Lost in Translation

SPEECH THERAPISTS HELP BILINGUAL STROKE PATIENTS FIND THEIR VOICE

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Hector Roman was unable to speak Spanish or English after he was shot in the head and then suffered a stroke 15 years ago. SAR researcher Swathi Kiran (far left) watches one of his speech therapy sessions.

HECTOR ROMAN SITS in a cubicle-sized room in Sargent College, a speech therapist drilling him in Spanish on images of everyday objects: shaver, dresser, clothespin. He grimaces at the picture of a radish, or *rábano* in Spanish. He forces his tongue and lips to feel the word. "Rabbi" is what comes out. Therapist Danielle Tsibulsky (SAR'10) gently nudges him along as he repeats the word for a vegetable he hates.

"*Eso es más* hard," Roman says. He flips his hand above the left side of his head. "*Mi cabeza es diferente.*"

Roman's head has been different for 15 years, since he was shot and suffered a stroke during the ensuing monthlong coma. The West Roxbury, Mass., resident woke up unable to speak either his native Spanish or English, the language he spoke every day. He has communicated since then using drawings, hand gestures, and fragmented sentences.

The 37-year-old wears a black patch over his left eye and a Red Sox cap pulled down low. He walks with a stilted swagger, his right arm limp, hand slightly curled. A jokester by nature, he likes to say he's a Puerto Rican pirate and that no one in his neighborhood would dare beat up a guy with a disability—one of the unexpected benefits of a debilitating stroke.

Millions of Americans speak more than one language. Like all people, as they age the likelihood of a stroke increases, and with it the possibility of losing the ability to speak, read, write, or understand what's being said, as well as some combination of those impairments, a condition known as aphasia.

Swathi Kiran, a SAR associate professor of speech, language, and hearing sciences, has studied the condition for eight years. She is one of the few researchers in the country confronting what she calls a pervasive problem: since most speech therapists are not bilingual, they may be reluctant or unable to treat bilingual patients because they do not know the patient's primary language.

When it comes to regaining language skills, bilingual patients face different challenges from those who have just one language. "Right now, patients with bilingual aphasia are limited in terms of the service they get," Kiran says. "Most of the therapy they receive is driven by the environment that they're in. In this country, it's more likely that they're going to receive therapy in English whether or not they need the therapy in English."

"We need to start now," she says, "so that we can have effective therapy practices for these individuals who speak all these different languages."

What if training bilingual aphasic patients in their weaker language—English, in many cases, Spanish in Roman's case—could actually strengthen their stronger language? "That's an important question," Kiran says, "because it means that everybody could receive therapy in

» When her research required a larger patient pool than was available, Swathi Kiran turned to a computer model that acts like a fluent bilingual.

one language, English." If Kiran's research bears this out, speech therapists fluent only in English could effectively treat bilingual or multilingual patients, who might actually reap greater benefit from receiving therapy in what is often their weaker language.

With funding from the American Speech-Language-Hearing Association, Kiran has launched a study giving bilingual aphasic patients 10 weeks of free speech therapy in their weaker language. The patients come twice a week for two-hour speech therapy sessions, where they're assessed on their ability to name objects on flash cards, assign them characteristics, and use them in complete sentences.

In Roman's case, he identifies the picture for "swan," chooses five written phrases that describe the bird, and weaves the word into sentences, all in Spanish. The goal is to cement "swan" in his brain within a network of ideas whose connections have become fuzzy since his stroke.

"The fundamental assumption of the therapy," Kiran says, "is that if we could give them information about words in a sort of semantically rich environment, they tend not only to understand the words better, but also to retain them for a longer period of time." Providing a context for each word allows patients to "make connections to other words that are related in meaning." If Roman remembers swan, the effort may help him recall similar words, like duck or goose.

Each week therapists measure patients' progress by the number of times they successfully name objects and answer questions about them. They are also tested on whether that newfound information is sparking vocabulary in their stronger language.

"We do know that patients not only improve their trained language, but also there's cross-language transfer," Kiran says. "But the nature of cross-language transfer and why some patients show clear effects of cross-language transfer and others don't is not very clear."

That uncertainty led her to focus on her patients' brains. Strokes typically damage brain tissue in the left hemisphere, the center for language processing. Functional magnetic resonance images (fMRI) of normal bilingual speakers' brains show that the same sections of the left hemisphere light up when either language is spoken.

Kiran, who speaks seven languages, wanted to know if that was true with her bilingual aphasic patients. She teamed up with the School of Medicine, whose fMRI technicians scanned patients while they were undergoing speech therapy. The results were surprising and encouraging: some patients' brains showed overlapping activity in the left hemisphere, but others' brains recruited help from diverse regions—including the right hemisphere.

"One of the reasons seems to be how well they knew these two languages before their stroke," she says. A patient who knows several hundred words in his weaker language is working from a different base than another whose lexicon expands into the thousands, explaining why the less fluent speaker may be searching elsewhere in the brain to find words he or she never knew.

WEB EXTRA Watch a video of a speech therapy session with one of Swathi Kiran's bilingual patients at bu.edu/bostonia.

Three years ago Kiran realized she would need a much larger patient pool to accurately determine which speech therapy would best suit each bilingual patient. She figured she needed at least 1,500 patients or else some methodology that would simulate the brains of that number of patients.

She found the help she needed at the University of Texas, Austin, where computer scientists have developed a model that acts like a fluent bilingual. "Once it starts accessing words in both languages, we lesion it," she says. "We pretend it's had a stroke. We remove the connections we just trained it to have. And then we try to see what happens in terms of how the brain can recover." The computer model's fluency can be tweaked to match that of potential patients.

"By causing a lesion in this model and retraining it, we understand what exactly we're doing to the brain," she says. "So we can make very clear predictions about what therapy should do." By the end of this year, she hopes to have 20 therapy scenarios to choose from in treating patients.

Kiran's research is based on her belief that the brain is malleable even a decade or more after a stroke, a perspective only recently accepted in her field. Roman is living proof. His English has improved, and he can hold his own in a Spanish conversation with his Puerto Rican grandmother, something he couldn't do easily before therapy.

"I don't believe these people lose everything after their stroke," Kiran says. "They have not lost information; that's called dementia. There's a loss of access—you know it, but you don't know how to get to it." ■

BILINGUAL APHASIA patients have access to limited services, says Swathi Kiran. But what if training them in their weaker language could strengthen their stronger language?

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