Retraining THE BRAIN

TO RESTORE A SENSE OF BALANCE

Charging up to 70 miles per hour, a cheetah's body moves in frenzied rhythms while its head remains relatively stable. This helps it monitor one constant: gravity. Although vision and other senses add vital information, the animal's brain relies on its vestibular system's unerring reference point. Most humans (moving more slowly, of course) take for granted similar, essential functions. But when a human's vestibular system becomes damaged, other senses cannot fully compensate for the loss, and walking becomes difficult. Researchers wondered whether an artificial system could monitor spatial position and provide feedback. ***In essence, could the patient's brain be retrained?***

A WELL-BALANCED WORLD

Visitors to the Dizziness and Balance Center soon meet Gertrude. This styrofoam head became the researchers' companion as she modeled prototypes of a balance-assist device. With further development, it is hoped that one day Gertude's strappy headgear may be hidden in a stylish hat, and the size of the computing devices similarly minimized.

More significant than appearance or convenience, however, is the question of whether the human brain can functionally adapt to these new stimuli. To find out, researchers unstrap Gertrude and transfer the device to safely harnessed human subjects.

PITCH Shaking head "yes"

YAW Shaking head "no"

ROLL Tilting head to the side

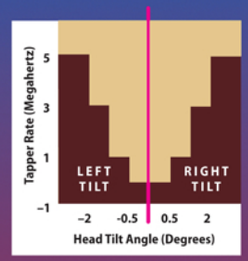
Joel A. Goebel, MD, and Belinda C. Sinks, AuD, display Gertrude and her high-tech accessories.

GYROSCOPE

A digital gyroscope attached to the back of the headband monitors head position relative to the environment.

TAPPERS

Tappers positioned alongside the head — front, back, left and right — provide sensory cues whenever the person veers "off course."



FEEDBACK

If the person doesn't immediately correct vertical position, the taps increase in frequency: a slow tap for one degree of tilt, fast for two degrees, and very fast for three degrees.

PLATFORM TEST

During lab tests, safely secured subjects respond to the device within a phone-booth-size artificial environment. Its disorienting, pivoting floorboard and landscape throws them off balance while researchers monitor results.

BRAIN POWER

Unlike the compact complexity of the brain's natural computing power, this circuitry must be worn in a backpack or connected externally. **The goal is to develop a miniaturized package for people on the go.**

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