

SURVIVING STROKE:

STUDYING A NEW THERAPEUTIC APPROACH

BY JAMES SCHULTZ



ONSET IS SUDDEN. Few symptoms herald its arrival. Yet when stricken, victims often cannot move or speak. For the immediate effect it has, its name is appropriately terse: stroke. Like the sudden fall of an ax, a stroke severs mind from brain, volition from action. What once seemed ridiculously easy — knotting a shoelace, grasping or picking up an object, speaking in complete sentences — becomes an emotionally painful, frustrating, often embarrassing ordeal. Characteristic of a stroke’s aftereffects are muscular weakness, numbness over large areas of the body, slurred speech, and mild-to-severe difficulty in communicating, either verbally or non-verbally.

“After a stroke, you may never again be able to talk in complete sentences,” says Stacie Raymer, a speech-language pathologist and associate professor in Old Dominion’s Department of Early Childhood, Speech-Language Pathology and Special Education. “You may talk by stringing together a series of words. And people may understand what you mean. But someone will never say you’re speaking normally.”

Raymer is a specialist in aphasia, a brain-based condition usually associated with stroke that leaves people with difficulty understanding and/or sounding out words. She is also a participant with aphasia colleagues at the University of Florida in a four-year, \$4 million study funded by the National Institutes of Health to examine ways to lessen the effects of aphasia and related disorders, such as reading difficulties.

Raymer and the research team will examine ways the brain may be reprogrammed to verbally communicate by calling upon less damaged but related regions, such as those involved with gestural communication. In all, up to 100 stroke victims are expected to participate. For each participant, the team will establish a baseline level of ability by assessing the post-stroke extent and severity of verbal impairment. Raymer’s specific study (involving as many as 24 patients) will assess a therapy that involves the use of pantomimes to pair words and gestures, calling upon undamaged areas of the brain to assist in word retrieval. If this physiological

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“recruitment” is successful in rerouting brain function to unimpaired regions, therapists could have a powerful tool at their disposal to aid in stroke recovery.

Function And Failure

In Norfolk, patients will travel to offices on the Old Dominion campus for the initial evaluations and subsequent therapeutic sessions. Later, investigators will visit participants’ homes to assess the effectiveness of treatment. Improvements or difficulties should be visible during daily routines.

“We want to know if what we’re doing in the therapy room makes any difference at home. So we’re going to people’s homes to videotape them to find out if what we’re doing really works,” Raymer says. “It’s a long-term, laborious process. It will take months to profile one person. But by the end of 2002, we should know where these changes are being mediated in the brain.”

And it is the brain that is at the center of both function and failure. According to the American Heart Association (AHA), a stroke occurs when a blood vessel bringing oxygen and nutrients to the brain bursts or is clogged by a blood clot or some other particle. Because of this rupture or blockage, part of the brain doesn’t get the blood flow it needs. Deprived of oxygen, nerve cells in the affected area of the brain cannot work properly and die within minutes. When nerve cells misfire or die, the part of the body controlled by these cells can’t function either. Because the dead brain cells aren’t replaced, the devastating effects of stroke are often permanent.

There are four main types of stroke: two caused by blockages and two by excessive bleeding, or hemorrhage. Cerebral blood clots and other obstructions that plug arteries are by far the most common, accounting for nearly 80 per-



cent of all strokes. Cerebral and related hemorrhages are caused by ruptured blood vessels. They have a much higher fatality rate than strokes caused by blockages.

The AHA notes that stroke accounts for nearly one of every 15 deaths in the United States. When considered separately from other cardiovascular diseases, stroke ranks as the third leading cause of death, behind diseases of the heart and cancer. Each year, about 600,000 people suffer a new or recurrent stroke. About 500,000 of these are first attacks, and 100,000 are recurrent attacks. On average, someone in the United States suffers a stroke every 53 seconds; roughly every three minutes someone dies of one.

Stroke is more common in men than in women; in most age groups, more men than women will have a stroke in a given year. However, more than half of total stroke deaths occur in women. At all ages, more women than men die of stroke. The chance of having a stroke before age 70 is

THE RESEARCH TEAM WILL EXAMINE WAYS THE BRAIN MAY BE REPROGRAMMED TO VERBALLY COMMUNICATE

one in 20 for both sexes. For people over age 55, the incidence of stroke more than doubles in each successive decade. Those who survive often require extensive rehabilitation to mitigate the devastating consequences stroke has on motor, sensory, cognitive and communicative functioning.

Mitigating Damage

Given the huge physical toll exacted by strokes, will it be possible to essentially reroute function, as Raymer and her collaborators hope? None of the investigators is certain. What is known is that the brain has enormous capabilities and reserves that, absent catastrophic damage across multiple regions, may allow for a generous degree of rerouting or rewiring.

Previous studies indicate that while aphasia is likely to persist, some recovery is likely, with treatment appearing to help patients improve their language and communication abilities. While psychosocial factors such as age, gender, handedness, emotional state and family support contribute to aphasia recovery, their effect is much less substantial than the role played by physiology. In general, a more positive outcome may be anticipated when the aphasia occurs in the first six to 12 months during an individual's recovery from a neurological disease, or results from a lesion that is smaller and less injurious to adjacent tissue.

There is of yet no single drug or multiple pharmacological approach to prevent or cure stroke. Pending generations of drugs may prove beneficial, but at present the drug of choice is a compound known as TPA, a clot-busting substance that, if taken immediately, can limit brain damage for those whose strokes are caused by blockages.

"We know, from other studies and our own pilot programs, that patients can improve," Raymer says. "What we don't know is exactly what is mediating that improvement. What exact part of the brain takes over to mitigate the damage?"

Raymer's team will ultimately use sophisticated medical imaging devices to gauge the extent to which their therapies may allow for recruitment within the brain. For now, they will be testing various approaches to improve retrieval of verbs and nouns. The team's verbal and gestural approach will encourage the use of pantomimes to evoke a corresponding verbal response, which will later be assessed in structured word-retrieval tasks, as well as in conversational and functional measures of treatment outcome.

"We're interested in outcomes," Raymer says. "It is difficult work: slow, frustrating and effortful. But if you have a person severely impaired, the most modest gains are really noticeable. People are incredibly grateful. The results can be extremely gratifying."



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