

The Linguistics of Language Revitalization: Problems of Acquisition and Attrition *

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1. Introduction

Complex phenomena often invite more than one type of explanation. During the 1830s, a smallpox contagion killed tens of thousands in England, in part because the Industrial Revolution had brought large numbers of people into crowded cities. In a sense, the epidemic was therefore a social phenomenon, fueled by economic pressures. At another level, however, it was a medical problem: a virus infected a large number of individuals who would otherwise have been healthy. There is nothing inherently right or wrong about either perspective; in fact, both are factually correct. Nonetheless, it is worth noting that, in the end, the medical perspective offered a more practical solution: smallpox was ultimately eradicated by a program of individual inoculation, not by abandoning industrialization or reversing migratory trends.

There may be a helpful lesson here for how we think about the study of endangered languages. On the one hand, language loss is most likely to occur under certain socio-economic conditions—poverty, urbanization, industrialization, a lack of political autonomy, and so on (e.g., Nettle and Romaine 2000:138ff, Fishman 2001:2, Austin 2011, Grenoble 2011, Harbert 2011, among many others). On the other hand, at a linguistic level, language loss can be thought of as a cognitive phenomenon. Put simply, a language dies when the conditions necessary for its acquisition and maintenance are no longer met: caregivers do not speak it enough in front of their children, and children do not have sufficient opportunity to use it in the first decade of their lives.

There is at least one good reason for approaching language loss and revitalization primarily as a linguistic problem: there is no practical alternative. The social forces that contribute to language shift are generally difficult, if not impossible, to reverse; the only hope is to mitigate their consequences by focusing on the conditions that favor language transmission within families, schools and neighborhoods. But that can be done only if we can define the precise conditions under which language acquisition occurs. As Fishman aptly states (2001: 13), 'It is of no help to tell a patient that he should attain health by getting better, or that he should get better by being healthier.' And perhaps more to the point, it is of little use to recommend a course of treatment that includes no information on how it should be implemented. 'Take some medication' is not a particularly effective piece of advice unless it is accompanied by an actual prescription: take this much of this drug on this schedule.

We cannot yet offer a prescription to communities who want to undertake a program of language revitalization. True, we can say that it is desirable for infants to be exposed to their community's language at home, that immersion programs are an effective option for young children, that it is good idea to have language programs for adults, that there should be

* For Kamele and Mālie. I thank the editors and Ryan Henke for their helpful comments.

opportunities to use the language beyond home and school, and so on (Fishman 2001, 12ff). However, these conclusions amount to little more than common sense. The hard questions, the ones whose answers will ultimately decide whether a language lives or dies, require more precise responses. How much exposure to a language is required for children to acquire it? How frequently does a language have to be used in order to be maintained? Do adults have a realistic prospect of success in language learning? And so on.

Much of what we know about these matters comes from research on language acquisition and maintenance in situations that are substantially different from those confronted by endangered language communities. Nonetheless, there are several key points of consensus that could very well serve as a foundation for a more directed program of research focusing specifically on issues of language revitalization. I will focus in this chapter on two macro-issues: the question of how children acquire—and lose—language, and the question of the practicality of bilingualism as a strategy for language revitalization.

2. Children and language

As any parent knows, children are especially gifted for language learning. Herein, for many people, lies the great hope for language revitalization. Surely, they think, all will be well if only we have children spend a few hours a week interacting with their grandparents or other speakers of the community's endangered language. Alas, things are not so simple. At least two factors, largely ignored in the revitalization literature, hinder and disrupt language acquisition even in childhood. I consider each in turn.

The importance of ample input

The enterprise of language revitalization is fraught with disappointments. A language is used at home, but children don't learn it. A community devotes its energy to a language immersion program, but the results fall well below expectations. Enthusiastic elders agree to teach the language to young learners, but their efforts fail. The most likely explanation for these results is simple: the children are not hearing the language often enough over a sufficiently long period of time. In my view, this is the single biggest challenge confronting revitalization efforts, and I will therefore devote considerable attention to research that addresses the importance of exposing young language learners to ample amounts of linguistic input.

Children's need for extensive exposure to whatever language they are learning was first documented in a landmark study conducted by two psychologists, Betty Hart and Todd Risley (Hart and Risley 1995, 1999). Their research team made monthly one-hour recordings of 42 children growing up in monolingual English-speaking families in the United States. The recording sessions began when the children were 7 to 9 months old and continued for two-and-a-half years. (Sampling techniques of this sort are common in research on child development, and are considered reliable, especially when they involve a large number of children and extend over a longer period of time, as the Hart–Risley study did.)

Hart and Risley's investigation revealed vast differences in the amount of language to which individual children were exposed. At one extreme were children from more talkative families, who heard more than 7000 utterance in a typical day—which amounts to about two-and-a-half

million utterances in the course of a year. This may seem like a very large number, but other work has produced comparable estimates (e.g., Wells 1985, Van de Weijer 2002, Roy 2009).

Table 1. Mean number of utterances per day and per year for children in more talkative families

<u>Sentences/day</u>	<u>Sentences/year</u>
7250	2.5 million+

In contrast, children from the least talkative families heard only about a third as much speech.

Table 2. Mean number of utterances per day and per year for children in the least talkative families

<u>Sentences/day</u>	<u>Sentences/year</u>
2170	800,000

These differences matter. At the age of 30 months, children from the most talkative families in Hart and Risley's study had vocabularies more than twice the size of the vocabulary of children from the least talkative families. Moreover, in the subsequent six months, the children from the highly talkative families went on to learn more than twice as many new words as their peers did.

Table 3. Children linguistic attainment as it relates to language exposure

	<u>Vocabulary size at 30 months</u>	<u>No. of words learned in next 6 months</u>
Talkative families	766	350
Non-talkative families	357	168

Vocabulary growth has long been recognized as a major marker of linguistic development, both in its own right (one cannot communicate effectively without an extensive vocabulary) and as a predictor of subsequent academic success. This point was recently further confirmed by Morgan, Farkas et al. (2015), whose longitudinal study of 8,650 children living in the U.S. revealed that larger vocabularies at age two correlated with better achievement in reading and mathematics upon entry into kindergarten three years later.

Vocabulary growth is also an indicator of how well other aspects of language have been acquired, including morphology and syntax (e.g., Bates, Bretherton and Snyder 1988). Fernald, Marchman and Weisleder (2013) report an additional effect involving how quickly children are able to recognize words that they hear. (Speed was measured by means of 'looking-while-listening' task: as the children looked at a picture of two familiar objects, they heard the name for one or the other. The amount of time, in milliseconds, that it took for their eyes to fixate on the right object was then measured.) In Fernald et al.'s study of 48 English-speaking infants, input-related differences in vocabulary size were evident at age 18 months and were positively

correlated six months later with word-recognition speed—a factor that has been linked in other studies to superior language and cognitive skills later in life.

A further interesting feature of Fernald et al.’s study was a correlation between vocabulary size and processing speed on the one hand and socio-economic status (SES) on the other. Overall, children from lower-SES families did less well. Hart and Risley report similar findings, for which they offer a straightforward explanation: the decisive factor is not SES; it is how talkative children’s families are. Addressing this point in an interview,¹ Todd Risley noted: ‘some poor people talked a lot to their kids and their kids did really well [linguistically]. Some affluent business people talked very little to their kids and their kids did very poorly.’ Risley went on to observe, ‘When you look at the amount of talking the parents are doing, nothing is left over relating to socioeconomic status. [The amount of talk] accounts for all the variance’ in children’s linguistic development.

This finding has been taken very seriously, both by scholars and by educators, and it has spawned a number of major projects devoted to filling the ‘word gap’ that hinders linguistic development in children from less talkative families. One such project, dubbed ‘Providence Talks’ (<http://www.providencetalks.org/>), uses bi-weekly visits and special technology to help parents keep track of how much they speak to their children. Early results suggest a significant increase in familial speech to children, with an average increment of over 4,000 words per day for children whose input was at or below the fiftieth percentile at the start of the project.² A program of periodic assessments is underway to document long-term results, including the possibility of improved performance in school.

The importance of input for linguistic development is not of course limited to English. Weisleder and Fernald (2013) investigated language development in a group of 29 Spanish-speaking Latino children in the United States, all from low-SES families. Their results revealed ‘striking variability’ in the amount of adult speech addressed to the children in samples collected when they were 19 months old. Some children heard as many 29,000 words in the course of a day, and some fewer than 2000. Crucially, the children to whom more speech had been directed had substantially larger vocabularies six months later and were quicker at recognizing words.

Do these findings extend to indigenous languages? A study by Schneidman and Goldin-Meadow (2012) considers the issue of input and development in a Yucatec Maya community in Mexico. Based on a study of 15 families, they report that the amount of speech directed to children at the age of 24 months was strongly correlated to the size of their vocabulary 11 months later. This is essentially the same finding that has been reported for English-speaking and Spanish-speaking children in the United States. It highlights the importance of input to language development in *all* linguistic communities, including those whose language is endangered.

Of course, quantity is not the only important factor; the *quality* of the input also matters, as various studies have shown (Hoff 2003; Huttenlocher et al. 2002, 2010; Rowe 2012; Ramírez-Esparza 2014). Children benefit from speech that is carefully articulated, from sentences that increase over time in complexity and sophistication, and from stories and conversations that capture their interest. Most important of all may well be the opportunity for one-on-one

¹ The interview can be accessed at <http://www.childrenofthecode.org/interviews/risley.htm>.

² <http://www.providencetalks.org/wp-content/uploads/2015/10/Providence-Talks-Pilot-Findings-Next-Steps.pdf>

interactions. A number of recent studies have documented the value of speech that is directed specifically to the child, identifying it as a major predictor and facilitator of linguistic development (Schneidman et al. 2013 for English, Weisleder and Fernald 2013 for Spanish, and Schneidman and Goldin-Meadow 2012 for Yucatec Maya). In Weisleder and Fernald's study, for example, vocabulary size at 24 months was linked to the amount of speech addressed to the child, not the amount of speech that she or he simply overheard.

The danger of attrition

It is often suggested that children's early success in language learning is due to a high degree of 'cerebral plasticity,' which allows them to quickly acquire new words and morphosyntactic patterns. The downside of cerebral plasticity is that until those words and patterns are fully entrenched, they are highly susceptible to loss. Language attrition is far less studied than language acquisition, but what is known points toward a major peril for children whose exposure to their first language is dramatically reduced (or even ceases) after a few years, often at the point at which they start attending school.

One well-documented example of rapid language attrition in young learners comes from the study of children who have been adopted by families living in a different country and speaking a different language (Genesee & Delcenserie 2013). Based on a survey of 130 infants and toddlers who had been adopted prior to the age of 30 months, Glennen and Masters (2002, 427) report a quick loss of 'existing ability in their birth language'—a conclusion that has also been confirmed by case studies of individual children (e.g., Nicoladis & Grabois 2002). Schmid (2012:184-85) reports a similar result in older children who were adopted after they had begun school, and Isurin (2000) documents precipitous language loss in a nine-year-old adoptee who she studied over a two-year period.³

The speed of attrition in adoptees is alarmingly fast, and one cannot help but wonder whether it might be attributable to the wrenching experience of being sent to live with a new family in a foreign land. However, the rate of linguistic decline observed in adoptees is not out of line with what has been reported in studies of children who move to a new country with their birth families. In one such study, Berman (1979) reports on a three-and-a-half-year-old Hebrew-speaking child who lost her ability to speak and understand Hebrew after just a few months in the United States with her family. Sunyoung Lee and I have documented a somewhat similar case involving a young Korean girl, who spent several months in the United States with her bilingual mother. The child, who was 6;10 at the time of her displacement, quickly became immersed in a monolingual English environment—she attended English-language school and her mother spoke to her almost exclusively in English. During the course of her stay in the United States, the child participated in a regimen of testing that included a 120-item picture-naming task that was administered monthly. The results are summarized in figure 1.

³ By far the largest investigation of language loss in adoptees was carried out by Gindis (2009), who studied 800 adoptees, mostly from Eastern Europe, whose age at adoption ranged from 3;6 to 9;00. Gindis reports that the children lost the ability to understand their birth language within a matter of months, with an even faster decline in the ability to speak it. Unfortunately, he provides no information about his methodology, and his study apparently did not undergo peer review.

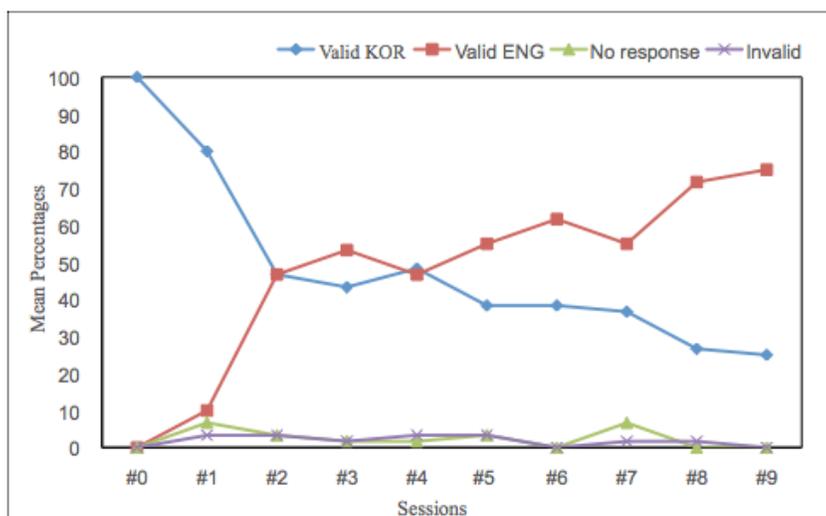


Figure 1. Vocabulary loss in a six-year-old Korean child

As can be seen here, the child's ability to access Korean vocabulary began to decline within the first month of her departure from Korea and her success rate fell to less than 50% after just two months in the United States. A dramatic decline was also observed in her ability to produce narratives and to carry on conversations in Korean; in fact, she quickly reached the point where she could no longer speak in Korean to her father, who had remained in Korea but spoke with her regularly by phone.

It is not yet known to what extent lost linguistic skills can be recovered, but it is evident that age and the amount of time that elapses before re-exposure to the language are crucial (Köpke and Schmid 2004, Bylund 2009, Hyltenstam et al. 2009). Various case studies have documented recovery of a lost or weakened childhood language by pre-adolescent children. For example, the Korean child who Sunyoung Lee and I studied began speaking her first language again shortly after her return to Korea. Berman (1979) reports similar success for the young Hebrew-speaking child who she studied (see above), and Hubbell-Weinhold (2005) recounts the recovery of English by three sisters who were immersed in Swiss German for three years, beginning when they were between the ages of 8 and 11.⁴

In contrast, the prognosis for recovery of a lost childhood language by adults is poor. Pallier et al. (2003) report that adults in their twenties and early thirties who had been adopted between the ages of 3 and 8 were unable to distinguish sentences of their native Korean from sentences of Polish and Japanese. Along similar lines, Hyltenstam et al. (2009) found that even after two years or more of study, a group of 21 ethnic Korean adults who had been adopted as children performed no better on Korean grammar tasks than did native speakers of Swedish who were studying Korean as a second language.

There are perhaps two bright spots in this otherwise quite grim picture. The first involves auditory perception. Research on Korean adoptees suggests that adults may retain a sensitivity to

⁴ It is worth noting, however, that although the children in these studies ceased to speak their first language for a period of time, they continued to receive some exposure to it from family members while abroad.

at least some subtle phonetic contrasts in their lost first language and that this sensitivity can be enhanced through practice and exposure (Bowers et al. 2009, Hyltenstam et al. 2009), Oh, Au and Jun 2010, Park 2015). In Oh et al.'s study, for instance, twelve adults (age 18 – 33 yrs) who had been adopted from Korea prior to age 1 and who had minimal subsequent exposure to Korean, were tested on their ability to distinguish among tense, lax and aspirated consonants—a staple of Korean phonology. While there was no overall advantage compared to a control group, the adoptees were better at distinguishing between lax and aspirated consonants.

A second bright spot involves the finding that adults who have spoken their first language into adolescence are able to maintain a relatively high level of proficiency, even after many years without an opportunity to use it. When tested, they often show relatively minor deficits and can still use the language effectively for communicative purposes, although not of course at the same level as monolingual native speakers (e.g., Köpke 2004, Köpke and Schmid 2004, Tsimpli, Sorace, et al. 2004). A particularly striking example comes from Schmid's (2012) case study of 11 Jewish children, who were rescued from Germany during World War II. Then 11 to 15 years old, they were placed with English-speaking families in the United Kingdom, and had no subsequent opportunity to speak German. Interviewed fifty years later, the by-then elderly subjects showed a remarkable ability to speak German as they recounted their experiences before and after adoption. Köpke and Schmid (2004) present other case studies, along with far-ranging discussion of language attrition and retention in adults.

Implications

What can we make of findings such as these on language acquisition and attrition as we think about the revitalization of endangered languages? In my opinion, two points are especially worth highlighting.

First, we see the importance of monitoring the quantity and quality of the language to which learners are exposed in revitalization programs. Hearing just a few dozen (or even a few hundred) utterances per week is unlikely to result in the acquisition of more than a few vocabulary items and fixed expressions. At the same time, exposure to an overly narrow range of speech, even in large quantities, can also create problems. An instructive example of this comes from Peter, Hirata-Edds and Montgomery's (2008) study of a first-grade Cherokee immersion classroom. Although the thirteen children in the class had already completed one to two years of pre-school immersion, they all performed very poorly on verbal inflection, with success rates of less than 20%. (Cherokee has two basic verb classes, each of which agrees with its subject in person and number.) Upon closer inspection, Peter et al. found the likely reason: the teachers tended to interact with the students through the use of commands (Sit down, Write on your paper, Read page 5), which provide no variation in the choice of subject and therefore little opportunity to observe the workings of subject-verb agreement.

Second, signs of language breakdown, such as difficulty accessing vocabulary and a decrease in fluency, occur soon after children's exposure to the first language ceases, often in a matter of months, if not weeks. A language cannot be considered secure unless it is used at least into adolescence. Children require continuous long-term exposure to the community's language if they are to maintain what they learned so easily as infants.

3. Bilingualism

No one has ever proposed that a community should become monolingual in order to save its language. Indeed, calls for monolingualism typically have the opposite goal in mind: the sacrifice of the indigenous language under the pretext that it is an inferior mode of communication or that its use undermines national unity. Bilingualism is the foundation of any reasonable plan for language revitalization.

This leads us to two important questions. Is bilingualism a good thing? Is bilingualism a practical option? Let us consider each question in turn.

The effects of bilingualism

The most obvious advantage of bilingualism is that it confers fluency in a second language, offering children and adults the benefits of maintaining their community's traditional language, without sacrificing the opportunities that might come from also being proficient in a national or international language. This in turn creates a cascade of developmental, cognitive and psychological effects.

On the developmental side, it is clear that acquiring two languages cannot take less time or effort than acquiring one. It is widely recognized that children who simultaneously acquire two languages learn each somewhat more slowly than do monolingual learners (e.g., Hoff et al. 2012, 20-22). The exact extent of the lag reflects the relative amount of exposure to each language (see below). Eventually, though, bilingual children catch up to their monolingual peers and are able to enjoy the advantages of fluency in two languages rather than just one.

It has also been established that even fluent bilinguals are slightly slower than monolinguals at retrieving words from their mental lexicon—a reflection of the 'embarrassment of riches' (a dual vocabulary) conferred by bilingualism. However, the slowdown is too minute to have any effect on communication and therefore does not create a practical disadvantage of any sort.

A wide range of cognitive benefits have been associated with bilingualism, ranging from protection against dementia (Schweizer et al. 2012) to being better able to take the perspective of others (Lieberman, Woodward et al., in press). Overall, the single most studied cognitive advantage of bilingualism involves apparent improvements in the 'executive processing' needed to sustain attention, adjust to contextual demands, and avoid distracting information (Bialystok, Fergus and Luk 2012)—all valuable skills. This claim is worth exploring in more detail, as it has recently become the subject of controversy.

A typical piece of evidence for a bilingualism-related advantage in executive processing comes from performance on 'Stroop tasks,' in which participants have to deal with distracting stimuli. In one experiment of this type, Hernández, Costa, Fuentes et al. (2010) presented young adult bilinguals and monolinguals with a series of numerals and asked them to indicate how many digits each contained. As illustrated below, there were two types of test items—congruent, in which the numerals directly signaled the number of digits, and non-congruent, in which there was a mismatch.

Congruent (numerals = no. of digits)	Non-congruent (numerals \neq no. of digits)
22	11
333	222

Bilinguals responded faster than monolinguals on both conditions, demonstrating a superior ability to use the extra clue on the congruent items and to suppress the distracting information on the incongruent items.

In another type of task, participants are asked to indicate the direction of an arrow that is flanked on each side by two other arrows. In the congruent pattern, all arrows point in the same direction; in the non-congruent pattern, the middle arrow points in a different direction.

Congruent	Non-congruent
→ → → → →	← ← → ← ←

Costa, Hernández and Sebastián-Gallés (2008) report that adult Spanish-Catalan bilinguals responded faster than monolinguals on both conditions and were less susceptible to interference from flanking arrows in the non-congruent test items.

Many similar findings have been reported (see, e.g., Bialystok et al. 2012 for a review), but the jury is still out on whether the reported effects are consistent, whether they are restricted to certain conditions, and whether they are manifested in only some types of bilinguals. For various perspectives on these issues, see Costa et al. 2009, Paap and Greenberg (2013), Baum and Titone (2014a,b), Duñabeitia, Hernández et al (2014), Bialystok, Kroll, Green et al. (2015), and Sekerina & Spardlin (2016).⁵

This controversy matters little for work on language endangerment and revitalization. If there are cognitive advantages of bilingualism, they should of course be reported to educators and caregivers. But it is important not to lose sight of the greater prize, which is the preservation of the community's traditional language. Indeed, there is good reason to think that this accomplishment confers psychological benefits independent of those associated with cognitive function. For instance, it is by now a well-established fact that proficiency in one's heritage language contributes to a sense of self-esteem and well-being (McIvor 2005, Fishman 1991, 7-8).

A further correlate is better academic achievement. Based on a review of Navajo, Yup'ik and Hawaiian language immersion schools, McCarty (2011) reports that indigenous language programs contribute not only to language maintenance, but also to improved scholastic performance. For example, in addition to developing their Navajo language skills, students in the Rock Point Navajo immersion program consistently outperformed their peers in English-only programs on state tests, even in mathematics and English. This is not an isolated finding: drawing on data from a multi-year study of 700,000 students representing 15 minority languages,

⁵ This issue has generated significant public interest in the media, including articles by Maria Konnikova ("Is Bilingualism Really an Advantage?") in the January 22, 2015 issue of the *New Yorker* and by Ed Yong ("The Bitter Fight over the Benefits of Bilingualism") in the February 10, 2016 issue of *The Atlantic*.

Thomas and Collier (1997) report that instruction in the child's native or heritage language is the single most powerful predictor of academic success in many cases.

More dramatically, there is even evidence that retention of a heritage language can sometimes be a matter of life and death. Based on a study of more than 150 Aboriginal communities in British Columbia, Canada, Hallett et al. (2007) report that youth suicide rates were correlated with the degree to which communities had maintained their traditional language. Communities with low language retention rates had six times as many youth suicides as communities in which at least half the population had retained an ability to converse in their traditional language. Of course, it is difficult to determine the exact contribution of language retention itself to this result. Chandler and Lalonde (2008) suggest that the key overall factor is 'cultural continuity,' of which language is a major component. Other relevant factors include self-government, legal title to traditional lands, control over education and community services, and promotion of traditional cultural practices—as well as the participation of women in local government and the provision of child care services.

The practicality of bilingualism

Bilingualism is a natural cognitive state, commonplace throughout the world. No reliable world-wide statistics are available, but a 2012 survey coordinated by the European Commission Directorate-General for Communication reports that more than half of all Europeans speak at least one language in addition to their mother tongue, with rates of bilingualism or multilingualism at well over 90% in several countries, including Luxembourg, the Netherlands, Latvia, Lithuania and Slovenia.⁶ According to 2007 U.S. census estimates, approximately 20% of Americans aged five and older speak a language other than English at home.⁷ Census figures for Canada, compiled in 2011, indicated that 17.5% of the population speaks two languages at home.⁸

Balanced bilingualism is rare: equal fluency in two languages is 'the exception, not the norm' (Grosjean 1982, 235) and therefore not a practical goal for most individuals or for most revitalization programs. A more realistic goal is to seek a level of fluency in each language that will support effortless communication in whatever situations it is used. A key predictor of this sort of developmental success is the amount of exposure that children receive to each of their two languages. A study by Hoff, Core, Place et al. (2012) offers an illustrative example.

Hoff et al. examined lexical and grammatical development in 47 bilingual Spanish-English children, aged 22 to 30 months of age. Their principal finding was straightforward: development is strongly correlated with the amount of home language input. Put simply, children who hear more Spanish than English have a better grasp of Spanish, in terms both of vocabulary and of the ability to produce complex sentences. Similarly, children who are exposed to more English than Spanish manifest an advantage in English.

Thordardottir (2015) reports comparable contrasts in a study of 56 three-year-olds and 83 five-year-olds who were growing up in Montreal, speaking both French and English. Because the

⁶ http://ec.europa.eu/public_opinion/archives/ebs/ebs_386_en.pdf

⁷ <http://www.census.gov/prod/2010pubs/acs-12.pdf>

⁸ <http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/98-314-x2011001-eng.cfm>

children were matched for socio-economic status and for non-verbal cognitive skills and because both languages have high status in Montreal, Thordardottir's study was able to control for many of the external factors that often obscure the role of input in language development. Her results were clear-cut: children who received unequal exposure to the two languages performed less well in the less commonly heard language in terms of vocabulary, utterance length, and use of inflection.

This in turn leads to the question of what the minimum input for bilingual development might be. It is not currently possible to identify a precise cut-off point for bilingual development; however, a suggestive finding by Pearson, Fernández, et al. (1997, 56) has been influential. In a study of 25 Spanish-English bilingual children who received varying amounts of exposure to the two languages, Pearson and her colleagues noted that six of the seven children who had received less than 20% of their exposure to one of the languages were 'very reluctant' to use that language and appeared to be 'tuning it out' when it was used around them in laboratory play sessions; see also Hoff et al. (2012, 22). Genesee (2007) and Baker (2014, 38) recommend a minimum of 30% exposure in order to ensure that a language develops fully.⁹

Ideally, children will receive a good deal of exposure to their family's language at home in the course of their childhood. Indeed, census results indicate that only a small percentage of bilinguals in the U.S. (around 16%) learned a language other than English in school, according to a study by the Commission on Language Learning of the American Academy of Arts and Sciences.¹⁰ The vast majority (over 75%) became bilingual thanks to early exposure to their family's traditional language. Sadly, many parents are reluctant to use that language at home, in the belief that their children benefit from being exposed only to the language of school. However, based on a study of 29 five-year-olds and their parents, Place and Hoff (2011, 1847) suggest that children do not benefit from this practice and that it has the negative effect of denying them access to their heritage language and potentially impeding parent-child communication. Paradis (2011, 231) draws a similar conclusion based on a study of 169 children aged 4 to 7; see also Hammer, Davison et al. (2009).

The prospects for acquired bilingualism in adults

Language revitalization programs typically target all age groups. Children may be the best language learners, but their ability to assume leadership of the revitalization effort may be decades away. In the meantime, they need role models and the community needs teachers (e.g., NeSmith 2012 for Hawaiian, and Te Paepae Motuhake 2011 for Maori). Often, these

⁹ There is some confusion over Genesee's recommendation, because it appears in different forms in two versions of the same article. In one version, available at Genesee's website (<http://www.psych.mcgill.ca/perpg/fac/genesee/A%20Short%20Guide%20to%20Raising%20Children%20Bilingually.pdf>), he says 'Our best guess at this time is that bilingual children must be exposed to a language during at least 30% of their total language exposure if their acquisition of that language is to proceed normally. Less exposure than this could result in incomplete acquisition of that language.' However, in the other version (available at <http://www.multilingualliving.com/wordpress/wp-content/uploads/mag/sept07/multilinguallivingmagazine.pdf>), Genesee explains that 'this 30% criterion may not be sufficient to ensure that a child acquires the language completely.' Grüter, Hurtado, et al. (2014) show that 'density' of exposure (how many utterances the child actually hears) is a better predictor of bilingual fluency than simple time of exposure.

¹⁰ The report is available at www.amacad.org/content/publications/publication.aspx?d=22429.

responsibilities fall to adult second-language learners. Two important fact calls for acknowledgment.

First, non-immersion school-based programs for language teaching rarely provide adults (or children) with enough input to develop fluency. The best estimates that we have (based on data from the U.S. Foreign Service Institute) suggest that a daunting amount of classroom time is required to develop mid-intermediate or low-advanced proficiency: many hundreds of hours for a young adult of average aptitude (Rifkin 2003, Johnson 2016) and even more for languages with a complex morphology and syntax.

Second, the ability to acquire language naturalistically declines with age. Indeed, with very rare exceptions (most notably Snow and Hoefnagel-Hohle 1985), comparative studies of age-related success in second language acquisition point toward a strong advantage in favor of young children. The earliest signs of a decline in the ability to learn a second language are manifested in the first year of life, perhaps as early as six months, as children begin to lose the ability to distinguish among new speech sounds (Werker, Lloyd, et al. 1996, Yoshida, Pons, et al. 2010, Kuhl 2011). By the age of eleven or twelve months, monolinguals are sensitive just to the phonetic contrasts of their one language, while bilinguals manifest a sensitivity to the sounds of both their languages (Ramírez, García-Sierra and Kuhl 2016).

The early loss of phonetic sensitivity can result in non-native pronunciation in a later-learned language. In Granena and Long's (2012) study of 65 Chinese-speaking immigrants to Spain, for example, no one whose first exposure to Spanish took place after age 5 developed native-like pronunciation (as judged by a panel of 12 native speakers), no matter how long they had been in their new country (more than 20 years in some cases).

The ability to acquire grammatical contrasts declines more slowly, and some studies (e.g., Schwartz 2004) suggest that children can acquire the grammar of a second language in much the same way as native speakers if they are exposed to it by age four. Older learners, including adolescents and adults, typically fare less well, as documented in detailed studies by Granena & Long and by Abrahamsson and Hyltenstam (2009), among others. However, it is well established that individual differences in aptitude make language learning easier for some individuals than for others (e.g., DeKeyser 2000, DeKeyser, Alfi-Shabtay and Ravid 2010), and that high motivation can facilitate progress toward proficiency (Ushioda & Dörnyei 2012, Dörnyei 2014). In all cases, rich input remains vital, ideally in an immersion setting.

Implications

Not every community can hope to restore full intergenerational transmission of its language. Nonetheless, regardless of the type of revitalization program that it chooses to pursue, the prospects for a positive outcome can be improved by an understanding of the conditions under which second languages are learned and maintained. I have focused here on two findings of broad relevance.

First and most obviously, the prospects for success in acquiring a second language are best with very young learners (ideally infants or toddlers), whose skills as language learners have not yet been compromised by age-related decline. In short, all other things being equal, the earlier that children are given the opportunity to become bilingual, the better.

Second, because language revitalization programs have bilingualism as their goal, care must be taken to ensure the quantity and quality of children's exposure to both languages. Like their monolingual counterparts, bilingual children need to hear ample amounts of speech addressed to them and to have frequent opportunities to engage in conversation. In order to ensure genuine proficiency in both languages, a rough balance in the child's linguistic experience is therefore important, with (it seems) neither language making up more than 75% of the total input. Moreover, the danger of attrition is ever-present. Children who learn two languages require ongoing opportunities to hear and use both, at least into the adolescent years.

4. Concluding Remarks

We all want languages to be saved, and we all know that this requires intergenerational transmission—a fact that is acknowledged in every measure of language vitality that has ever been proposed (see Lee and Van Way 2016 for a review). But we cannot allow ourselves to engage in magical thinking. The laws of cognition do not vary from place to place, anymore than the laws of nature do. It doesn't matter what the language is, where it is spoken, or how endangered it is. Languages can be saved only if they are acquired by each generation of children, and that can happen only if particular *linguistic* conditions are met. The study of those conditions is an ongoing matter, and there is a particular need for research that is directed specifically toward the acquisition and use of endangered languages. Nonetheless, we do have in hand certain fundamental findings that can and should inform ongoing efforts to preserve and revitalize threatened languages.

Writing a quarter of century ago, Fishman (1991, 1) made the sobering observation that 'most efforts to reverse language shift are only indifferently successful, at best, and outright failures or even contra-indicated and harmful undertakings, at worst.' Fifteen years later, despite a flurry of activity in the name of language conservation, Grenoble & Whaley (2006:ix) express a similarly pessimistic view: 'an honest evaluation of most language revitalization efforts to date will show that they have failed.' No revitalization program can be perfect, of course. Compromises have to be made, and some disappointments are inevitable. Nonetheless, we are now at least in a position to better see how our energies should be invested, to know what is realistic and reasonable, and to understand the benefits and perils both of action and of inaction.

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