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Exercise aside, genes may ultimately dictate seniors' mobility

Genes interact with behavior to affect how well people move

GAINESVILLE, Fla. - Genes can keep elderly people from benefiting equally from exercise, no matter how much effort they expend, according to research findings published in today's (Aug. 10) Journal of the American Medical Association.

Of nearly 3,000 seniors studied, those who exercised stayed healthier than their couch potato peers, but those born with a certain gene benefited the most from physical activity, said Marco Pahor, M.D., director of University of Florida's Institute on Aging and the multi-institutional study's senior author.

"To our knowledge, this is the first study to show behavioral and genetic interaction in functioning and aging, and shows people are already pre-selected, that there are genes that interact with behavior to affect mobility," Pahor said.

Decreasing mobility, along with lack of muscle strength and a decline in aerobic ability, are common aspects of aging that can lead to loss in quality of life, Pahor said. Understanding the mechanisms of how people lose mobility may lead to ways to help people remain independent longer, he added.

Federal health statistics have shown that about 34 percent of the U.S. population aged 70 or older reports difficulty walking a quarter of a mile. These individuals are at much greater risk of moving into a nursing home or dying over a two-year period, compared with their counterparts who do not report trouble walking the distance.

And despite the undisputed benefits of exercise, not everyone responds the same, even when they do lead active lives - for reasons that have not been entirely clear.

In the current study, researchers assessed seniors in an effort to better understand the relationship between genetic makeup, intensity of physical activity and functional decline. Twice a year throughout the four-year study, participants ages 70 to 79 reported their level of activity and their ability to walk a quarter mile or up 10 stairs.

Researchers also tested the blood of each study subject to identify which version of a gene long associated with exercise performance they had. About a third of the population possesses the DD genotype of the gene, named for the angiotensin-converting enzyme, or ACE. The rest have the II or ID versions of the ACE gene.

Study participants were categorized according to their exercise intensity and their genetic makeup. Overall, about 41 percent of study participants became less mobile over the four-year period. Even though people who exercised were less likely to develop substantial physical limitations, not everyone received the same benefits, even if they exercised with the same intensity.

About a third of the seniors engaged in significant physical exercise including walking and strenuous exercise, and they preserved their mobility longer than the 70 percent who engaged in little or no physical activity. Researchers also evaluated the 8 percent who reported participating in weight training.

But genetic makeup influenced long-term physical function. Among exercisers, the DD and ID genotypes were more likely to remain fit than those with the II genotype, who developed mobility problems at a 45 percent higher rate, researchers found. No difference in mobility according to genotype was found among non-exercisers, suggesting function was influenced by an interaction between exercise intensity and genetic make-up.

In addition, seniors who reported weight training and had the DD or ID genotype displayed the lowest rate of mobility loss in any exercise category. In contrast, weight trainers with the II genotype developed physical limitations similar to those experienced by seniors who were relatively inactive.

What differences in body composition the genotype creates also may yield clues to what causes mobility limitations to develop with age, and what people can do to stay active, Pahor said. Those with the II genotype, for example, tended to have higher total body fat.

"The good news is that regardless of genotype, the physically active people were at lower risk of losing mobility, suggesting that everyone should exercise to preserve mobility," said Pahor, a professor and chairman of the College of Medicine's department of aging and geriatric research.

The study's lead author, Stephen Kritchevsky, Ph.D., a professor and director of the Sticht Center on Aging at the Wake Forest University School of Medicine, said that people respond differently to exercise and that the implications of that response may change as they age.

"In our study, the II genotype is associated with increased fat in the leg muscles," Kritchevsky said. "Now energy storage near muscles may benefit young athletes engaged in endurance activities, but in older persons, accumulation of leg fat has been linked to poorer muscle function and metabolic diseases like diabetes."

The study, funded by the National Institute on Aging and the Claude D. Pepper Older Americans Independence Center and conducted in conjunction with researchers at several other institutions, including the University of Tennessee and the University of Pittsburgh, opens the door to more research on the interaction of behavior and genes and how that changes with age, Pahor said.

"This report is one step," he said. "It is necessary to do more research to determine whether there are other genes that may affect the benefits of physical activity on functioning of older adults."

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