Researcher finds altered cerebella in those with Down syndrome

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A scientist investigating why those with Down syndrome often have poor balance and motor coordination has found that key eye reflexes are substantially altered.

The findings by University of Colorado School of Medicine researcher Alberto Costa, MD, Ph.D., could lead to new tools to assess the effectiveness of new drugs and therapies aimed at improving quality of life for those with this genetic disorder.

"People with Down syndrome suffer various degrees of motor difficulty," said Costa, whose study was published last week in the journal, *Experimental Brain Research*. "They tend to walk later than their typical peers; they often lack balance and have low muscle tone and poor postural control."

That's likely because Down syndrome affects the optokinetic and vestibular systems of the brain. In a healthy brain, the vestibular system reacts to signals from neuroreceptors in the inner ear to produce responses to head movements. The optokinetic system uses visual information to produce eye movement. These reactions are often slow or decreased in those with Down syndrome.

Costa studied 32 participants between the ages of 14 and 36. He used special binocular goggles to measure eye movements in response to visual and vestibular stimuli. His focus was the cerebellum which is responsible for balance, posture and movement control.

"Although we have known for many years that the cerebellum is disproportionally shrunk in persons with Down syndrome, we wanted to find out how their cerebella operated on a functional level," Costa said. "We found that people with Down had much diminished optokinetic and vestibular reflexes compared to typically developing individuals. As a consequence, it is likely that things may appear blurry when they ride a bike or play sports."

Because those with Alzheimer's disease also show a similar reduction in the optokinetic reflex, these new findings further support Costa's ongoing exploration of the links between Down and Alzheimer's disease.

"All individuals with Down syndrome develop a neuropathology indistinguishable from Alzheimer's disease after the third decade of life," he said.

Babies born with Down often carry the biological markers for Alzheimer's. At the same time, 20-30 percent of those with Down syndrome develop full-blown Alzheimer's dementia by the time they reach their 50s, he said.

Costa recently completed a clinical trial with the drug Memantine – used to treat Alzheimer's patients - to determine if it could boost memory and learning in those with Down syndrome. His work was chronicled in a lengthy New York Times Magazine profile earlier this month.

"Alzheimer's patients suffer similar declines to those with Down syndrome and we might be able to use the same drugs to treat both," he said. "As we continue to explore how these two conditions are linked, new avenues of treatment could arise that would not only alleviate symptoms but perhaps delay or stop the progression of these degenerative disorders."