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by Judy Willis, M.D., M.Ed.

Bilingual Brains – Smarter & Faster

Better attention and cognition in children who grow up in bilingual settings.

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A Gift Parents Can Give Children that Money Can't Buy

Recent studies of children who grow up in bilingual settings reveal advantages over single language children, including both increased attentive focus and cognition. The findings correlate with prefrontal cortex brain activity networks, which direct the highest levels of thinking and awareness.

Compared to monolinguals, the studied bilingual children, who had had five to ten years of bilingual exposure, averaged higher scores in cognitive performance on tests and had greater attention focus, distraction resistance, decision-making, judgment and responsiveness to feedback. The correlated neuroimaging (fMRI scans) of these children revealed greater activity in the prefrontal cortex networks directing these and other executive functions. (Bialystok, 2009; Kaushanskaya & Marian, 2007).

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This increased executive function activation in the brains of children in bilingual settings extends beyond the translation of language intake and output. The powerful implications of the new research are about brainpower enhanced by growing up bilingual.

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Dr. Judy Willis, a board-certified neurologist and middle school teacher, is an authority on classroom strategies derived from brain research.
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The networks that appear more active in the brains of bilingual children are part of the brain's CEO networks, called executive functions. These are a constellation of cognitive abilities that support goal-oriented behavior including directing attentive focus, prioritizing, planning, self-monitoring, inhibitory control, judgment, working memory (maintenance and manipulation of information), and analysis.

It is not during the first months or even years of life that the brain undergoes its greatest changes with regard to cognition. These neural networks of executive functions are the last regions of the brain to "mature" as recognized by the pruning of unused circuits and the myelination of the most active networks that as they become stronger and more efficient.

Executive functions such as selective attentive focus and the ability to block out distraction are typically minimally developed in childhood. These functions gradually become stronger throughout the years of prefrontal cortex maturation into the mid twenties. It is with regard to these executive functions that research about the "bilingual brain" is particularly exciting.

What is Happening in the Brains in Bilingual Settings?



This aspect of bilingual research has focused on bilingual upbringing with one language spoken at home that is not the same as the dominant language of the country. The interpretations of researchers, such as Ellen Bialystok who compared responses of 6-year olds from bilingual and monolingual homes, suggest the bilingual brain is highly engaged in the cognitive challenge of evaluating between the two competing language systems. This requires executive

function attention selecting and focusing on the language being used while intentionally inhibiting the activity of the competing language system.

When bilingual brains evaluate language, control and storage networks of both their languages are active and available. This ongoing processing, that seems instantaneous, is not reflexive or unconscious. It requires deliberate focus of attention on specific input and withholding of focus from simultaneous distracting input to analyze the language being used. Their brains need to evaluate and determine not only the meaning of words, but also which patterns of sentence structure and grammar apply and recognize nuances of pronunciation unique to the language of focus.

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Bialystok describes this massive activity as exercising the executive functions early in bilinguals at work to decipher these multiple codes within each language. These control networks make choices, such as which memory storage circuits are the language-correct ones to activate from which to select the correct word, syntax, and pronunciation. The choices are demanding of a CEO that can simultaneously direct where ongoing new input is sent for successful evaluation and activate the correct language storage banks to use for response. These executive functions simultaneously coordinate the evaluation of the content of the messages and direct the response to that information.

Implications for Brighter Starts



One of the most significant implications of the bilingual research is the recognition that even very young children's executive functions appear responsive to exercise which strengthens them for future use. An example from the research is these children's higher scores on cognitive testing.

This incoming research supports encouraging parents to retain use of their native language in the home, but too often, social pressures and mistaken beliefs often limit children benefiting from the bilingual brain booster.

One problem is parents concern that exposure to one language is less confusing for children. When I taught fifth grade in a school where most of the students' primary language was Spanish, I recall recently immigrated parents of my students telling me that although they were just learning English, they tried to only speak English at home with their children. They felt that would help their children learn English more successfully and believed that exposure to two languages would be confusing and make the transition to their new schools more difficult.

Another issue limiting the bilingual experiences was children's desire to fit in. As my students' English fluency improved, they would sometimes be asked by their parents to translate from English to Spanish during school conferences or meetings. When they did so, such as during "Back to School Night", many were clearly embarrassed that their parents didn't speak English and even tried to avoid having classmates hear them speak Spanish to their parents. When I would ask them about their reluctance, some would tell me that it made their parents seem "ignorant" when they did not speak English. My urging of parents to sustain the bilingual experience by speaking Spanish with their children in the home was thus resisted as children began to develop this bias against their native language.



The mistaken parental beliefs about confusing the brain with two languages and the response to their children's negative responses to their native language cause these children to miss out on a unique and

powerful opportunity to strengthen their highest cognitive brain potentials. One intervention educators and others in the community can do to avoid loss of the bilingual boost is to explain to new immigrants about the research and the strong impact they can have on their children's academic success by retaining their native language in the home.

The other intervention is to lay to rest the mistaken assumption that the brain has limitations that are overwhelmed with dual language exposure. The more we learn about neuroplasticity, the more it appears the reverse is true. Experiences with new domains of challenge in general seem to strengthen the brain's executive functions and cognition. This is evident on neuroimaging as well as in performance on the cognitive testing, reading comprehension, and success learning subsequent new languages. New challenges that include the use of judgment, analysis, deduction, translation, prioritizing, attention focusing, inhibitory control, delayed gratification, and pursuit of long-term goals are associated with increasing the number, strength, and efficiency of the executive function networks.

Just like our muscles become stronger with physical workouts, the developing brains of children in bilingual environments appear to build strength, speed, and efficiency in their executive function networks. This is the "neurons that fire together, wire together" phenomenon that in response to the electrical activations of messages traveling through them when used, executive function networks develop stronger connections – dendrites, synapses, and myelinated axons.

For now, it appears that when families have another language that can be spoken in the home where children are being raised it could be an opportunity to both enrich their language skills and also provide a cognitive boost for their highest brain networks of executive functions.



The implications of the bilingual research raise considerations of what other early exposures before and during school years can be designed to promote these executive function activations in all children. What are the implications regarding introducing second languages to young children from monolingual homes? Perhaps grandparents, nannies, friendships with families who speak another language could spend time with the children, or parents could participate in parent-child language classes suitable for youngsters such as learning and singing songs with movements in another language.

Does the bilingual benefit on cognition also work on older children and adults who learn second languages to the point of fluency? I'll address some of these questions in my next blog, including the relationship of executive function activation and building new networks of learning with reduction in the manifestations of cognitive degenerative diseases such as Alzheimer's disease.

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