Learning another language

A collection of articles on language learning from the Mempowered website

By Dr Fiona McPherson

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How many words do you need to learn?

An analysis of English vocabulary* has found that the first 1000 words account for 84.3% of the words used in conversation, 82.3% of the words encountered in fiction, 75.6% of the words in newspapers, and 73.5% of the words in academic texts. The second 1000 accounts for about another 5% (specifically, 6% of conversation, 5.1% of fiction, 4.7% of newspapers, 4.6% of academic texts). In other words, if you learn the top 1000 words, you would understand 84% of the words used in ordinary conversation, and if you learned the top 2000, you would understand 90% of the words used.

While the effort to learn this second 1000 words may seem a lot of effort for not much gain, the difference between understanding 84% of the words and understanding 90% is actually quite dramatic. Learn those first 2000, and you can go out there and talk to people, and the words you don't understand will be obvious by context a lot of the time.

You will also have enough to read novels (87.4%) — not quite as good a coverage as in conversation, but good enough, especially when you consider the advantage a book has over conversation — you can take as long as you need to understand what's being said.

I haven't seen such analyses in other languages, but I imagine that the results would be similar (perhaps even higher coverage given, since it is generally agreed that English has a particularly large vocabulary).

I.S.P. Nation says, in his widely regarded text on learning vocabulary in another language[1], that "high-frequency words are so important that anything that teachers and learners can do to make sure they are learned is worth doing."

In one sense, high-frequency words are easier to remember because you come across them so often. But words are inherently different in how easily learned they are. What factors govern the learnability of individual words?

Factors that affect how easily learned a word is

The most important factor in determining how easily words are learned is, of course, how similar they are to the words in one's native language (or another language you know well). Learning a language that is closely related to a language you already know is obviously a very different proposition to learning a language that is unrelated. Thus, learning Spanish when you already know French and English and Latin (my own position) is made infinitely easier by virtue of the vast number of words that are "cognate" (words that are the same or very similar in both languages).

You do need to pay particular attention to so-called "false cognates" - words which appear similar, but have different meanings. But in most cases that doesn't require any special strategy; the observation that they are different is enough (provided, of course, that you are sufficiently

aware to remind yourself every time you come across the word - this is much easier if you are immersing yourself in a language).

Another factor is the similarity between the word and other words in the chosen language that you've already learned.

Another factor is the context in which you are learning the word. You generally don't learn only one word at a time. So factors that will influence ease of learning will be:

- the relationship between the words (it's more difficult to remember words that are similar in meaning, if you try and learn them at the same time);
- how many words you're learning at a time (if the words are difficult, learn fewer);
- the order in which you learn them (words you learn first and last are more easily remembered, therefore you need to give more attention to those in the middle, to make up for it)

What's your goal?

Your strategy will also be very different depending on whether your primary goal is to understand the language (either in reading or listening) or to produce it (speaking or writing). Learning to speak or write is of course much more difficult than simply learning to understand (which requires recognition rather than the harder recall).

Approaches to learning vocabulary

Your approach to learning a language depends therefore on all these factors. Most particularly, *how* you learn a language depends on *why* you want to learn the language.

A large proportion of teach-yourself language books assume your purpose is to travel in a country that speaks that language. Accordingly, the emphasis is on learning appropriate phrases for situations such as eating in a restaurant, buying a train ticket, etc. Another, growing, section is aimed at business travelers, with appropriate phrases for formal introductions, conversations in an office, etc. Both of these categories emphasize the conversational — learning to speak and listen.

None of these, I'm afraid do anything for me. I've tried, but they are too far from what I want. Any time I spend on them is wasted by the little voice saying, 'So? Do I care? Why should I want to know this?' My own desire is always to be able to *read* the language.

I was wildly delighted when I found "Literary Chinese by the inductive method" - a 1948 book that teaches Chinese by presenting the text of the simplest classic Chinese text - the Classic of Filial Piety - and providing notes on the meaning of each character, including notes on the derivation of those characters and their elements. This method probably would not appeal to many people, but since my primary reason for learning Chinese is to read the classic texts, it appeals to me hugely.

A large part of the appeal is that you are learning, right from the beginning, something "real". This is a text that people have been reading and studying for over 2000 years. That alone gives the words an intrinsic fascination. And looking at each character through its etymology gives each word a depth of meaning that immediately provides connections, and sometimes, emotional resonance.

For me, that is. I recognize that, for many people, this approach would leave them cold.

The point is that, regardless of how "good" a course/book/program is, what matters is how well it works for you. Which is why, even if you're using a "canned" system, you still need to customize it to your own quirks and style. To do that you need to have a wide variety of strategies to call on, and an understanding of the principles involved.

Links

General resource for learning another language

http://www.languagetutoring.co.uk/

Learning English:

test yourself to find your level: http://www.er.uqam.ca/nobel/r21270/levels/

learning words in context:
http://www.bbc.co.uk/worldservice/learningenglish/news/words/general/word2001.shtml

(news items with difficult words and phrases explained)

http://www.rhymezone.com/ give it a word and it will find words that rhyme with it, and also point to definitions, and quotations in which the word appears

http://www.better-english.com/exerciselist.html exercises to improve your English

http://www.comenius.com/idioms/ new idiom to assist students of English. They provide a definition as well as audio files of the idiom itself and the idiom used in context.

References:

Nation, I.S.P. 2001. *Learning Vocabulary in Another Language*. Cambridge University Press.

Strategies for learning languages

A general distinction you can make is that between:

- direct study, and

- learning from context

Direct study is more important when you're learning a non-cognate language. It's also more important in the initial stages of learning a language. Learning from context is particularly useful for cognate languages.

Of course learning a language requires both approaches, but the relative proportions will vary.

You need both definitional and contextual information to "know" a word properly. It is also helpful to process words at a "deeper" level - by playing with them, using them, thinking about them.

And of course, you need multiple exposures - a requirement for which extensive reading is the best remedy, but in the beginning, is probably best answered by programmed texts/courses that repeatedly present words in slightly different contexts (e.g., in different sentences).

Let's look at some particular techniques:

Decontextualized vocabulary

Word lists - can be a useful resource. generally decontextualized; however, sometimes they are provided in conjunction with a reading passage, thus providing context - this is, of course, more effective. lists of "most frequently used" words can also be quite motivating. however, lists of difficult or less frequent words are probably more useful. lists are also fairly tedious to learn from. their main use is therefore as a *resource* - e.g., in order to make flashcards or semantic maps. (look below for some word lists available on the Web)

Set yourself **targets** (daily as well as longer term)

Study words in their "**families**" - e.g., write, written, wrote, writing, typewriter, etc

Flashcards

Drill - good for getting in the needed repetition; most useful when they involve multiple media; when they group words according to context (words that "belong" together, for one reason or another), rather than, as is often the case, according to frequency; when they provide full and immediate feedback. (More on flashcards below)

Bilingual-dichotic method

This is a somewhat specialized technique. Dichotic listening refers to a technique used in the psychology laboratory, whereby a person wearing headphones hears different messages in the left and right ear. The technique has been used with some success in teaching foreign language words - the foreign word is heard in the right ear while simultaneously the native translation is heard in the left ear (most people process speech better in the right ear). The student is instructed

to attend to the foreign language word. The student also has a list of the words to read while listening.

Reading

Graded reading - is, after all, the means by which most of us acquired the bulk of our native language vocabulary; the main problem with this approach, when applied to another language, is that you need to understand around 95% of the words in a text in order to infer the meaning of the rest. this makes it harder to simply grab books aimed at the native speaker - you need graded readers, specifically created for students of the language. another useful resource to build up your vocabulary are bilingual readers.

The great benefit of reading is the repeated experiences of the same words in slightly different contexts; the down side is that it is a time consuming method of learning. also, infrequent words will, of course, appear infrequently - these words really need to be given special attention.

Dictionary use - using a bilingual dictionary is of course helpful, and often necessary; however, it is better if looking things up in the dictionary is NOT your first strategy - better to try and guess the meaning first. effective students tend to use a dictionary flexibly and thoughtfully; they are also better at judging when guesses are likely to be accurate, and which words in a sentence are most important for understanding the meaning.

A useful strategy to prevent you getting too bogged down, is to mark the words you're in doubt about, on your first reading, and then look them up at the end of the passage.

The Web is a great resource for language students - find a **newspaper** in your chosen language and practice with it regularly; find a **radio station** that broadcasts in your chosen language

I find **DVDs** wonderful - look for ones that offer your chosen language. You can listen in your native language and have subtitles in your chosen language; listen to your chosen language with native language subtitles; or, have both the soundtrack and the subtitles in your chosen language.

Retelling

Try to **retell** passages of text in your own words

Recounting what you have learned to someone else is an excellent way to reinforce learning (trying to teach them is better still!)

Remember to **speak aloud** words as you read/think them

Talk to yourself - tell yourself what you're doing as you do it; make up sentences about what you can see when you're walking, or waiting for something

Try and think of **different ways** of saying the same thing

Organization

Have a **notebook** to record new words and grammar points; don't simply list the words as you come across them, but **organize them into categories** - categories that are personally meaningful. for ready reference, start the notebook with a list of words you find or think you'll find particularly difficult. (note: useful groups include generic categories, e.g., animals, fruit; functions, e.g., greetings, prepositions; situations, e.g., Post Office, airport, shop)

Make **labels** for items round the home and stick them up - and don't limit yourself to single words, create sentences. remember to read them aloud at appropriate moments.

In the bathroom and toilet, **put up lists** of declensions/conjugations or even passages of text or dialog.

Association

Even unrelated languages throw up words that share **similarities** - look out for these. Be creative.

Physically act out words and sentences - use **mime** and **gestures**.

Associate words with **pictures**

Visualize words

Mnemonics

See Mnemonics at a glance (downloadable document)

Review

Periodic review - vital!

To make sure words are "fixed", you need to **overlearn** them - don't tick them off too soon!

Daily practice is essential, but try not to get into a rut. Routine is useful for establishing a habit, but ring the changes with your activities, both to keep your interest up, and because it is a more effective means of learning.

Remember:

Experiment with different strategies till you find what works for you.

Aim to have a variety of strategies to choose from.

Some word lists

English top 1000 words:

http://esl.about.com/library/vocabulary/bl1000_list1.htm

I like this because it groups words according to their stem, thus: able: ability abler ablest ably abilities unable inability:

http://www.lextutor.ca/lists_learn/

1047 "basic" words in French

http://mypage.bluewin.ch/a-z/cusipage/basicfrench.html

1040 "basic" words in German

http://mypage.bluewin.ch/a-z/cusipage/basicgerman.html

top 1000 most-used German words

http://german.about.com/library/weekly/aa041601a.htm

List of High-Frequency Baseword Vocabulary for Japanese EFL Students

http://iteslj.org/lists/Daulton-BasewordVocabulary.html

also check out the supermemo language collections: http://www.super-memory.com/sml/language.htm

Basic principles of learning

When considering what will be the most effective strategies for you, don't forget the basic principles of memory:

(1) Repetition repetition repetition

The trick is to find a way of repeating that is interesting to you. This is partly governed by level of difficulty (too easy is boring; too difficult is discouraging). The point is to find an activity (more than one, in fact), which enable you to hold on to your motivation through sufficient repetitions to drive them into your head. Bear in mind, too, the importance of:

(2) Changing context

Simple repetition (cat - el gato; cat - el gato; cat - el gato ...) is not only boring, but also the least effective way of experiencing the needed repetition. Not only do you want to see/hear words

presented in a variety of different sentences; you also want to experience them in different ways - listening, reading, speaking, writing.

(3) Space your practice

(4) Seek the link

The basis for the keyword mnemonic, and the reason some words are "easy" and others not. Looking for the similarities between words, and being inventive when necessary, is crucial to easing the learning burden, and reducing the number of repetitions you need to fix the word in your memory. It can be as simple as observing that "gato" is very like "cat", or that "el borrego" means "sheep" because sheep are boring.

Flashcards

Flashcards are cards with a word (or phrase) on one side and its translation on the other. You can buy ready-made flashcards, and these can certainly be helpful, particularly if you're inexperienced at learning another language. However, it is more effective if you make them yourself. Not only will the cards be customized to your own use, but the activity of selecting words and writing them down help you learn them.

A standard way of using flashcards is simply to go through a set number each day, separating out those you have trouble with, so you can review them more often. Keep these ones handy so that you can go through them at odd moments during the day when you're waiting for something.

Use the flashcards as a handy way to group words in different ways. Deal out the cards and move them around, looking for connections.

If you have word-family flashcards (recommended) - e.g., cards with various related forms of a word - you can make different sentences with your cards. You could also play cards with them, if you have others to play with. You could play a version of rummy, for example, where the sets are infinitive, present tense, future tense, past perfect. Use your imagination!

A bingo game with flashcards is another fun way to practice. Construct bingo cards (large cards divided into a certain number of spaces the same size as your flashcards) with the native language words on it. While this is better played with others, you can at a pinch play with yourself, simply picking out a flashcard from the pile and seeing how quickly you can match it with its counterpart.

Learning words in isolation will not help you much in dealing with words in context. You do need to practice reading/writing/speaking/listening sentences. But flashcards are a useful means of memorizing vocabulary.

Flashcard software

VTrain (Vocabulary Trainer): is flashcard software apparently used in the language labs of 40 Universities and hundreds of high schools; it's free for educational establishments. It's shareware.

Mnemonics for learning languages

Keyword mnemonic

The one mnemonic strategy that has been investigated quite extensively by researchers is the keyword mnemonic. This has been used successfully in a variety of learning areas, but its chief use has been in the area of learning vocabulary.

The keyword mnemonic is certainly an effective technique, particularly for learning to read in another language, as opposed to writing or talking (where you have to actively remember the words you want, rather than simply recognize them when you see them). But I wouldn't advocate using the keyword mnemonic on 1000 words, or even most of them. I would keep it for the hard words. (Read more on the usefulness of the keyword mnemonic for learning vocabulary. Find out what the keyword method is here)

Linkword

This is essentially the keyword technique, but simplified by fact that someone else has done all the hard work. Dr Michael Gruneberg, a British academic who has done a lot of work in the area of practical mnemonics (a rare concern among academic researchers) formalized the Linkword technique for learning foreign languages, and has produced Linkword books for learning French, German, Spanish, and Italian.

The books aim to quickly teach you a few hundred words of your chosen language (my own count of words taught in the German book was 355), by giving you a linking image to use. Thus, for Raupe (German for caterpillar), you are told to imagine a caterpillar with a rope attached to its middle.

As you would expect (Dr Gruneberg does know his stuff), the books are designed with an eye to fundamental memory principles. Words are grouped according to category; only ten words are given at a time; words are reviewed, etc. Simple grammar points are also included. It's well organized, and I do think it's an excellent way for a beginner to get a quick introduction to the language.

Apart from my general criticisms and warnings about the keyword technique (for which, see my article), my principle caveat is the difficulty in forming the visual images. For example, for Hummer (German for lobster), we are told to imagine a lobster with a sense of humor. Similarly, for Motte (German for moth), we are told to imagine that our personal motto is "I like moths". Personally, I don't find it particularly easy to visualize these "images". Now, I mean no criticism of Dr Gruneberg, the difficulty is experienced by anyone trying to find images to express verbal connections; some words just don't lend themselves to being images. But of course, verbal mnemonics are just as memorable as visual mnemonics, and infinitely more flexible. I assume,

although he doesn't say it, that Dr Gruneberg means by "image" something more movie-like, with a sound track.

There are also Linkword courses available, in a wider variety of languages, and for some languages, at more advanced levels (this link is for a British site; here's a U.S. site). I have no personal experience of these, but here's a review by a teacher.

List-learning mnemonics

The various list-learning mnemonics - the method of loci, the pegword method, the link method, the story method - can all be adapted to help you learn lists of words. In general, learning lists is not a particularly useful technique for learning a language, however, there are some circumstances in which it can be helpful.

If you do need to remember a list, my own recommendation is the story mnemonic, unless you are already expert at one of the other techniques. The advantage of the story mnemonic is that it is very simple to master.

Here's an example of its use. I'm brushing up my Latin, and like to run through the various conjugations and declensions in my head before going to sleep (it's wonderfully soothing!). To ensure I cover them all, I've devised the following mnemonics:

I **love** to **advise** those who **rule** that **sum**s are **fooey**. [1st conjugation: amo, I love; 2nd conjugation: moneo, I advise; 3rd conjugation: rego, I rule; irregular verb to be: sum, I am; fui, I have been]

At the **table** the **daughter** awaits the **master**; the **son** awaits the **god** in the **field** where the **boy**s go to **war**. The **king** tells the **legion** his **name** is a **burden**. The **citizen** lies on his **couch** in the **city**. [1st to 3rd declensions, with variants]

Gesturing

Gestures improve language learning

Those learning a new language benefit from making suitable gestures as they repeat new vocabulary, and this can even extend to gestures arbitrarily linked to abstract adverbs.

I always like gesture studies. I think I'm probably right in saying that they started with language learning. Way back in 1980 it was shown that acting out action phrases meant they were remembered better than if the phrases had been only heard or read (the "enactment effect"). Enacted items, it turned out, "popped out" effortlessly in free recall tests — in other words, enactment had made the phrases highly accessible. Subsequent research found that this effect occurred both for both older and younger adults, and in immediate and delayed recall tests — suggesting not only that such items are more accessible but that forgetting is slower.

Following these demonstrations, there have been a few studies that have specifically looked at the effect of gestures on learning foreign languages, which have confirmed the benefits of gestures. But there are various confounding factors that are hard to remove when using natural languages, which is why the present researchers have developed an artificial language ("Vimmi") to use in their research. In their first study, as in most other studies, the words and phrases used related to actions. In a new study, the findings were extended to more abstract vocabulary.

In this study, 20 German-speakers participated in a six-day language class to study Vimmi. The training material included 32 sentences, each containing a subject, verb, adverb, and object. While the subject nouns were concrete agents (e.g., musician, director), the other words were all abstract. Here's a couple of sample sentences (translated, obviously): (The) designer frequently shapes (the) style. (The) pilot really enjoys (the) view. The length of the words was controlled: nouns all had 3 syllables; verbs and adverbs all had two.

For 16 of the sentences, participants saw the word in Vimmi and heard it. The translation of the word appeared on the screen fractionally later, while at the same time a video appeared in which woman performed the gesture relating to the word. The audio of the word was replayed, and participants were cued to imitate the gesture as they repeated the word. For the other 16 sentences, a video with a still image of the actress appeared, and the participants were simply cued to repeat the word when the audio was replayed.

While many of the words used gestures similar to their meaning (such as a cutting gesture for the word "cut"), the researchers found that the use of any gesture made a difference as long as it was unique and connected to a specific word. For example, the abstract word "rather" does not have an obvious gesture that would go with it. However, a gesture attached to this word also worked.

Each daily session lasted three hours. From day 2, sessions began with a free recall and a cued recall test. In the free recall test, participants were asked to write as many items as possible in both German and Vimmi. Items had to be perfectly correct to be counted. From day 4, participants were also required to produce new sentences with the words they had learned.

Right from the beginning, free recall of items which had been enacted was superior to those which hadn't been — in German. However, in Vimmi, significant benefits from enactment occurred only from day 3. The main problem here was not forgetting the items, but correctly spelling them. In the cued recall test (translating from Vimmi to German, or German to Vimmi), again, the superiority of the enactment condition only showed up from day 3.

Perhaps the most interesting result came from the written production test. Here, people reproduced the same number of sentences they had learned on each of the three days of the test, and although enacted words were remembered at a higher rate, that rate didn't alter, and didn't reach significance. However, the production of new sentences improved each day, and the benefits of enactment increased each day. These benefits were significant from day 5.

The main question, however, was whether the benefits of enactment depended on word category. As expected, concrete nouns were remembered than verbs, followed by abstract nouns, and

finally adverbs. When all the tests were lumped together, there was a significant benefit of enactment for all types of word. However, the situation became a little more nuanced when the data was separately analyzed.

In free recall, for Vimmi, enactment was only of significant benefit for concrete nouns and verbs. In cued recall, for translating German into Vimmi, the enactment benefit was significant for all *except* concrete nouns (I'm guessing concrete nouns have enough 'natural' power not to need gestures in this situation). For translating Vimmi into German, the benefit was only significant for verbs and abstract nouns. In new sentence production, interestingly, participants used significantly more items of all four categories if they had been enacted. This is perhaps the best evidence that enactment makes items more accessible in memory.

What all this suggests is that acting out new words helps you learn them, but some types of words may benefit more from this strategy than others. But I think we need more research before being sure about such subtleties. The pattern of results make it clear that we really need longer training, and longer delays, to get a better picture of the most effective way to use this strategy.

For example, it may be that adverbs, although they showed the most inconsistent benefits, are potentially the category that stands to gain the most from this strategy — because they are the hardest type of word to remember. Because any embodiment of such an abstract adverb must be arbitrary — symbolic rather than representational — it naturally is going to be harder to learn (yes, some adverbs could be represented, but the ones used in this study, and the ones I am talking about, are of the "rather", "really", "otherwise" ilk). But if you persist in learning the association between concept and gesture, you may derive greater benefit from enactment than you would from easier words, which need less help.

Here's a practical discussion of all this from a language teacher's perspective.

Reference:

Macedonia, M., & Knösche T. R. (2011). Body in Mind: How Gestures Empower Foreign Language Learning. Mind, Brain, and Education. 5(4), 196 - 211.

Source:

http://medicalxpress.com/news/2012-01-gestures-language.html

Gesturing to improve memory, language & thought

Gesturing can change the way you think and remember.

Indications are that it does so by spreading the load on working memory.

Using gestures to augment speech can also help pre-verbal children communicate and develop language skills.

I recently reported on a study showing how the gestures people made in describing how they solved a problem (the Tower of Hanoi) changed the way they remembered the game. These findings add to other research demonstrating that gestures make thought concrete and can help us understand and remember abstract concepts better.

For example, two experiments of children in late third and early fourth grade, who made mistakes in solving math problems, have found that children told to move their hands when explaining how they'd solve a problem were four times as likely to manually express correct new ways to solve problems as children given no instructions. Even though they didn't give the right answer, their gestures revealed an implicit knowledge of mathematical ideas, and the second experiment showed that gesturing set them up to benefit from subsequent instruction.

And in a demonstration of improved memory, an earlier study had participants watch someone narrating three cartoons. Sometimes the narrator used hand gestures and at other times they did not. The participants were then asked to recall the story. The study found that when the narrator used gestures as well as speech the participants were more likely to accurately remember what actually happened in the story rather than change it in some way.

In another study, in which 40 children and 36 adults were asked to remember a list of letters (adults) or words (children) while explaining how they solved a math problem, both groups remembered significantly more items when they gestured during their math explanations than when they did not gesture.

It's thought that gesturing helps memory and understanding by lightening the load on working memory while you're thinking of what to say. Gestures use up visuospatial working memory rather than verbal memory, so essentially what you're doing is moving part of the information in one limited working memory space into another working memory space (and brain region).

Gesturing begins at an early age, first with pointing and then with more complex gestures. It is interesting to note that several advances in cognitive abilities are displayed first in gesture before later being expressed in speech. Moreover, the early use of gesture is associated with later verbal skill.

For example, research from Susan Goldin-Meadow and her colleagues has found that toddlers (14 months), studied during an hour and a half of play with their parents, used gestures more if they were from better-educated families, and this correlated with significantly greater vocabulary at 4 ½. On average, toddlers from well-educated families used gestures to convey 24 different meanings, while those from less-educated families used gestures to convey only 13. Better-educated parents also used more gestures when interacting with their children.

Another interesting study by the same researchers showed that the number of different meanings conveyed in gesture at 18 months predicted vocabulary at 42 months, while the number of gesture+speech combinations, particularly those conveying sentence-like ideas, predicted sentence complexity.

Some months ago, I read an article in The Philadelphia Inquirer about parents communicating with their pre-verbal infants using sign language. I was greatly taken with this idea. Though it sounds, at first blush, to be part of the whole flashcards-for-babies movement, it is something quite different (I do think you need to be very judicious in the 'hothousing' of children; there's more to making a person than stuffing them with knowledge like a foie gras goose). The development of verbal skills requires physical development and control that is beyond babies, but we shouldn't assume their inability to articulate words means they don't have the mental capacity for thought.

Nor is there any evidence that teaching them simple signs delays or impedes their verbal development. Indeed, it may help it. It may also help their social development. There's a lot of frustration in not being able to communicate — surely eliminating, or at least reducing, that frustration is going to have positive effects.

Now this is speculation. At this point we only have anecdotal reports, no research. But we can point to the positive effects of bilingualism to tell us learning two languages is beneficial rather than a hindrance (although children growing up in a truly bilingual household may be a few weeks later in starting to speak), and we know that children's language skills improve the more time parents spend (positively) interacting with them, and, as we have just discussed, early skill with gestures is associated with better verbal skills later on.

Caregivers of young children who are interested in this can go to:
http://www.babysignlanguage.com/

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Rowe, M. L. & Goldin-Meadow, S. 2009. Early gesture selectively predicts later language learning. Developmental Science, 12, 182-187.

Writing things out

Better learning through handwriting

One of the points I mention in my book on notetaking is that the very act of taking notes helps us remember — it's not simply about providing yourself with a record. There are a number of reasons for this, but a recent study bears on one of them. The researchers were interested in whether physically writing by hand has a different effect than typing on a keyboard.

In a fascinating experiment, adults were asked to learn to write in an unknown alphabet, with around twenty letters. One group was taught to write by hand, while another group used a keyboard. Participants were tested on their fluency and recall after three and six weeks. Those who had learned the letters by handwriting were significantly better on all tests. Moreover, Broca's area, a brain region involved in language, was active when this group were recognizing the letters, but not among those who had learned by typing on a keyboard.

The findings point to the importance of sensorimotor processes in processes we have typically regarded as primarily intellectual.

I recently reported on another finding concerning handwriting — that the memory-blocking effect of exam anxiety could be overcome by the simple strategy of writing out your anxieties just before the exam. It's also interesting in this context to remember the research into the benefits of gesturing for reducing the load on your working memory, with consequent assistance for memory, learning and comprehension. The writing effect on exam anxiety is also thought to be related to reducing the load on working memory.

In the case of this latest study, it seems likely that the benefits have more to do with the increased focus on the shape of the letters that occurs when writing by hand, and with the intimate connection between reading and writing.

But the message of these different studies is the same: that we ignore the physical at our peril; that cognition is "embodied cognition", rooted in our bodies in ways we are only beginning to understand.

References:

Mangen, A. & Velay, J. (2010). Digitizing Literacy: Reflections on the Haptics of Writing, Advances in Haptics, Mehrdad Hosseini Zadeh (Ed.), InTech, Available from:

http://www.intechopen.com/articles/show/title/digitizing-literacy-reflec... Press release at http://www.eurekalert.org/pub_releases/2011-01/uos-blt011911.php

Teacher's accent

Foreign language better understood in your own accent

While most foreign language courses try hard to provide native speakers, a new study shows that adults find it easier when the teacher speaks it in the same accent as the student. 60 participants aged 18-26, of whom 20 were native Hebrew speakers, 20 new adult immigrants to Israel from the Former Soviet Union, and 20 were Israeli Arabic speakers who began learning Hebrew at age 7-8, has found that while accent made no difference to native Hebrew speakers, both the Russian and Arabic speakers needed less phonological information to recognize Hebrew words when they were pronounced in the accent of their native language.

Leikin, M., Ibrahim R., Eviatar Z., & Sapir S. (2009). Listening with an Accent: Speech Perception in a Second Language by Late Bilinguals. Journal of Psycholinguistic Research. 38(5), 447 - 457.

http://www.eurekalert.org/pub_releases/2010-02/uoh-taf021410.php

Teaching Arabic

Literate Arabic speakers have bilingual brains

Research has found that Arabic-speaking students tend to be less proficient in reading than other students are in their native language. Spoken Arabic comes in a variety of dialects and is quite different from the common written Arabic (Modern Standard Arabic - MSA). A new imaging study has now compared brain activity in a priming task among trilinguals fluent in MSA, spoken Arabic and Hebrew. The results revealed that the cognitive process in using MSA was more similar to that employed for Hebrew, and less similar to the cognitive process of using the spoken native language. These results not only help explain why learning to read is more difficult for Arabic speakers, but also suggests that the most effective way of teaching written Arabic is by using techniques usually employed for the instruction of a second language — including exposing children to written Arabic in preschool or kindergarten.

Ibrahim, R. 2009. The cognitive basis of diglossia in Arabic: Evidence from a repetition priming study within and between languages. Journal of Psychology Research and Behavior Management, 2.

http://www.eurekalert.org/pub_releases/2009-11/uoh-wiu110409.php

Temporary problems with native language

Why learning a new language may make you forget your old one

The common experience of having difficulty remembering words in your native language when you've been immersed in a new language is called first-language attrition, and new research has revealed that it occurs because native language words that might distract us when we are mastering a new language are actively inhibited. The study also found that this inhibition lessened as students became more fluent with the new language, suggesting it principally occurs during the initial stages of second language learning.

Levy, B. J., McVeigh N. D., Marful A., & Anderson M. C. (2007). Inhibiting your native language: the role of retrieval-induced forgetting during second-language acquisition. Psychological Science: A Journal of the American Psychological Society / APS. 18(1), 29 - 34.

http://www.sciencedaily.com/releases/2007/01/070118094015.htm

Effect of working memory capacity on new language learning

Vocabulary acquisition in children is significantly affected by the child's ability to repeat back words.

This limitation becomes less as the individual gains a large vocabulary, and thus develops a greater ability to make semantic (meaningful) associations.

When learning a new language, your ability to repeat back unfamiliar words is only a factor where you are unable to form a meaningful association to a familiar word.

In such cases, the keyword mnemonic can be especially useful to those with limited ability to repeat back words.

Research with children has demonstrated that the ability to learn new words is greatly affected by working memory span - specifically, by how much information they can hold in that part of working memory called "phonological short-term memory". The constraining effect of working memory capacity on the ability to learn new words appears to continue into adolescence.

But, as you grow in experience, building a vocabulary, this constraint becomes less important. Because working memory capacity is measured in "chunks" - and the amount of information contained in a chunk is extremely malleable. To a large extent, developing chunking strategies is what memory improvement is all about.

In terms of learning another language, there are essentially four possible classes of word:

- words that are already familiar because they are the same in your native language (or another known language)

- words that are already familiar because they involve words that you already know in that language (e.g., learning a related verb form, or learning a word made up of two words you already know, such as sweat-shirt)
- words that resemble a known word with similar or related meaning (e.g., Russian *garlo* means *throat*, and the word *garlo* resembles the word *gargle*)
- words that have no ready association to known words

It appears that in these first three cases, the size of your phonological short-term memory is of no significant relevance. It is only in the last case - where the word cannot utilize any meaningful associations - that your phonological short-term memory capacity becomes important.

Fairly obviously, as your knowledge of language (your own and others) grows, the more meaningful associations you will be able to make, and the fewer new words will fall into this last, difficult, category.

This suggests, of course, the usefulness of a mnemonic strategy (specifically, the keyword strategy) in the last, difficult case.

The importance of phonological short-term memory is also greater for productive learning (learning to produce a language, i.e., speak or write it) than in receptive learning (learning to read or understand a language). For productive learning, the pronounceability of the new words is very important. The more easily pronounced, the more easily learnt.

References:

Nation, I.S.P. 2001. Learning vocabulary in another language. Cambridge: Cambridge University Press.

Ellis, N.C. & Beaton, A. 1993. Factors affecting foreign language vocabulary: imagery keyword mediators and phonological short-term memory. *Quarterly Journal of Experimental Psychology, 46A*, 533-58.

Papagno, C., Valentine, T. & Baddeley, A. 1991. Phonological short-term memory and foreign-language vocabulary learning. *Journal of Memory and Language, 30*, 331-47.

Are children really so much better at learning a second language?

Most people believe that an adult learner can't hope to replicate the fluency of someone who learned another language in childhood. And certainly there is research to support this. However, people tend to confuse these findings - that the age of acquisition affects your representation of grammar - with the idea that children can learn words vastly quicker than adults. This is not true. Adults have a number of advantages over children:

- they usually have more and practiced strategies available to them,

- they have a wider vocabulary in their native language (which makes it easier to find similarities between languages),
- they have (for a while) a greater working memory capacity,
- they are more likely to have experience of other languages, and of language learning.

For all these reasons, adults can usually learn more words faster than children.

Part of the reason for the belief is that children seem to learn their native language "by magic". While there is certainly something magical about the way they pick up grammar, their learning of new words doesn't come under the same category. In fact, children are quite slow at learning new words, learning on average:

12 - 16 months: 0.3 words/day

16 - 23 months: 0.8 words/day

23 - 30 months: 1.6 words/day

30 mths - 6 yrs: 3.6 words/day

6 yrs - 8 yrs: 6.6 words/day

8 yrs - 10 yrs: 12.1 words/day

(from Paul Bloom's (2000) "How Children Learn the Meanings of Words")

Original language can be completely forgotten

The following research is also interesting, since it exposes another cherished myth. A study[1] of adults who were born in Korea but adopted by French families in childhood, found not only that they had no conscious memory of Korean, but that imaging showed no difference in brain activation when they heard Korean compared to any other unknown foreign language (activation patterns were different when they heard French).

I don't, however, know the age of the children when they were adopted. It would also be interesting to know whether such children would learn their original language with greater facility - this would imply that present imaging techniques are insufficiently subtle to pick up some differences.

References:

Pallier, C., Dehaene, S., Poline, J.-B., LeBihan, D., Argenti, A.-M., Dupoux, E. & Mehler, J. 2003. Brain Imaging of Language Plasticity in Adopted Adults: Can a Second Language Replace the First? *Cerebral Cortex, 13 (2)*, 155-161.

Is timing important?

Relearning a forgotten language is easier for those under 40

A small study involving 7 native English speakers who had learned either Hindi or Zulu as children when living abroad, but now had no memory of the neglected language, found that the three who were under 40 could relearn certain phonemes that are difficult for native English speakers to recognize, but those over 40, like those who had never been exposed to the language in childhood, could not. The amount of experience of exposure in childhood ranged from 4 to 10 years, and it's especially notable that the 47-year old individual who had 10 years exposure, having become almost fluent, still could not recover the ability to distinguish these difficult sounds. It should also be noted that where the ability was recovered (and recovered almost to native ability), it took about 15-20 training sessions. The findings point to the value of early foreign language learning.

Bowers, J. S., Mattys S. L., & Gage S. H. (2009). Preserved implicit knowledge of a forgotten childhood language. Psychological Science: A Journal of the American Psychological Society / APS. 20(9), 1064 - 1069.

http://www.eurekalert.org/pub_releases/2009-09/afps-uio092409.php

Language learning declines after second year of life

A study involving 96 deaf children who had received cochlear implants during their first four years of life has found that the rate of language learning was greatest for those given implants before they turned two. Children given implants at three or four years of age acquired language skills more slowly. The finding supports the idea that there is a 'sensitive period' for language learning, and suggests that deaf children should get cochlear implants sooner (it is still relatively rare for them to be given to children younger than two).

The findings were presented on 16 May at the Acoustical Society of America conference in Vancouver, Canada.

http://www.nature.com/news/2005/050516/full/050516-1.html

Learning a second language may not be as laborious as believed

A study of adult learners of a second language has revealed that their brains still possess a surprising facility for learning words — much greater than the learner is consciously aware of. College students learning first-year French demonstrated brain activity that was clearly discriminating between real and pseudo-French words after only 14 hours of classroom instruction, although the students performed only at chance levels when asked to consciously choose whether or not the stimuli were real French words. The greater the exposure to French, the larger the difference in brain response to words and pseudo words.

McLaughlin, J., Osterhout L., & Kim A. (2004). Neural correlates of second-language word learning: minimal instruction produces rapid change. Nature Neuroscience. 7(7), 703 - 704.

http://www.eurekalert.org/pub_releases/2004-06/uow-baw061104.php

Second language best taught in childhood

Sadly, it does appear that the easiest time to learn a second language is, indeed, in childhood. An imaging study has found that when grammatical judgment in the second language was compared to grammatical judgment in first language (as evidenced by performance on sentences with grammatical mistakes), there was no difference in brain activation in those who learned the second language as children. However, people who acquired the second language late and with different proficiency levels displayed significantly more activity in the Broca's region during second language grammatical processing. "This finding suggests that at the level of brain activity, the parallel learning of the two languages since birth or the early acquisition of a second language are crucial in the setting of the neural substrate for grammar."

Wartenburger, I., Heekeren H. R., Abutalebi J., Cappa S. F., Villringer A., & Perani D. (2003). Early Setting of Grammatical Processing in the Bilingual Brain. Neuron. 37(1), 159 - 170.

Study finds there's a critical time for learning all languages, including sign language

It is generally believed that there is a critical period for learning a first language, and that children not exposed to language during this period will never fully acquire language. It is also thought that this might apply as well to second language learning — that those who learn another language after puberty can never become as fluent as those who learn it before puberty. A recent study suggests that this may also be true for non-verbal languages. Using functional magnetic resonance imaging (fMRI), it was found that patterns of brain activity in bilingual people who learned American Sign Language (ASL) before puberty differed from those who learned it after puberty.

Newman, A. J., Bavelier D., Corina D., Jezzard P., & Neville H. J. (2002). A critical period for right hemisphere recruitment in American Sign Language processing. Nat Neurosci. 5(1), 76 - 80.

http://www.eurekalert.org/pub_releases/2002-01/uow-sft010202.php

Music and language

Some of the attributes of music are particularly memorable, and can be used to assist learning.

Music and language are both important in helping humans form large social groups, and one can argue that they co-evolved on the back of this function*.

There is growing evidence that the same brain structures are involved in music and language processing.

A rare disorder suggests a genetic link between social skills, language skills, and musical skills.

These connections between music and language processing support recent evidence that music training can improve children's language skills.

The role of melody in helping recall

The most obvious connection between language and music is that music can be used to help us remember words. It has been convincingly shown that words are better recalled when they are learned as a song rather than speech - in particular conditions.

Melody is what is important. Rhythm is obviously part of that. We are all aware of the power of rhythm in helping make something memorable. But melody, it seems, has quite a lot of attributes, apart from rhythm, that we can use as cues to help our recall. And what seems to be crucial is the simplicity and predictability of the melody.

But the connection between language and music is much more profound than this.

The evolution of language

One of my favorite books is Robin Dunbar's Grooming, gossip and the evolution of language . In it he moves on from the fact that monkeys and apes are intensely social and that grooming each other is a major social bonding mechanism, to the theory that in humans language (particularly the sort of social language we call gossip) has taken the place of grooming. The size of human social groups, he argues cogently, was able to increase (to our species' benefit) because of the advantages language has over grooming. For example, it's hard to groom more than one at a time, but you can talk to several at once.

Language, music, and emotion

I mention this now because he also suggests that both music and language helped humans knit together in social groups, and maybe music was first. We are all familiar with the extraordinary power of music to not only evoke emotion, but also to bind us into a group. Think of your feelings at times of group singing - the singing of the national anthem, singing 'Auld Lang Syne' at New Year's Eve, singing in church, campfire singing, carol singing ... fill in your own experience.

Dunbar also observes that, while skilled oratory has its place of course, language is fairly inadequate at the emotional level - something we all have occasion to notice when we wish to offer comfort and support to those in emotional pain. At times like these, we tend to fall back on the tried and true methods of our forebears - touch.

So, while language is unrivalled in its ability to convey "the facts", there is a point at which it fails. At this point, other facilities need to step in. At an individual level, we have touch, and "body language". At the social level, we have music.

Language and music then, may well have developed together, not entirely independently.More evidence for this comes from recent neurological studies.

The neural substrates of language and music

Language is a very important and complex function in humans, and unsurprisingly it involves a number of brain regions. The most famous is Broca's area. Recent research into neurological aspects of music have held some surprises. Imaging studies have revealed that, while the same area (the planum temporale) was active in all subjects listening to music, in non-musicians it was the right planum temporale that was most active, while in musicians the left side dominated. The left planum temporale is thought to control language processing. It has been suggested that musicians process music as a language. This left-brain activity was most pronounced in people who had started musical training at an early age.

Moreover, several studies have now demonstrated that there are significant differences in the distribution of gray matter in the brain between professional musicians trained at an early age and non-musicians. In particular, musicians have an increased volume of gray matter in Broca's area. The extent of this increase appears to depend on the number of years devoted to musical training. There also appears to be a very significant increase in the amount of gray matter in the part of the auditory cortex called the Heschl's gyrus (also involved in the categorical perception of speech sounds).

An imaging study$_1$ investigating the neural correlates of music processing found that " unexpected musical events" activated the areas of Broca and Wernicke, the superior temporal sulcus, Heschl's gyrus, both planum polare and planum temporale, as well as the anterior superior insular cortices. The important thing about this is that, while some of those regions were already known to be involved in music processing, the cortical network comprising *all* these structures has up to now been thought to be domain-specific for language processing.

People are sensitive to acoustic cues used to distinguish both different musicians and different speakers

Another study$_2$ has found that people remember music in the same way that they remember speech. Both musicians and non-musicians were found to be equally accurate in distinguishing changes in musical sequences, when those changes were in the length and loudness of certain tones. This discrimination appeared to also be within the capabilities of ten-month-old babies, arguing that the facility is built into us, and does not require training.

These acoustic characteristics are what make two musicians sound different when they are playing the same music, and make two speakers sound different when they are saying the same sentence.

So, if this facility is innate, what do our genes tell us?

Williams syndrome

Williams syndrome is a rare genetic disorder. Those with this syndrome have characteristic facial and physical features, certain cardiovascular problems and mild to moderate mental retardation.

They are also markedly social, and have greater language capabilities than you would expect from their general cognitive ability. They score significantly higher on tests measuring behavior in social situations, including their ability to remember names and faces, eagerness to please others, empathy with others' emotions and tendency to approach strangers.

This connection, between sociability, language skills, and memory for names and faces, is what makes Williams syndrome interesting in this context. And of course, the final characteristic: an extraordinary connection with music
(see http://www.the-scientist.com/yr2001/nov/research_011126.html)

Mozart effect

A Canadian study is now underway to look at whether musical training gives children an edge over non-musical counterparts in verbal and writing skills (as well as perhaps giving the elderly an edge in preserving cognitive function for as long as possible). In view of the factors discussed here, the idea that music training benefits verbal skills is certainly plausible. I discuss this in more detail in my discussion of the much-hyped Mozart effect.

* I'm sorry, I know this is expressed somewhat clumsily. More colloquially, many people would say they co-evolved for this purpose. But functions don't evolve purposively - the eye didn't evolve because one day an organism thought it would be a really good idea to be able to see. We know this, but it is ... oh so much easier ... to talk about evolution as if it was purposeful. Unfortunately, what starts simply because as a sloppy shorthand way of saying something, becomes how people think of it. I don't want to perpetuate this myself, so, I'm sorry, we have to go with the clumsy.

References:

Dunbar, R. 1996. *Grooming, gossip, and the evolution of language.* Cambridge, Mass.: Harvard University Press.

Wallace, W.T. 1994. Memory for music: effect of melody on recall of text. *Journal of Experimental Psychology: Learning, Memory & Cognition, 20,* 1471-85.

1. Koelsch, S., Gunter, T.C., von Cramon, D.Y., Zysset, S., Lohmann, G. & Friederici, A.D. 2002. Bach Speaks: A Cortical "Language-Network" Serves the Processing of Music, *NeuroImage, 17(2),* 956-966.

2. Palmer, C.,Jungers, M.K. & Jusczyk, P.W. 2001. Episodic Memory for Musical Prosody. *Journal of Memory and Language, 45*, 526-545. http://www.eurekalert.org/pub_releases/2002-01/osu-lrn010902.htm

Benefits of music training for language learning

Music training and language skills

A month-long music-based program produced dramatic improvement in preschoolers' language skills. Another study helps explain why music training helps language skills.

Music-based training 'cartoons' improved preschoolers' verbal IQ

A study in which 48 preschoolers (aged 4-6) participated in computer-based, cognitive training programs that were projected on a classroom wall and featured colorful, animated cartoon characters delivering the lessons, has found that 90% of those who received music-based training significantly improved their scores on a test of verbal intelligence, while those who received visual art-based training did not.

The music-based training involved a combination of motor, perceptual and cognitive tasks, and included training on rhythm, pitch, melody, voice and basic musical concepts. Visual art training emphasized the development of visuo-spatial skills relating to concepts such as shape, color, line, dimension and perspective. Each group received two one-hour training sessions each day in classroom, over four weeks.

Children's abilities and brain function were tested before the training and five to 20 days after the end of the programs. While there were no significant changes, in the brain or in performance, in the children who participated in the visual art training, nearly all of those who took the music-based training showed large improvements on a measure of vocabulary knowledge, as well as increased accuracy and reaction time. These correlated with changes in brain function.

The findings add to the growing evidence for the benefits of music training for intellectual development, especially in language.

Musical aptitude relates to reading ability through sensitivity to sound patterns

Another new study points to one reason for the correlation between music training and language acquisition. In the study, 42 children (aged 8-13) were tested on their ability to read and recognize words, as well as their auditory working memory (remembering a sequence of numbers and then being able to quote them in reverse), and musical aptitude (both melody and rhythm). Brain activity was also measured.

It turned out that both music aptitude and literacy were related to the brain's response to acoustic regularities in speech, as well as auditory working memory and attention. Compared to good readers, poor readers had reduced activity in the auditory brainstem to rhythmic rather than random sounds. Responsiveness to acoustic regularities correlated with both reading ability and

musical aptitude. Musical ability (largely driven by performance in rhythm) was also related to reading ability, and auditory working memory to both of these.

It was calculated that music skill, through the functions it shares with reading (brainstem responsiveness to auditory regularities and auditory working memory) accounts for 38% of the difference in reading ability between children.

These findings are consistent with previous findings that auditory working memory is an important component of child literacy, and that positive correlations exist between auditory working memory and musical skill.

Basically what this is saying, is that the auditory brainstem (a subcortical region — that is, below the cerebral cortex, where our 'higher-order' functions are carried out) is boosting the experience of predictable speech in better readers. This fine-tuning may reflect stronger top-down control in those with better musical ability and reading skills. While there may be some genetic contribution, previous research makes it clear that musicians' increased sensitivity to sound patterns is at least partly due to training.

In other words, giving young children music training is a good first step to literacy.

The children were rated as good readers if they scored 110 or above on the Test of Word Reading Efficiency, and poor readers if they scored 90 or below. There were 8 good readers and 21 poor readers. Those 13 who scored in the middle were excluded from group analyses. Good and poor readers didn't differ in age, gender, maternal education, years of musical training, extent of extracurricular activity, or nonverbal IQ. Only 6 of the 42 children had had at least a year of musical training (of which one was a poor reader, three were average, and two were good).

Auditory brainstem responses were gathered to the speech sound /da/, which was either presented with 100% probability, or randomly interspersed with seven other speech sounds. The children heard these sounds through an earpiece in the right ear, while they listened to the soundtrack of a chosen video with the other ear.

Reference:

Moreno, S., Bialystok E., Barac R., Schellenberg E. Glenn, Cepeda N. J., & Chau T. (2011). Short-Term Music Training Enhances Verbal Intelligence and Executive Function. Psychological Science. 22(11), 1425 - 1433.

Strait, Dana L, Jane Hornickel, and Nina Kraus. "Subcortical processing of speech regularities underlies reading and music aptitude in children." Behavioral and brain functions : BBF 7, no. 1 (October 17, 2011): 44. http://www.ncbi.nlm.nih.gov/pubmed/22005291.

Full text is available at http://www.behavioralandbrainfunctions.com/content/pdf/1744-9081-7-44.pd...

Source:

http://www.eurekalert.org/pub_releases/2011-10/bcfg-ycs100411.php
http://www.eurekalert.org/pub_releases/2011-10/bc-mar101411.php

Early music training 'tunes' auditory system

Mandarin is a tonal language, that is, the pitch pattern is as important as the sound of the syllables in determining the meaning of a word. In a small study, a Mandarin word was presented to 20 adults as they watched a movie. All were native English speakers with no knowledge of Mandarin, but half had at least six years of musical instrument training starting before the age of 12, while half had minimal or no musical training. As the subjects watched the movie, the researchers measured the accuracy of their brainstem ability to track three differently pitched "mi" sounds. Those who were musically trained were far better at tracking the three different tones than the non-musicians. The study is the first to provide concrete evidence that playing a musical instrument significantly enhances the brainstem's sensitivity to speech sounds, and supports the view that experience with music at a young age can "fine-tune" the brain's auditory system. The findings are in line with previous studies suggesting that musical experience can improve one's ability to learn tone languages in adulthood, and are also consistent with studies revealing anomalies in brainstem sound encoding in some children with learning disabilities which can be improved by auditory training. The findings are also noteworthy for implicating the brainstem in processing that has been thought of as exclusively involving the cortex.

Wong, P. C. M., Skoe E., Russo N. M., Dees T., & Kraus N. (2007). Musical experience shapes human brainstem encoding of linguistic pitch patterns. Nat Neurosci. 10(4), 420 - 422.

http://www.eurekalert.org/pub_releases/2007-03/nu-rfm031207.php

Benefits of bilingualism

Benefits in old age

Physical evidence bilingualism delays onset of Alzheimer's symptoms

Brain scans reveal that active bilinguals can have nearly twice as much brain atrophy as monolinguals before cognitive performance suffers.

Growing evidence points to greater education and mentally stimulating occupations and activities providing a cognitive reserve that enables people with developing Alzheimer's to function normally for longer. Cognitive reserve means that your brain can take more damage before it has noticeable effects. A 2006 review found that some 30% of older adults found to have Alzheimer’s when autopsied had shown no signs of it when alive.

There are two relevant concepts behind the protection some brains have: cognitive reserve (which I have mentioned on a number of occasions), and brain reserve, which is more structural. ‘Brain reserve’ encapsulates the idea that certain characteristics, such as a greater brain size, help

protect the brain from damage. Longitudinal studies have provided evidence, for example, that a larger head size in childhood helps reduce the risk of developing Alzheimer's.

While cognitive reserve has been most often associated with education, it has also been associated with occupation, bilingualism, and music. A new study provides physical evidence for how effective bilingualism is.

The Toronto study involved 40 patients with a diagnosis of probable Alzheimer's, of whom half were bilingual (fluent in a second language, and consistent users of both languages throughout their lives). Bilingual and monolingual patients were matched on a test of cognitive function (the Behavioral Neurology Assessment). The two groups were similar in education levels, gender, and performance on the MMSE and the clock drawing test. The groups did differ significantly in occupational status, with the monolinguals having higher job status than the bilinguals.

Notwithstanding this similarity in cognitive performance, brain scans revealed that the bilingual group had substantially greater atrophy in the medial temporal lobe and the temporal lobe. The two groups did not differ in measures of central and frontal atrophy, however — these regions are not associated with Alzheimer's.

In other words, bilingualism seems to specifically help protect those areas implicated in Alzheimer's, and the bilinguals could take much greater damage to the brain before it impacted their cognitive performance. It is suggested that the act of constantly switching between languages, or suppressing one language in favor of other, may help train the brain to be more flexible when the need comes to compensate for damaged areas.

The findings are consistent with previous observational studies suggesting that bilingualism delays the onset of Alzheimer's symptoms by up to five years.

Schweizer, T. A., Ware J., Fischer C. E., Craik F. I. M., & Bialystok E. (2011). Bilingualism as a contributor to cognitive reserve: Evidence from brain atrophy in Alzheimer's disease. Cortex.

Valenzuela MJ and Sachdev P. 2006. Brain reserve and dementia: A systematic review. Psychological Medicine, 36(4): 441e454.

http://www.eurekalert.org/pub_releases/2011-10/smh-trf101311.php

Bilingualism delays onset of Alzheimer's symptoms

A second study confirms the dramatic effect of being bilingual, with bilingual speakers being diagnosed with Alzheimer's more than 4 years later than monoglots.

Clinical records of 211 patients diagnosed with probable Alzheimer's disease have revealed that those who have spoken two or more languages consistently over many years experienced a delay in the onset of their symptoms by as much as five years. It's thought that lifelong bilingualism may contribute to cognitive reserve in the brain, enabling it to compensate for memory loss, confusion, and difficulties with problem-solving and planning.

Of the 211 patients of the Sam and Ida Ross Memory Clinic at Baycrest, 102 patients were classified as bilingual and 109 as monolingual. Bilingual patients had been diagnosed with Alzheimer's 4.3 years later than the monolingual patients on average, and had reported the onset of symptoms 5.1 years later. The groups were equivalent on measures of cognitive and occupational level, there was no apparent effect of immigration status, and there were no gender differences.

The findings confirm an earlier study from the same researchers, from the clinical records of 184 patients diagnosed with probable Alzheimer's and other forms of dementia.

Craik, F. I. M., Bialystok E., & Freedman M. (2010). Delaying the onset of Alzheimer disease. Neurology. 75(19), 1726 - 1729.

http://www.eurekalert.org/pub_releases/2010-11/bcfg-bdo110810.php

Bilingualism has protective effect in delaying onset of dementia

An analysis of 184 people with dementia (132 were diagnosed with Alzheimer's; the remaining 52 with other dementias) found that the mean age of onset of dementia symptoms in the 91 monolingual patients was 71.4 years, while for the 93 bilingual patients it was 75.5 years — a very significant difference. This difference remained even after considering the possible effect of cultural differences, immigration, formal education, employment and even gender as influencers in the results.

Bialystok, E., Craik F. I. M., & Freedman M. (2007). Bilingualism as a protection against the onset of symptoms of dementia. Neuropsychologia. 45(2), 459 - 464.

http://www.eurekalert.org/pub_releases/2007-01/bcfg-css011107.php

Being fluent in two languages may help keep the brain sharper for longer

A study of 104 people aged between 30 and 88 has found that those who were fluent in two languages rather than just one were sharper mentally. Those fluent in two languages responded faster on tasks assumed to place demands on working memory, compared to those who were fluent in just English, at all age groups. This is consistent with the theory that constant management of 2 competing languages enhances executive functions. Bilingual volunteers were also much less likely to suffer from the mental decline associated with old age. The finding is consistent with other research suggesting that mental activity helps in protecting older adults from mental decline. The participants were all middle class, and educated to degree level. Half of the volunteers came from Canada and spoke only English. The other half came from India and were fluent in both English and Tamil.

Bialystok, E., Craik F. I. M., Klein R., & Viswanathan M. (2004). Bilingualism, aging, and cognitive control: evidence from the Simon task. Psychology and Aging. 19(2), 290 - 303.

http://news.bbc.co.uk/2/hi/health/3794479.stm

Benefits for children

Bilingualism helps early development of executive control

A study of Korean preschoolers demonstrates that at least some of the cognitive benefits of bilingualism are due to learning two languages, not because of a more diligent culture or a more enriched environment.

An increasing number of studies have been showing the benefits of bilingualism, both for children and in old age. However, there's debate over whether the apparent benefits for children are real, or a product of cultural ("Asians work harder!" or more seriously, are taught more behavioral control from an early age) or environmental factors (such as socioeconomic status).

A new study aimed to disentangle these complicating factors, by choosing 56 4-year-olds with college-educated parents, from middle-class neighborhoods, and comparing English-speaking U.S. children, Korean-speaking children in the U.S. and in Korea, and Korean-English bilingual children in the U.S.

The children were tested on a computer-game-like activity designed to assess the alerting, orienting, and executive control components of executive attention (a child version of the Attention Network Test). They were also given a vocabulary test (the Peabody Picture Vocabulary Test-III) in their own language, if monolingual, or in English for the bilinguals.

As expected, given their young age, English monolinguals scored well above bilinguals (learning more than one language slows the acquisition of vocabulary in the short-term). Interestingly, however, while Korean monolinguals in Korea performed at a comparable level to the English monolinguals, Korean monolinguals in the U.S. performed at the level of the bilinguals. In other words, the monolinguals living in a country where their language is a majority language have comparable language skills, and those living in a country in which their primary language is a minority language have similar, and worse, language skills.

That's interesting, but the primary purpose of the study was to look at executive control. And here the bilingual children shone over the monolinguals. Specifically, the bilingual children were significantly more accurate on the attention test than the monolingual Koreans in the U.S. (whether they spoke Korean or English). Although their performance in terms of accuracy was not significantly different from that of the monolingual children in Korea, these children obtained their high accuracy at the expense of speed. The bilinguals were both accurate and fast, suggesting a different mechanism is at work.

The findings confirm earlier research indicating that bilingualism, independent of culture, helps develop executive attention, and points to how early this advantage begins.

The Korean-only and bilingual children from the United States had first generation native Korean parents. The bilingual children had about 11 months of formal exposure to English through a bilingual daycare program, resulting in them spending roughly 45% of their time using Korean (at home and in the community) and 55% of their time using English (at daycare). The

children in Korea belonged to a daycare center that did offer a weekly 15-minute session during which they were exposed to English through educational DVDs, but their understanding of English was minimal. Similarly, the Korean-only children in the U.S. would have had some exposure to English, but it was insufficient to allow them to understand English instructions. The researchers' informal observation of the Korean daycare center and the ones in the U.S. was that the programs were quite similar, and neither was more enriching.

Yang, S., Yang H., & Lust B. (2011). Early Childhood Bilingualism Leads to Advances in Executive Attention: Dissociating Culture and Language. Bilingualism: Language and Cognition. 14(03), 412 - 422.

http://medicalxpress.com/news/2011-07-bilingualism-boost-tots-minds.html

Exposure to two languages carries far-reaching benefits

A new study provides evidence that bilingual speakers find it easier to learn a new language than those who only know one language. The study compared the ability of three groups of native English speakers - English-Mandarin bilinguals, English-Spanish bilinguals and monolinguals - to master words in an invented language that bore no relationship to English, Spanish or Mandarin. The bilingual participants mastered nearly twice the number of words as the monolinguals. The finding adds more support to the value of introducing another language to children at a young age.

Kaushanskaya, M., & Marian V. (2009). The bilingual advantage in novel word learning. Psychonomic Bulletin & Review. 16(4), 705 - 710.

http://www.eurekalert.org/pub_releases/2009-05/nu-ett051909.php

Bilingual babies get a head start on executive functioning

A number of studies have pointed to benefits of being bilingual, but many people still believe that the experience of two languages in infancy may cause confusion and impair their acquisition of language. Now a new study shows that bilingual babies quickly adapt to different learning cues at seven months old compared with babies from single-language households. The study involved families in the Trieste area of Italy, where parents spoke to infants from birth using both Italian and Slovenian mother tongues. When bilingual and monolingual babies were first taught to look at one side of a screen in response to a sound cue (and in anticipation of a visual "reward" image of a puppet), then required to switch sides, it was found that bilingual babies quickly learned to look at the other side, but the monolingual babies never adapted to the change. The findings indicate that bilingualism gives an advantage above the purely linguistic, in executive function, which is consistent with other research indicating bilingual children have improved attention.

Kovacs, A. M., & Mehler J. (2009). Cognitive gains in 7-month-old bilingual infants. Proceedings of the National Academy of Sciences. 106(16), 6556 - 6560.

http://www.livescience.com/culture/090413-bilingual-smart.html

Beneficial effects of bilingual learning

A recent Canadian study comparing young monolingual children to bilingual found that bilingual children were much better at a non-language cognitive task. The 4-6 year old bilingual children were versed in a spoken language and a signing one. It was suggested that their higher cognitive skill was due to the increased computational demands of processing two different language systems.

Baker, S.A., Kovelman, I., Bialystok, E. & Petitto, L. A. (2003, November). "Bilingual children's complex linguistic experience yields a cognitive advantage." Presented at 2003 Society For Neuroscience conference. New Orleans, LA.

http://www.eurekalert.org/pub_releases/2003-11/sfn-ssb111103.php

Bilingualism doesn't hamper language abilities of children with autism

Two studies demonstrate that language development in young children with ASD is the same in those raised in a multilingual environment as in those raised with only one language.

Bilingual parents of children with autism spectrum disorder often decide to speak only one language around their child because of advice from child development professionals who believe that exposure to two languages might further limit the child's communication skills. Two recent studies challenge that assumption.

One study tested the vocabulary size of 14 bilingual (English-Mandarin/Cantonese) and 14 English-monolingual young children with ASD (aged 3-6). Bilingual children had a larger total vocabulary than monolingual children. When translation equivalents (two words in each language with the same meaning) were counted only once, the vocabularies of both bilingual and monolingual children were not significantly different. Both groups had equivalent scores on all but one measure of language and vocabulary, including English production vocabulary, conceptual production vocabulary, and vocabulary comprehension.

The second Canadian study found similar results in a slightly larger group of children (45 bilingual and 30 monolingual children with an average age of around 5). Languages covered were diverse: French, English, Chinese, Farsi, Hebrew, Italian, Romanian, Spanish and Tamil. Bilingual children were divided into those who were exposed to both languages from infancy, and those who were exposed later (the cut-off was 12 months, but in general changes in the language environment occurred much later: on average, children in the former group were bilingually-exposed for the first 25 months; children in the latter group were monolingually-exposed for the first 31 months). Eleven children were trilingual. In order not to introduce sampler bias, non-verbal children were not excluded — seven participants spoke fewer than 10 words, of whom two were nonverbal.

There were no significant differences between the three groups at a language level, although monolingual and bilingual children exposed from infancy consistently scored higher than bilingual children exposed from a later age. Also, children exposed to two or more languages from infancy scored significantly higher than both groups on social interaction, and those exposed later were worst of the three groups. These differences probably reflect various social variables underlying the different language experiences.

The main reason for the belief that autistic children are better not 'burdened' with an additional language is because of their language difficulties. These studies are not saying that a child with ASD raised in two languages will be equally fluent with both. In the second study, second language vocabularies were much smaller than their dominant language vocabularies. But that's not the point. Whether or not there is any general cognitive advantage in bilingualism for this group, as there is for normally-developing children, remains to be determined. But there is a clear message that parents of ASD children can take on board: if your family is bilingual, relax and enjoy interacting with your ASD child in your language of choice.

Petersen, J. M., Marinova-Todd S. H., & Mirenda P. (2011). Brief Report: An Exploratory Study of Lexical Skills in Bilingual Children with Autism Spectrum Disorder. Journal of Autism and Developmental Disorders.

Hambly, C., & Fombonne E. (2011). The Impact of Bilingual Environments on Language Development in Children with Autism Spectrum Disorders. Journal of Autism and Developmental Disorders.

http://medicalxpress.com/news/2011-10-bilingualism-doesnt-hamper-languag...

Neural substrate of second language learning

Anatomical advantage for second language learners

Based on the size of a small brain region called Heschl's Gyrus (HG) in the left hemisphere, researchers found they could predict who would be more successful in learning 18 words in an invented language (those predicted to be "more successful learners" achieved an average of 97% accuracy in identifying the pseudo words, compared to 63% from those deemed "less successful"). The size of the right HG was not important. The finding was surprising, given that this area, the primary region of the auditory cortex, is typically associated with handling the basic building blocks of sound — whether the pitch of a sound is going up or down, where sounds come from, and how loud a sound is — rather than speech per se.

Wong, P. C. M., Warrier C. M., Penhune V. B., Roy A. K., Sadehh A., Parrish T. B., et al. (2008). Volume of Left Heschl's Gyrus and Linguistic Pitch Learning. Cereb. Cortex. 18(4), 828 - 836.

http://www.physorg.com/news104599345.html

How bilingualism affects the brain

Using a new technique, researchers have shed light on how bilingualism affects the brain. The study involved 20 younger adults of whom half were bilingual in Spanish and English. Similar brain activity, in the left Broca's area and left dorsolateral prefrontal cortex (DLPFC), was found in bilinguals and monolinguals when the task involved only one language. However, when the bilinguals were simultaneously processing each of their two languages and rapidly switching between them, they showed an increase in brain activity in both the left and the right hemisphere Broca's area, with greater activation in the right equivalent of Broca's area and the right DLPFC. The findings support the view that the brains of bilinguals and monolinguals are similar, and both process their individual languages in fundamentally similar ways, but bilinguals engage more of the neurons available for language processing.

The study was presented at the Society for Neuroscience's annual meeting on October 14-18 in Atlanta, Ga.

http://www.eurekalert.org/pub_releases/2006-10/dc-drf101706.php

How does the bilingual brain distinguish between languages?

Studies of bilingual people have found that the same brain regions, particularly parts of the left temporal cortex, are similarly activated by both languages. But there must be some part of the brain that knows one language from another. A new imaging study reveals that this region is the left caudate — a finding supported by case studies of bilingual patients with damage to the left caudate, who are prone to switch languages involuntarily.

Stockton, K., Usui K., Green D. W., Price C. J., Crinion J., Turner R., et al. (2006). Language Control in the Bilingual Brain. Science. 312(5779), 1537 - 1540.

http://sciencenow.sciencemag.org/cgi/content/full/2006/608/2?etoc

Fast language learners have more white matter in auditory region

An imaging study has found that fast language learners have more white matter in a region of the brain that's critical for processing sound. The study involved 65 French adults in their twenties, who were asked to distinguish two closely related sounds (the French 'da' sound from the Hindi 'da' sound). There was considerable variation in people's ability to learn to tell these sounds apart — the fastest could do it within 8 minutes; the slowest were still guessing randomly after 20 minutes. The 11 fastest and 10 slowest learners were then given brain scans, revealing that the fastest learners had, on average, 70% more white matter in the left Heschl's gyrus than the slowest learners, as well as a greater asymmetry in the parietal lobe (the left being bigger than the right).

Golestani, N., Molko N., Dehaene S., LeBihan D., & Pallier C. (2007). Brain Structure Predicts the Learning of Foreign Speech Sounds. Cereb. Cortex. 17(3), 575 - 582.

http://www.newscientist.com/article/dn8964

Learning languages increases gray matter density

An imaging study of 25 Britons who did not speak a second language, 25 people who had learned another European language before the age of five and 33 bilinguals who had learned a second language between 10 and 15 years old found that the density of the gray matter in the left inferior parietal cortex of the brain was greater in bilinguals than in those without a second language. The effect was particularly noticeable in the "early" bilinguals. The findings were replicated in a study of 22 native Italian speakers who had learned English as a second language between the ages of two and 34.

Mechelli, A., Crinion, J.T., Noppeney, U., O'doherty, J., Ashburner, J., Frackowiak, R.S. & Price, C.J. 2004. Neurolinguistics: Structural plasticity in the bilingual brain. Nature, 431, 757.

http://news.bbc.co.uk/2/hi/health/3739690.stm

Both languages active in bilingual speakers

An imaging study involving bilingual Dutch and English speakers suggests that when a bilingual person is speaking a second language, the first language is always active and cannot be suppressed. It was thought that an environment of total immersion in a language would provide massive exposure to a second language and suppress the first language. However, it's now suggested that a large component of language immersion involves learning a new set of cues to the second language. To test this, students with no exposure to German or Dutch were taught 40 Dutch words. Some students learned the words in association with their English counterparts and others learned the words in association with a picture. Some of the pictures were oriented in the normal way and others were upside down or otherwise skewed. People who learned the Dutch in association with an object that was oriented uniquely were faster to later translate English words into Dutch. The mis-oriented pictures served as a unique cue.

The research was presented at the Second Language Research Forum, October 18, in Tucson, Arizona.

http://www.eurekalert.org/pub_releases/2003-10/ps-bla101703.php