect of language of instruction, $F(8, 110) = 7.86, p < .001$ ($\eta^2 = .38$). The mean scores, the univariate F statistics, and the effect size statistics are presented in Section 3 of Table 2. Univariate tests yielded a significant effect of language of instruction at all four test occasions, and post hoc pairwise comparisons confirmed that children in the Inuttitut program scored significantly higher than children in the French and English programs on all four of these test occasions. At Test Occasion 6, children in the French program scored significantly higher than children in English.

Summary of results of Comparison 1. It appears clear that instruction in Inuttitut is associated with stronger development of Inuttitut language skills among Inuit children. Similarly, this first set of analyses appear to show the beginnings of a "subtractive" bilingual profile, such that instruction exclusively in a societally dominant language is associated with poorer development of the heritage language. Instruction exclusively in English and French is associated with lower conversational Inuttitut proficiency. However, it is the development of academic proficiency in Inuttitut that suffers most for children instructed exclusively in English or French. The separate analyses of specific tests confirm that, to varying degrees, the findings are consistent across these three measures. Inuit children in second language not only fall behind in what might be considered more "school-based skills," such as literacy, but show lower

¹¹ Cohen (1988) has established a widely accepted set of conventions for interpreting effect size (see also Cohen, 1992). The eta-squared statistic represents the amount of variance accounted for in the dependent variable by the effect. Cohen proposed the following conventions for interpreting this statistic: small $\eta^2 = .02$, medium $\eta^2 = .07$, and large $\eta^2 = .16$.

Table 2

Comparison 1: Mean Scores on Inuttitut Vocabulary, Story Comprehension, and Literacy Tests for Inuit Children in Each of Three Language of Instruction Programs Across Six Test Occasions

Test occasion	Language of instruction			<i>F</i> (2, 60)	<i>p</i>	η^2
	Inuttitut (<i>n</i> = 31)	English (<i>n</i> = 14)	French (<i>n</i> = 17)			
Section 1: Vocabulary						
1. Kindergarten, fall	50.58	49.15	50.24	0.89	<i>ns</i>	.03
2. Kindergarten, spring	72.81 _a	58.53 _b	60.95 _b	8.96	<.001	.27
3. Grade 1, fall	79.92 _a	64.28 _b	65.47 _b	11.62	<.001	.32
4. Grade 1, spring	80.56 _a	73.22 _b	71.81 _b	4.11	<.05	.14
5. Grade 2, fall	89.57 _a	79.15 _b	75.00 _b	12.47	<.001	.34
6. Grade 2, spring	90.09 _a	73.23 _b	79.22 _b	7.24	<.01	.23
Section 2: Story Comprehension						
1. Kindergarten, fall	10.50	8.00	9.73	0.68	<i>ns</i>	.05
2. Kindergarten, spring	19.23	24.50	28.12	1.09	<i>ns</i>	.20
3. Grade 1, fall	28.84	17.50	25.00	0.77	<i>ns</i>	.08
4. Grade 1, spring	48.08	32.50	40.26	1.22	<i>ns</i>	.09
5. Grade 2, fall	25.96	30.00	17.19	1.18	<i>ns</i>	.11
6. Grade 2, spring	40.39	20.00 _b	17.19 _b	4.10	<.05	.14
Section 3: Literacy						
3. Grade 1, fall	13.75 _a	1.78 _b	1.96 _b	4.96	<.05	.15
4. Grade 1, spring	65.65 _a	21.20 _b	22.92 _b	16.41	<.001	.38
5. Grade 2, fall	64.47 _a	15.83 _b	23.59 _b	22.06	<.001	.45
6. Grade 2, spring	91.16 _a	25.33 _b	30.12 _c	34.06	<.001	.56

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure.

scores in general vocabulary and, in the later spring testings, they are apparently less able to comprehend age-appropriate stories. Finally, it appears that instruction in the heritage language leads to relatively strong heritage-language proficiency, both academic and conversational.

Although supportive of both Hypotheses 1 and 2, this first comparison cannot distinguish between these two predictions. It is not clear whether there is a disruption in the heritage-language development among Inuit children in English and French instruction or an enhancement of heritage-language development among those educated in Inuttitut. To further investigate each of these two hypotheses, Comparisons 2 and 3 were performed.

Comparison 2: Heritage-Language Proficiency of Inuit Children in the English and French Programs Versus Mixed-Heritage Children in the Inuttitut and French Programs

This comparison tests the prediction that second-language instruction will have a greater negative impact on the heritage language of Inuit children (the minority-language group being educated in a dominant language) than on the heritage language of mixed-heritage children (the group whose first language is a dominant language). Thus, the heritage language scores of four groups of children were compared: (a) Inuit children in English instruction, (b) Inuit children in French instruction, (c) mixed-heritage children in

Inuttitut instruction, and (d) mixed-heritage children in French instruction.

General language proficiency. An overall MANOVA comparing these four groups on general language proficiency in their heritage language at each of the six test occasions yielded a significant main effect of group, $F(18, 117) = 11.74$, $p < .001$ ($\eta^2 = .34$). Univariate analyses indicated significant differences between groups on the first test occasion (i.e., when the children entered kindergarten), $F(3, 42) = 8.12$, $p < .001$ ($\eta^2 = .37$). Post hoc comparisons indicated that when entering kindergarten both groups of Inuit children had significantly lower proficiency in their heritage language ($M = 37.39$, English instruction; $M = 36.56$, French instruction) than did the two groups of mixed-heritage in their heritage language ($M = 54.17$, Inuttitut instruction; $M = 48.60$, French instruction).

This finding may represent a real difference in heritage-language skills. The Inuit cultural tradition is much less verbal than White mainstream Canadian-U.S. culture, and Inuit children are not expected to participate in adult-type language until later than are most White children (Crago, 1992; Crago & Eriks-Brophy, 1994). However, this initial difference in heritage language scores may also represent an effect of the testing situation. Inuit children are likely to be far less familiar with the question-response format of a language test. This type of interaction, although prominent in the language socialization patterns of White Canadian-U.S. caregivers, is uncommon among Inuit caregivers

(Crago, 1992; Crago, Annahatak, & Ningiuruvik, 1993). Previous exposure to the question-response interaction with adults may result in mixed-heritage children simply finding the task more familiar. This familiarity may account for their better performance, independent of underlying linguistic competence.

Whatever the underlying cause, to understand the effect of second-language instruction, it was necessary to control for this initial difference in heritage-language proficiency between Inuit and mixed-heritage children. Thus, the analysis was rerun using a multivariate analysis of covariance (MANCOVA). This allowed for comparisons of Inuit and mixed-heritage children on test occasions 2–6 using scores at the first test occasion as a covariate. Thus, heritage-language proficiency scores on Test Occasions 2–6 were adjusted for initial heritage-language proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption of homogeneity of slopes. The MANCOVA yielded a significant overall main effect of group, $F(15, 102) = 2.72, p < .01 (\eta^2 = .23)$. The adjusted means for the four groups at Test Occasions 2–6, univariate F statistics, and effect size statistics are presented in Section 1 of Table 3. Univariate analyses indicated significant differences between the groups at Test Occasions

2, 3, 4, and 6. Post hoc comparisons showed that the heritage-language scores of the two groups of Inuit children were significantly lower than heritage-language scores of the two groups of mixed-heritage children on all four of these test occasions. No significant differences emerged for comparisons between the two Inuit groups, nor did any emerge for comparisons between the two mixed-heritage groups.

Inuit children educated exclusively in a dominant second language showed lower levels of heritage-language proficiency than did mixed-heritage children educated in a second language, even when these scores were adjusted for initial differences in heritage-language proficiency. This finding provides support for Hypothesis 1 by showing that the second-language instruction has a greater negative impact on the heritage-language development of children who speak a minority language (Inuit children) and are being educated in a societally dominant language than on children whose first language is a societally dominant language (mixed-heritage children). The lack of differences between the two groups of Inuit children indicates that this effect is not the result of the specific dominant language. The two dominant languages (French or English) both are associated with lower heritage-language proficiency. The results of this second comparison also appear to demonstrate a subtractive bilingualism pattern for Inuit children educated in a dominant language.

The lack of differences between the two groups of

Table 3

Comparison 2: Adjusted Mean Heritage-Language Proficiency Scores (General, Conversational, and Academic) for Inuit and Mixed-Heritage Children in Second-Language Instruction Programs Across Five Test Occasions

Test occasion	Inuit children		Mixed-heritage children		<i>F</i> (3, 41)	<i>p</i>	η^2
	English instruction (<i>n</i> = 14)	French instruction (<i>n</i> = 17)	Inuttitut instruction (<i>n</i> = 8)	French instruction (<i>n</i> = 7)			
Section 1: General language proficiency							
2. Kindergarten, spring	53.16 _a	53.05 _a	59.56 _b	61.63 _b	3.78	<.05	.22
3. Grade 1, fall	50.90 _a	52.15 _a	63.83 _b	64.55 _b	9.03	<.001	.39
4. Grade 1, spring	59.74 _a	61.65 _a	74.66 _b	72.09 _b	5.81	<.01	.30
5. Grade 2, fall	59.59	61.07	67.44	69.74	1.80	<i>ns</i>	.12
6. Grade 2, spring	63.77 _a	66.31 _{a,b}	73.70 _{b,c}	76.53 _c	2.93	<.05	.18
Section 2: Conversational language proficiency							
2. Kindergarten, spring	48.45 _a	48.07 _a	57.73 _b	57.73 _b	3.00	<.05	.18
3. Grade 1, fall	58.02	56.05	63.02	60.09	0.72	<i>ns</i>	.05
4. Grade 1, spring	61.47 _a	63.51 _a	78.51 _b	78.11 _b	4.75	<.01	.26
5. Grade 2, fall	66.02	68.69	76.42	78.02	1.66	<i>ns</i>	.10
6. Grade 2, spring	64.15 _a	66.55 _a	87.40 _b	88.51 _b	10.96	<.001	.44
Section 3: Academic language proficiency							
2. Kindergarten, spring	33.53	30.21	36.49	31.86	0.64	<i>ns</i>	.04
3. Grade 1, fall	24.46 _a	26.06 _{a,b}	35.95 _c	32.36 _{b,c}	4.15	<.05	.23
4. Grade 1, spring	33.68	38.22	42.52	33.24	1.61	<i>ns</i>	.10
5. Grade 2, fall	31.01	34.67	34.11	35.29	0.28	<i>ns</i>	.02
6. Grade 2, spring	37.99	44.23	40.15	41.15	0.99	<i>ns</i>	.07

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure. All means are adjusted for language proficiency at first test occasion (i.e., scores when entering kindergarten).

mixed-heritage children also supports the generality of this result. Linguistically, Inuttitut and French are very different, yet mixed-heritage children in these two programs show equivalent levels of development in their heritage language (English). Thus, the superior proficiency of the mixed-heritage children in their heritage language does not arise because instruction in a particular language (Inuttitut or French) provides some special support of mixed-heritage children's heritage language (English).

To further investigate the nature of the lower proficiency in heritage language shown by Inuit children compared with mixed-heritage children, separate analyses were performed on the conversational and academic proficiency scores of these four groups of children.

Conversational heritage language proficiency. The differential effect of second-language instruction on the conversational skills of Inuit versus mixed-heritage children was tested using a MANCOVA procedure. Conversational proficiency scores in the heritage language at Test Occasions 2–6 were used as dependent variables, with conversational proficiency in the heritage language at the first test occasion as a covariate. This means that scores for Test Occasions 2–6 were adjusted for initial conversational proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The result of the MANCOVA was a significant overall effect of group, $F(15, 102) = 2.72, p < .01$ ($\eta^2 = .27$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 2 of Table 3. Univariate analyses yielded a significant effect of group at Test Occasions 2, 4, and 6. These are the three spring (i.e., the end of the school year) test occasions. At each of these three spring test occasions, the adjusted conversational Inuttitut scores of Inuit children in the English and French programs were significantly lower than the adjusted English conversational scores of mixed-heritage children in the Inuttitut and French programs.

Academic heritage language proficiency. The differential effect of second-language instruction on academic language proficiency of Inuit versus mixed-heritage children was tested using a MANCOVA. Academic proficiency scores in the heritage language at Test Occasions 2–6 were used as dependent variables, with academic proficiency in the heritage language at the first test occasion as a covariate.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The result of the MANCOVA was a significant overall effect of group, $F(15, 102) = 2.05, p < .05$ ($\eta^2 = .21$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 3 of Table 3. The univariate analyses indicated significant differences between the groups only at Test Occasion 3.

The results of the separate analyses of conversational and academic language proficiency demonstrate that the poorer heritage language proficiency of Inuit children in second-language programs compared with mixed-heritage children in second-language programs is largely the result of differences in conversational proficiency. Inuit children are only slightly (and not consistently) poorer in academic language proficiency in their heritage language than are mixed-heritage children. One interpretation of this finding is that second-language instruction slows the development of academic proficiency in the heritage languages of both Inuit and mixed-heritage children. The academic-proficiency measure includes measures of literacy (i.e., reading), skills that might not be easily learned outside of the classroom. Thus, it might be that these heritage-language skills are acquired more slowly by both Inuit and mixed-heritage children educated in a second language.

The poorer conversational proficiency in the heritage language among the Inuit children is more consistent. It is possible that as Inuit children begin to acquire some skills in English or French in the classroom, this new language also replaces (or intrudes on) heritage language use in interactions outside the classroom, such as on the playground, on the school bus, in the halls, or in the community outside of school. These are all contexts in which conversational language skills are used. If this is true, the heritage language may be receiving less "practice" in conversational contexts during these formative years of language development. It is also informative that the larger (and significant) differences between Inuit and mixed-heritage children's conversational proficiency in the heritage language are found at the end of each school year (i.e., at the spring test occasions). It appears that the school environment provides some support for continued improvement of conversational English of mixed-heritage children, even though they are receiving formal instruction in Inuttitut or French. However, the school environment does not appear to support the same degree of improvement of conversational Inuttitut for Inuit children who are educated in French or English. In fact, if we compare the mean for conversational proficiency in the fall and spring of both Grades 1 and 2 (that is we compare Test Occasion 3 to 4 and 5 to 6),¹² we see that the conversational proficiency of Inuit children in both English and French classes improve little during the school year in Grades 1 and 2 (their adjusted scores actually decline during Grade 2). Mixed-heritage children, on the other hand, show relatively greater improvement in both these years.

Analyses of specific tests. Three MANCOVAs were used to test the differences between Inuit and mixed-heritage children on the tests of vocabulary, story comprehension, and literacy (in Grades 1 and 2) in their heritage language. In each case, scores from the first relevant test occasion were used as a covariate and scores from subsequent test occasions were used as dependent variables. Preliminary analy-

¹² These comparisons are possible because the language tests were identical in the fall and spring of each school year. Comparisons across years are problematic because of the addition of new tasks in each year.

ses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$) for any of the three MANOVAs, indicating that the data did not violate the assumption on homogeneity of slopes.

The analysis for the Vocabulary test yielded a significant overall effect of group, $F(15, 102) = 1.86, p < .05$ ($\eta^2 = .22$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 1 of Table 4. The univariate analyses indicated significant differences between the groups at Test Occasions 2 and 4, and post hoc pairwise comparisons indicated that Inuit children in both second-language programs were scored significantly lower than the two groups of mixed heritage children.

The analysis for the Story Comprehension test yielded no significant overall effect of group, $F(15, 102) = 0.96, ns$ ($\eta^2 = .11$). The adjusted mean scores, univariate F statistics, and effect size statistics are presented in Section 2 of Table 4. Although all of the means are in the predicted direction, with Inuit children scoring lower than mixed-heritage children, none of the differences reached traditional levels of statistical significance.

The analysis for the Literacy tests (Grades 1 and 2) used the Literacy scores at Test Occasion 3 (fall of Grade 1) as the covariate and the remaining three test occasions as the dependent variables. This analysis yielded a significant overall effect of group, $F(9, 106) = 2.08, p < .05$

($\eta^2 = .13$). The adjusted mean scores, univariate F statistics, and effect size statistics are presented in Section 3 of Table 4. Again, the means were in the predicted direction at all test occasions, but the univariate analyses indicated significant differences between the groups only at Test Occasion 6. Post hoc pairwise comparisons indicated that Inuit children in both second-language programs scored significantly lower than the two groups of mixed heritage children at this final test occasion.

Summary of Comparison 2

Compared with mixed-heritage children educated in a second language, Inuit children educated in English or French showed lower levels of conversational language proficiency in their heritage language at the end of each of the first 3 years of schooling. Analyses of specific tests show that this difference is reflected in lower vocabulary skills and to a lesser (and often not significant) degree in comprehension and literacy. This finding provides additional support for Hypothesis 1, that instruction in a dominant language will undermine the heritage-language development of Inuit children more than the majority-language-speaking mixed-heritage children. Taken in combination with Comparison 1, this finding appears to indicate that Inuit children educated in a dominant language may suffer disruptions in the development of heritage language proficiency (i.e., there is evidence of a pattern of subtractive bilingualism).

Table 4

Comparison 2: Adjusted Mean Scores on Heritage-Language Vocabulary, Story Comprehension, and Literacy Tests for Inuit and Mixed-Heritage Children in Second-Language Instruction Programs Across Five Test Occasions

Test occasion	Inuit children		Mixed-heritage children		<i>F</i> (3, 41)	<i>p</i>	η^2
	English instruction (<i>n</i> = 14)	French instruction (<i>n</i> = 17)	Inuttitut instruction (<i>n</i> = 8)	French instruction (<i>n</i> = 7)			
Section 1: Vocabulary							
2. Kindergarten, spring	64.75 _a	67.66 _a	73.06 _b	75.90 _b	4.71	<.01	.26
3. Grade 1, fall	70.46	71.77	76.23	78.28	1.52	<i>ns</i>	.10
4. Grade 1, spring	73.14 _a	72.65 _a	81.67 _b	80.49 _b	2.91	<.05	.17
5. Grade 2, fall	81.72	81.64	85.43	81.73	0.49	<i>ns</i>	.03
6. Grade 2, spring	81.29	80.42	82.31	87.37	1.03	<i>ns</i>	.07
Section 2: Story Comprehension							
2. Kindergarten, spring	37.18	37.05	52.78	48.53	0.46	<i>ns</i>	.03
3. Grade 1, fall	22.55	32.70	51.89	50.92	2.51	<i>ns</i>	.15
4. Grade 1, spring	35.50	44.91	65.87	44.06	1.09	<i>ns</i>	.08
5. Grade 2, fall	27.90	16.85	38.32	38.15	1.68	<i>ns</i>	.11
6. Grade 2, spring	21.24	19.87	30.38	27.11	0.47	<i>ns</i>	.04
Section 3: Literacy							
4. Grade 1, spring	24.72	26.05	39.93	51.04	1.64	<i>ns</i>	.10
5. Grade 2, fall	20.67	29.78	28.64	42.62	1.16	<i>ns</i>	.08
6. Grade 2, spring	31.16 _a	40.19 _a	55.78 _b	60.56 _b	2.89	<.05	.19

Note. Means in the same rows with different subscripts differ significantly ($p < .05$) by Newman-Keuls procedure. All means are adjusted for language proficiency at first test occasion (i.e., scores when entering kindergarten).

Comparison 3: Heritage-Language Proficiency of Inuit Children in the Inuttitut Program Versus Mixed-Heritage Children in the English Program and Francophone Children in the French Program

To further test Hypothesis 2, that instruction exclusively in the heritage language can prevent disruption of heritage language development among minority language speakers, the heritage-language proficiency of Inuit children educated in Inuttitut was compared with the heritage-language proficiency of mixed-heritage children educated in English and with the heritage-language proficiency of Francophone children educated in French.

General language proficiency. An overall MANOVA comparing these three groups on general language proficiency in their heritage language at the six test occasions yielded a significant overall main effect of group, $F(12, 78) = 5.38, p < .001 (\eta^2 = .45)$. Univariate analyses indicated a significant difference between groups at the first test occasion (i.e., when the children were entering kindergarten), $F(2, 44) = 24.49, p < .001 (\eta^2 = .53)$. Post hoc comparisons indicated that when entering kindergarten, Inuit children ($M = 39.03$) had significantly lower heritage-language proficiency than both the mixed-heritage children ($M = 54.13$) and the Francophone children ($M = 58.63$). The difference between the mixed-heritage and Francophone children was not significant.

The same explanations described in the previous analysis

may apply here. This may represent a real difference in heritage-language skills as a result of Inuit cultural traditions, or it may reflect differential familiarity with the question-response interaction of the test situation. Whatever the underlying cause, it was necessary to control for this initial difference in heritage-language proficiency. Thus, the analysis was rerun using a MANCOVA approach. This procedure compares the three groups on the second through sixth test occasion using scores at the first test occasion as a covariate. Thus, heritage-language proficiency scores on the second through sixth test occasion were adjusted for initial heritage-language proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The MANCOVA resulted in a significant overall main effect of group, $F(10, 78) = 2.00, p < .05 (\eta^2 = .20)$. The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 1 of Table 5. Univariate analyses indicated significant differences between the adjusted means of the three groups only at Test Occasion 5. Post hoc comparisons showed that the adjusted heritage-language scores of the Inuit children and the Francophone children were significantly higher than the adjusted scores for the mixed-heritage children.

Table 5
Comparison 3: Adjusted Mean Heritage-Language Proficiency Scores (General, Conversational, and Academic) for Inuit, Mixed-Heritage, and Francophone Children in Heritage-Language Instruction Programs Across Five Test Occasions

Test occasion	Inuit in the Inuttitut program ($n = 31$)	Mixed-heritage in the English program ($n = 10$)	Francophones in the French program ($n = 8$)	$F(2, 43)$	p	η^2
Section 1: General language proficiency						
2. Kindergarten, spring	69.05	71.35	72.63	.46	<i>ns</i>	.02
3. Grade 1, fall	67.17	69.25	72.29	.85	<i>ns</i>	.04
4. Grade 1, spring	80.77	78.70	80.98	.27	<i>ns</i>	.02
5. Grade 2, fall	83.28 _a	77.37 _b	85.78 _a	6.04	<.01	.22
6. Grade 2, spring	88.08	81.55	87.39	3.00	<i>ns</i>	.12
Section 2: Conversational language proficiency						
2. Kindergarten, spring	62.71 _a	68.71 _a	74.41 _b	3.23	<.05	.14
3. Grade 1, fall	63.70 _a	65.88 _a	79.06 _b	3.85	<.05	.15
4. Grade 1, spring	75.07	85.63	86.46	2.50	<i>ns</i>	.10
5. Grade 2, fall	77.72	84.34	89.28	2.47	<i>ns</i>	.10
6. Grade 2, spring	79.33 _a	94.20 _b	94.34 _b	10.71	<.05	.33
Section 3: Academic language proficiency						
2. Kindergarten, spring	36.25 _a	55.87 _b	57.08 _b	7.25	<.01	.25
3. Grade 1, fall	34.58	40.54	43.75	1.60	<i>ns</i>	.07
4. Grade 1, spring	59.67 _{a,b}	49.69 _a	67.12 _b	4.51	<.05	.17
5. Grade 2, fall	59.25 _a	43.67 _b	67.56 _c	10.98	<.001	.34
6. Grade 2, spring	73.88 _a	52.48 _b	66.81 _a	21.14	<.001	.49

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure. All means are adjusted for language proficiency at first test occasion (i.e., scores when entering kindergarten).

These data appear to indicate that Inuit children educated in Inuttitut have very strong heritage-language skills. In fact, when adjusted for lower initial heritage-language proficiency, Inuit children perform better at the later test occasion than mixed-heritage children. The lack of differences between these three groups supports Hypothesis 2, that education in their heritage language can prevent the disruption of heritage-language development seen among Inuit children educated in one of the dominant languages. To further investigate whether the positive effects of heritage-language education generalize to both academic and conversational proficiencies, separate analyses were performed on the conversational- and academic-proficiency scores of these three groups of children educated in their heritage language.

Conversational heritage language proficiency. The effect of heritage-language instruction on the conversational proficiency of Inuit versus mixed-heritage and Francophone children was tested using a MANCOVA procedure. Conversational proficiency scores in the heritage language at Test Occasions 2–6 were used as dependent variables, with conversational proficiency in the heritage language at the first test occasion as a covariate. Thus, the scores for Test Occasions 2–6 were adjusted for initial conversational proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The MANCOVA yielded a significant overall effect of group, $F(10, 78) = 2.74, p < .01$ ($\eta^2 = .26$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 2 of Table 5.

Section 2 of Table 5 shows that generally the adjusted Inuttitut conversational proficiency scores of Inuit children were lower than the adjusted English conversational proficiency score of mixed-heritage children and the adjusted French conversational proficiency scores of Francophone children. Univariate analyses and post hoc comparisons indicated that these differences were significant at Test Occasion 6. At Test Occasions 2 and 3, the adjusted scores of Inuit children were significantly lower than those of Francophone children but not those of mixed-heritage children.

Academic heritage language proficiency. The effect of heritage-language instruction on the academic language skills of Inuit versus mixed-heritage and Francophone children was tested using a MANCOVA procedure. Academic proficiency scores in the heritage language at Test Occasions 2–6 were used as dependent variables, with academic proficiency in the heritage language at the first test occasion as a covariate. Thus, the scores for Test Occasions 2–6 were adjusted for initial academic language proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The MANCOVA yielded a significant overall effect of group, $F(10, 78) = 7.93, p < .001$ ($\eta^2 = .50$). The

adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 3 of Table 5.

At Test Occasion 2, Inuit children's adjusted academic language scores in their heritage language were significantly lower than the scores of mixed-heritage children and Francophone children. However, by Test Occasions 4, 5, and 6, Inuit children's adjusted academic language scores were significantly higher than those of mixed heritage children. By Test Occasion 6 Inuit children's scores were comparable to the scores of Francophone children as well.

The results of the separate analyses of conversational and academic language proficiency show that in comparison with mixed-heritage children in English and Francophone children in French, Inuit children showed strong improvement in their academic language proficiency in Inuttitut. Despite what appears to be lower proficiency in this domain when entering kindergarten, this group of Inuit children finished Grade 2 with academic proficiency in Inuttitut that was as strong as Francophone children's academic proficiency in French and stronger than mixed-heritage children's academic proficiency in English.

However, in terms of conversational proficiency, Inuit children in the Inuttitut program appear to show a somewhat lower proficiency in their heritage language than the two groups of majority-language speakers. It is possible that the consistently lower conversational scores may be a reflection of the less verbal cultural tradition of the Inuit. The cultural tradition of less verbal interaction present in Inuit children's homes is likely to be reinforced in the Inuttitut program, where teachers are also Inuit. This particular finding points to an interesting qualification to Hypothesis 2. Although students educated in their heritage language may not show the poor heritage-language skills seen among those in second-language instruction (see Comparison 1), heritage-language education is likely to promote a pattern of heritage-language acquisition that is consistent with the traditional cultural-linguistic practices (especially when the teachers are members of the cultural group). Comparisons with other cultural groups alone cannot determine the absolute impact of heritage-language education, because these comparisons are confounded with cultural differences.

Analyses of specific tests. Three MANCOVAs were used to test the differences between Inuit, mixed-heritage, and Francophone children on the tests of vocabulary, story comprehension, and literacy (in Grades 1 and 2) in their heritage language. In each case, scores from the first relevant test occasion were used as a covariate and scores from subsequent test occasions were used as dependent variables. Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$) for any of the three MANOVAs, indicating that the data did not violate the assumption on homogeneity of slopes.

The analysis for the Vocabulary test yielded a significant overall effect of group, $F(10, 78) = 2.63, p < .001$ ($\eta^2 = .27$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 1 of Table 6. The univariate

Table 6
Comparison 3: Adjusted Mean Scores on Heritage-Language Vocabulary, Story Comprehension, and Literacy for Inuit, Mixed-Heritage, and Francophone Children in Heritage-Language Instruction Programs Across Five Test Occasions

Test occasion	Inuit in the Inuttitut program (n = 31)	Mixed-heritage in the English program (n = 10)	Francophones in the French program (n = 8)	F(2, 43)	p	η^2
Section 1: Vocabulary						
2. Kindergarten, spring	77.63	75.94	74.01	0.56	ns	.03
3. Grade 1, fall	83.97	78.71	79.83	1.49	ns	.07
4. Grade 1, spring	83.57	81.06	80.53	0.62	ns	.03
5. Grade 2, fall	91.99 _a	82.97 _b	86.75 _b	7.33	<.01	.27
6. Grade 2, spring	92.82 _a	83.17 _b	80.81 _b	8.11	<.01	.29
Section 2: Story Comprehension						
2. Kindergarten, spring	20.70 _a	48.95 _b	49.61 _b	4.63	<.05	.19
3. Grade 1, fall	31.68 _a	50.85 _b	70.39 _b	5.69	<.01	.23
4. Grade 1, spring	47.32	43.24	66.02	1.10	ns	.05
5. Grade 2, fall	24.80	38.00	40.17	2.27	ns	.10
6. Grade 2, spring	53.65 _a	25.67 _b	37.62 _b	4.98	<.05	.20
Section 3: Literacy						
4. Grade 1, spring	65.32	51.53	82.33	2.73	ns	.11
5. Grade 2, fall	65.21	43.26 _a	77.92 _b	3.86	<.05	.15
6. Grade 2, spring	90.16 _a	64.63 _b	82.91 _a	4.90	<.05	.18

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure. All means are adjusted for language proficiency at first test occasion (i.e., scores when entering kindergarten).

analyses indicated significant differences between the groups at Test Occasions 5 and 6, and post hoc pairwise comparisons indicated that Inuit children scored higher than Francophone and mixed-heritage children at both these occasions.

The analysis for the Story Comprehension test yielded a significant overall effect of group, $F(10, 78) = 3.86$, $p < .001$ ($\eta^2 = .35$). The adjusted mean scores, univariate F statistics, and effect size statistics are presented in Section 2 of Table 6. Univariate tests yielded a significant effect of language of instruction at Test Occasions 2, 3, and 6. Post hoc pairwise comparisons indicated that Inuit children scored lower than Francophone and mixed-heritage children at Test Occasions 2 and 3 but higher than Francophone and mixed-heritage children at Test Occasion 6.

The analysis for the Literacy tests (Grades 1 and 2) used the Literacy scores at Test Occasion 3 (beginning of Grade 1) as the covariate and the remaining three test occasions as the dependent variables. This analysis yielded a significant overall effect of group, $F(6, 88) = 2.78$, $p = .05$ ($\eta^2 = .16$). The adjusted mean scores, univariate F statistics, and effect size statistics are presented in Section 3 of Table 6. Univariate tests yielded a significant effect of language of instruction at Test Occasions 5 and 6. Post hoc pairwise comparisons indicated that mixed-heritage children scored lower than Francophone at Test Occasion 5 (with Inuit children falling in between), but at Test Occasion 6 Inuit and Francophone children scored higher than mixed-heritage children.

Summary of Comparison 3. Generally, these findings provide additional support for Hypothesis 2. Education in

their heritage language is associated with general proficiency in Inuttitut among Inuit children that is equivalent to the heritage-language proficiency of both the English-speaking and French-speaking samples. Their conversational proficiency appears to lag behind these two comparison groups, but in terms of academic language proficiency, their Inuttitut appears to be as sophisticated as the French used by Francophone children and perhaps more sophisticated than the English used by mixed-heritage children. The analyses of the three separate tests (Vocabulary, Comprehension, and Literacy) were consistent with this general finding. The comprehension and literacy tests showed the clearest pattern of change as the Inuit children appear to "catch up" to the other two groups over the 3-year period.

Despite the difficulties with these types of cross-ethnic group comparison, these data would support the claim that Inuttitut instruction supports heritage-language development among Inuit children at least as well as French or English instruction supports language development among native speakers of these two languages.

Comparison 4: Second-Language Proficiency of Inuit Children in the English and French Programs Versus Mixed-Heritage Children in the Inuttitut and French Programs

Hypothesis 3 predicted that a pattern of second-language acquisition that is truly subtractive should not only show disruptions in the development of the heritage language but also include only partial or incomplete proficiency in the

second language. Thus, compared with majority-language children (mixed-heritage) educated in a second language, minority-language children (Inuit) educated in a dominant second language should show slower progress in acquiring that second language. To test this hypothesis, Comparison 4 used second-language proficiency scores as the dependent variable and contrasted Inuit children in two second-language programs (English and French) with mixed-heritage children in two second-language programs (Inuttitut and French).

General language proficiency. An overall MANOVA comparing these four groups on general second-language proficiency at each of the six test occasions yielded a significant main effect of group, $F(18, 105) = 3.87, p < .001$ ($\eta^2 = .38$). Univariate analyses yielded significant differences between groups at the first test occasion (i.e., when the children were entering kindergarten), $F(3, 42) = 7.86, p < .001$ ($\eta^2 = .36$). Post hoc comparisons indicated that when entering kindergarten Inuit children in the French program ($M = 8.71$) had significantly lower second-language skills than all three other groups ($M = 22.62$ for Inuit in English, $M = 30.06$ for mixed-heritage children in Inuttitut, and $M = 19.12$ for mixed-heritage children in French).

The greater knowledge of English than French among Inuit children entering kindergarten is not surprising, because there is much greater general use of English in the community, a much higher rate of Inuttitut/English bilingualism, and the television is primarily in English (Taylor & Wright, 1990). The stronger proficiency of mixed-heritage children in Inuttitut when entering kindergarten is also not surprising, given that these children have one Inuit parent (usually their mother). Inuttitut is the heritage language of 96% of the Inuit in this community. Although it is clear that English is the predominate language in mixed-heritage homes (Taylor & Wright, 1990), these children are very likely to have been exposed to Inuttitut through their extended family and when their Inuit parent is interacting with other Inuit community members.

To understand the effect of second-language instruction, it was necessary to control for these large initial differences in second-language proficiency across the four groups. Thus, the analysis was rerun using a MANCOVA procedure. This allowed for comparisons on Test Occasions 2–6 using scores at the first test occasion as a covariate. Thus, second-language proficiency scores on Test Occasions 2–6 were adjusted for initial second-language proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The MANCOVA resulted in significant overall main effect of group, $F(15, 102) = 2.96, p < .01$ ($\eta^2 = .28$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 1 of Table 7. Univariate analyses indicated significant differences between the adjusted scores of the four groups at all six test occasions. On all six occasions, the adjusted second-language scores of Inuit children in French

instruction tended to be lower than the second language scores of all three of the other groups. Post hoc comparisons confirmed that these differences were significant except on Test Occasions 4 and 6, when the differences between Inuit children in French and mixed-heritage children in Inuttitut were not significant, and on Test Occasion 5, when the difference between Inuit children in French and mixed-heritage children in French was not significant.

These findings provide only partial support for the hypothesis that Inuit children educated exclusively in a dominant language will show slower progress in the acquisition of the second language compared with mixed-heritage children educated in a second language. Although this pattern held for Inuit children in the French program, it did not appear to hold for Inuit children in the English program. To examine potential differential effects on conversational and academic language proficiencies, separate analyses were run on each of these two scales.

Conversational second-language proficiency. The differential effect of second-language instruction on the conversational skills of Inuit versus mixed-heritage children in their second language was tested using a MANCOVA similar to that in the preceding analysis. Conversational proficiency scores in the second language at Test Occasions 2–6 were the dependent variables, with conversational proficiency in the second language at the first test occasion as a covariate. Thus, scores for Test Occasions 2–6 were adjusted for initial conversational proficiency at the beginning of kindergarten.

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The MANCOVA yielded a significant overall effect of group, $F(15, 102) = 2.37, p < .01$ ($\eta^2 = .24$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 2 of Table 7. Univariate analyses yielded a significant effect of group at Test Occasions 2 and 4.

Inspection of the adjusted means shows that Inuit children in the French program and mixed-heritage children in the Inuttitut program tended to score lower on conversational proficiency in the second language than Inuit children in the English program and mixed-heritage children in the French program. However, post hoc comparisons yielded only two significant differences. At Test Occasion 2, Inuit children in the French program scored significantly lower than Inuit children in the English program and the mixed-heritage children in the French program. At Test Occasion 4, mixed-heritage children in the Inuttitut program scored significantly lower than Inuit children in the English program and the mixed-heritage children in the French program.

Academic second-language proficiency. The differential effect of second-language instruction on academic language proficiency of Inuit versus mixed-heritage children in their second language was tested using a MANCOVA. Academic proficiency scores in second language at Test Occasions 2–6 were used as dependent variables, with academic proficiency in the second language at the first test occasion as a covariate.

Table 7

Comparison 4: Adjusted Mean Second-Language Proficiency Scores (General, Conversational, and Academic) for Inuit and Mixed-Heritage Children in Second-Language Instruction Programs Across Five Test Occasions

Test occasion	Inuit children		Mixed-heritage children		<i>F</i> (3, 41)	<i>p</i>	η^2
	English instruction (<i>n</i> = 14)	French instruction (<i>n</i> = 17)	Inuttitut instruction (<i>n</i> = 8)	French instruction (<i>n</i> = 7)			
Section 1: General language proficiency							
2. Kindergarten, spring	56.63 _a	34.14 _b	50.31 _a	52.22 _a	6.48	<.05	.32
3. Grade 1, fall	53.65 _a	33.50 _b	43.23 _a	47.79 _a	8.23	<.001	.37
4. Grade 1, spring	70.51 _a	61.13 _b	68.92 _{a,b}	71.50 _a	2.92	<.05	.17
5. Grade 2, fall	67.40 _a	54.73 _b	71.00 _a	63.79 _{a,b}	4.78	<.01	.25
6. Grade 2, spring	75.96 _{a,b}	71.21 _a	80.40 _{a,b}	81.19 _b	2.86	<.05	.16
Section 2: Conversational language proficiency							
2. Kindergarten, spring	60.57 _a	41.10 _b	48.10 _{a,b}	54.34 _a	7.65	<.001	.36
3. Grade 1, fall	50.67	36.50	47.22	48.42	2.57	<i>ns</i>	.16
4. Grade 1, spring	82.29 _a	73.04 _{a,b}	65.08 _b	80.37 _a	3.84	<.05	.22
5. Grade 2, fall	82.06	70.11	69.15	74.18	2.72	<i>ns</i>	.17
6. Grade 2, spring	89.25	83.61	79.94	87.23	2.12	<i>ns</i>	.13
Section 3: Academic language proficiency							
2. Kindergarten, spring	24.50	17.84	21.08	23.77	0.48	<i>ns</i>	.03
3. Grade 1, fall	19.20 _a	7.93 _b	18.23 _a	10.58 _{a,b}	7.72	<.001	.37
4. Grade 1, spring	30.60 _a	17.70 _b	55.81 _c	34.25 _a	18.15	<.001	.57
5. Grade 2, fall	27.87 _a	11.87 _b	51.93 _c	24.47 _a	16.37	<.001	.54
6. Grade 2, spring	41.31 _a	25.83 _b	65.33 _c	53.47 _{a,c}	9.68	<.001	.41

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure. All means are adjusted for language proficiency at first test occasion (i.e., scores when entering kindergarten).

Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$), indicating that the data did not violate the assumption on homogeneity of slopes. The MANCOVA yielded a significant overall effect of group, $F(15, 102) = 5.93$, $p < .001$ ($\eta^2 = .44$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 3 of Table 7. Univariate analyses yielded significant differences between the groups on Test Occasions 3–6.

Post hoc comparisons yielded a similar pattern for the last three test occasions, in which Inuit children in the French program scored significantly lower than the other three groups and mixed-heritage children in the Inuttitut program scored significantly higher than the other three groups. Inuit children in the English program and mixed-heritage children in French instruction scored in between.

The results of the separate analyses of conversational and academic language proficiency appear to provide mixed support for Hypothesis 3. Inuit children educated exclusively in a dominant language showed some signs of poorer acquisition of second-language skills than did mixed-heritage children educated in a second language. Although few consistent significant effects were found for conversational proficiency, academic language proficiency scores show that mixed-heritage children in Inuttitut instruction showed the greatest improvement. Both Inuit groups had

relatively more difficulties acquiring academic proficiency in the dominant language.

Analyses of specific tests. Three MANCOVAs were used to test the differences between Inuit, mixed-heritage, and Francophone children on the tests of Vocabulary, Story Comprehension, and Literacy (in Grades 1 and 2) in their second language. In each case, scores from the first relevant test occasion were used as a covariate and scores from subsequent test occasions were used as dependent variables. Preliminary analyses indicated no significant interactions between the covariate and the independent variable across the five dependent variables ($p > .05$) for any of the three MANOVAs, indicating that the data did not violate the assumption on homogeneity of slopes.

The analysis for the Vocabulary test yielded a significant overall effect of group, $F(15, 102) = 2.37$, $p < .01$ ($\eta^2 = .24$). The adjusted means for the four groups at each test occasion, univariate F statistics, and effect size statistics are presented in Section 1 of Table 8. The univariate analyses indicated significant differences between the groups at Test Occasions 2–6; post hoc pairwise comparisons indicated a similar pattern at each test occasion, with Inuit children in the French program scoring lower than the other three groups.

The analysis for the Story Comprehension test yielded a significant overall effect of language of instruction, $F(15, 102) = 2.38$, $p < .01$ ($\eta^2 = .28$). The adjusted mean scores,

Table 8

Comparison 4: Adjusted Mean Scores on Second-Language Vocabulary, Story Comprehension, and Literacy for Inuit and Mixed-Heritage Children in Second-Language Instruction Programs Across Five Test Occasions

Test occasion	Inuit children		Mixed-heritage children		<i>F</i> (3, 41)	<i>p</i>	η^2
	English instruction (<i>n</i> = 14)	French instruction (<i>n</i> = 17)	Inuttitut instruction (<i>n</i> = 8)	French instruction (<i>n</i> = 7)			
Section 1: Vocabulary							
2. Kindergarten, spring	60.71 _a	36.93 _b	58.57 _a	58.78 _a	6.51	<.01	.33
3. Grade 1, fall	64.53 _a	40.73 _b	56.79 _a	65.05 _a	7.42	<.001	.36
4. Grade 1, spring	79.08 _a	68.78 _b	71.27 _{a,b}	80.53 _a	4.21	<.05	.24
5. Grade 2, fall	80.03 _a	66.28 _b	78.94 _a	77.51 _a	4.77	<.01	.26
6. Grade 2, spring	86.44 _a	73.45 _b	84.73 _a	82.23 _a	25.12	<.01	.28
Section 2: Story Comprehension							
2. Kindergarten, spring	13.44 _{a,b}	5.56 _b	32.01 _a	31.74 _a	4.07	<.05	.26
3. Grade 1, fall	20.38	3.79	15.76	18.23	1.94	<i>ns</i>	.15
4. Grade 1, spring	20.12 _c	7.60 _b	51.71 _a	39.84 _a	8.33	<.001	.42
5. Grade 2, fall	18.04	3.38	27.34	13.41	2.30	<i>ns</i>	.17
6. Grade 2, spring	20.42 _c	8.38 _b	43.56 _a	35.09 _a	4.51	<.01	.28
Section 3: Literacy							
4. Grade 1, spring	44.65 _b	48.28 _b	79.70 _a	64.79 _a	5.71	<.01	.33
5. Grade 2, fall	37.28 _b	35.87 _b	58.60 _a	51.82 _a	2.69	.06	.19
6. Grade 2, spring	60.26 _b	64.16 _b	88.42 _a	77.45 _{a,b}	2.91	.05	.20

Note. Means in the same rows with different subscripts differ significantly ($\alpha < .05$) by Newman-Keuls procedure. All means are adjusted for language proficiency at first test occasion (i.e., scores when entering kindergarten).

univariate F statistics, and effect size statistics are presented in Section 2 of Table 8. Univariate tests yielded a significant effect of language of instruction at Test Occasions 2, 4, and 6. Post hoc pairwise comparisons indicated that Inuit children in the French program consistently scored lower than the other three groups, and at Test Occasion 6, Inuit children in the English program also scored lower than the two groups of mixed-heritage children.

The analysis for the Literacy tests (Grades 1 and 2) used the Literacy scores at Test Occasion 3 (beginning of Grade 1) as the covariate and those from the remaining three test occasions as the dependent variables. This analysis yielded a significant overall effect of language of instruction, $F(9, 123) = 4.60, p = .001 (\eta^2 = .25)$. The adjusted mean scores, univariate F statistics, and effect size statistics are presented in Section 3 of Table 8. Univariate tests yielded a significant effect of language of instruction at Test Occasions 4, 5, and 6. Post hoc pairwise comparisons indicated that Inuit children in both second-language programs scored lower than both groups of mixed-heritage children at all three of these test occasions.

Summary of Comparison 4. As pointed out earlier, Inuit children in the English program have a significant advantage over Inuit children in the French program in terms of developing skills in the language of instruction due to the much greater "out-of-school support" for English. This might account for the higher scores of Inuit in English over Inuit in French. However, even with the considerable out-of-school support for English over French, mixed-

heritage children in the French program were as strong in second-language academic proficiency as were Inuit in the English program.

Similarly, there is out-of-school support for mixed-heritage children's acquisition of Inuttitut. Mixed-heritage children are likely to be exposed to some Inuttitut with family and community members. Thus, the fairest comparisons might be as follows: (a) Inuit children in English versus mixed-heritage children in Inuttitut (children with some out-of-school support for the language of instruction) and (b) Inuit children in French versus mixed-heritage children in French (two groups in the same language program). In both of these comparisons, the group of Inuit children show significantly lower levels of academic language proficiency in the second language at the later test occasions, even with adjustments for initial academic language proficiency at the beginning of kindergarten.

Conclusions

Subtractive Bilingualism

Taken together, these data provide some support for the major hypotheses concerning the subtractive impact of instruction exclusively in a societally dominant second language. Consistent with Hypothesis 1, Inuit children in second-language instruction show what appears to be disruptions in the development of their heritage language. Comparison 1 (see Table 1) shows that over the first 3 years of school,

Inuit children in second-language classes show consistently lower levels of heritage-language proficiency compared with Inuit children in Inuttitut classes. This pattern holds for both academic and conversational language proficiency, although the effect is stronger for academic language proficiency and for all three specific tests we considered (Vocabulary, Story Comprehension, and Literacy). Comparison 2 (see Table 2) shows that Inuit children educated in a dominant language showed consistently poorer heritage-language proficiency than did mixed-heritage children educated in a second language. In this case, the effect is primarily in terms of academic language proficiency.

Hypothesis 2, that instruction in the heritage language can prevent or reduce this subtractive effect, was also supported. Comparison 1 (see Table 1) shows that Inuit children in Inuttitut classes scored significantly higher on heritage-language proficiency than did Inuit children in second-language classes (especially on academic language proficiency). More important, Comparison 3 (see Table 3) shows that by the end of the third year of school, Inuit children in Inuttitut instruction demonstrate levels of heritage-language proficiency that are equal to or exceed those of mixed-heritage and Francophone children educated in their heritage languages (again, especially in academic language proficiency).

There is also some tentative support for Hypothesis 3 concerning the greater negative effects of second-language instruction for Inuit children's second-language acquisition. However, this support is qualified by clear differences between the two dominant-languages programs. Comparison 4 (see Table 4) shows that Inuit children in the French program performed more poorly in the second language than did Inuit children in the English program, and more poorly on measures of academic proficiency in the second language than both groups of mixed-heritage children. Inuit children in the English program, although showing strong conversational skills, fell behind mixed-heritage children in the Inuttitut program on academic proficiency in the second language. It is possible that "out-of-school support" for the second language may be aiding the acquisition of English proficiency among the Inuit in the English program and Inuttitut proficiency of mixed-heritage children in Inuttitut. However, in the case of academic language proficiency, this out-of-school support is of greater assistance to the mixed-heritage children.

The Conversational-Academic Language Distinction

There is evidence that the conversational-academic language distinction may be valuable in understanding the nature of the subtractive bilingualism process. In some cases, the effects of language of instruction were much more apparent on academic proficiency, as was the case in Comparison 1. Although Inuit children in French and English instruction may continue to be able to carry on basic daily conversations in Inuttitut, they are not developing the sophistication in their heritage language that will allow them to use it for school work. As well (because the academic language proficiency measure was designed to measure

more than simply school-based skills), it would appear that these children may also be unable to use Inuttitut well enough to fully participate in the complex linguistic interchanges expected of children their age (such as understanding the implications of a story told by an elder).

Conversely, in Comparison 3 it is the conversational proficiency measure that shows the greatest differences across the groups. Although Inuit children and mixed-heritage children educated in a second language showed few differences in academic proficiency in their heritage languages, Inuit children showed a clear and consistent pattern of poorer conversational proficiency in their heritage language.

In short, it appears that heritage- and second-language instruction are associated with different outcomes in terms of heritage- and second-language development and that these differences are at some times reflected in the child's ability to use more sophisticated, abstract, decontextualized language and at other times reflected in the child's performance in context-imbedded, easier conversations consistent with those used in daily interaction. Analysis of both conversational and academic language proficiency provides a much more detailed picture.

Limitations to the Present Study

Of course, this type of field research is hampered by restrictions and limitations imposed by the practical realities of the research context. The most obvious limitation is one suffered by most educational research interested in the outcomes of real educational programs: the lack of random assignment of participants to conditions. In the present case, children are in a particular language program as a result of parental preference. This limits the confidence with which we can make direct causal statements. However, as indicated in the introduction, the size, isolation, and relative homogeneity of out-of-school influences within the Inuit population reduces many of the confounds common to research of this kind. In addition, we have collected baseline data at the beginning of the kindergarten year and can show that in the case of heritage-language skills (Comparison 1), Inuit children in all three language programs enter the programs with the same language proficiency. Thus, although there are certainly other possible mediating variables in addition to the specific content of the classroom instruction that may account for the subsequent differences in language proficiency, these mediating variables must be systematically associated with language of instruction. In cases where initial language-proficiency levels are not equivalent (Comparisons 2-4), we are able to use these baseline data as covariates.

In addition, this study uses a new, untested set of measures in all three languages. Although there are very real linguistic and cultural constraints that make this necessary, the confidence with which we interpret the findings must be qualified by the degree to which we accept that these are reliable and valid measures of proficiency in the three languages. In addition, despite our having made every effort to make these tests equivalent across the three languages, it is probably

true that absolute equivalence across languages is not possible (see Bontempo, 1993). Similarly, this research also makes comparisons across different ethnolinguistic-cultural groups and, as we have recognized in a number of places, this necessarily confounds cultural differences with the comparisons of interest. Thus, the findings of Comparisons 2-4, which involve some comparisons across languages, must be considered with this in mind.

Also, because it was necessary to add additional measures to the tests in each year of the study, direct tests across these years were not possible. So, although we are able to look at differences between groups across a number of occasions (replications), we are not able to look directly at improvement in children's proficiency in a language across the 3 years. For this reason, we have used a MANOVA approach that does not make direct comparisons between the six occasions.¹³

Finally, there are aspects of the present sample and educational context that are unique. First, the present sample is involved in educational programs that make almost exclusive use of a single language. Children in Inuttitut receive virtually all instruction in Inuttitut, and the English and French programs are almost as exclusive in their language use. Many bilingual programs in other communities make use of both the majority and minority languages in the same program, and the present data can be used only in a very speculative way when considering this "mixed language program." Second, these children live in a small, isolated northern community where the White majority population is small. The lifestyle and cultural habits of Inuit children may be very disparate from those of other minority-language children. This apparent uniqueness may raise questions about the generality of these findings to children in other multilingual school contexts. Can these data be used to support the broader contention that second-language education in a context dominated by the majority language and culture will be associated with a pattern of subtractive bilingualism among minority-language children?

Although the unique elements of the present sample and educational context cannot be dismissed, a closer examination may reveal that the experiences of the present sample may not be as unlike the experience of other minority groups in North America as it first appears. The limited exposure of the Inuit children in our sample to mainstream White culture may appear unlike the experience of other minority-language children, most of whom live in large towns and cities. However, research shows that, for the most part, neighborhoods throughout North America remain ethnically and racially segregated (Bickford & Massey, 1991; Farley, 1984, 1985). This reality leads to a situation in which children from many ethnic and linguistic minorities have little contact with majority group members. Whether the isolation results from hundreds of miles of arctic tundra or several city blocks and a railway track, the world of many preschoolers includes relatively little direct contact with ethnic out-group members.

The present context may also seem unusual because the linguistic minority is in reality the numerical majority in the community and the school. However, this is the usual occurrence in virtually every Canadian and many United

States Native reservation schools. It is also the growing reality for Spanish-speaking children in communities in California, New Mexico, and a number of other states. In many cases, the majority of the students are members of an ethnic or linguistic minority, whereas most of the teachers are White and Anglo, and the school is dominated by the mainstream language and culture. Finally, the non-verbal cultural traditions of the Inuit may also be shared by a variety of nonurbanized societies (Rogoff, 1990), making the experiences of the present sample similar to those of a variety of immigrant groups.

In summary, field research of this type clearly requires replication with other minority-language groups, in different educational settings, using different testing procedures. In addition, even longer longitudinal studies will help to determine whether the present findings continue and whether the subtractive process ultimately leads to the kind of complete or near-complete loss of the heritage language seen among other Native groups. That said, despite its limitations, the present research provides insights into the experiences of ethnolinguistic minority students in terms of the association between language of instruction and the subtractive bilingualism process; a process that threatens the child's heritage language and perhaps even disrupts second-language acquisition. In cases like the Inuit of Nunavik, where a small population of native speakers represent one of the only sources of the language, this subtraction of the heritage language represents not only a threat to the linguistic and social development of each child, it contributes directly to the advancing extinction of the language itself.

¹³ The data can also be analyzed using a series of three repeated measures ANOVAS, comparing data from the fall and spring within each of the 3 years. (The tests are identical for the two testings within a given year.) This, of course, makes the presentation of the data much more complex, and the basic results are very similar to those using the MANOVA approach. However, the results of these more complex analyses can be provided on request by Stephen C. Wright.

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