Mount Everest in decline?

An expedition in the Himalayas has found that glaciers above 8,000 metres may disappear by the middle of this century

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A view of Mt Everest from *South Col*

'Why do you want to climb Mount Everest?" English mountaineer George Mallory was asked. "Because it's there," he answered.

Mallory's expedition, in 1924, was perhaps the earliest of many that followed. Mariusz Potocki, Paul Andrew Mayewski, Tom Matthews, L Baker Perry, Margit Schwikowski, Alexander M Tait, Elena Korotkikh, Heather Clifford, Shichang Kang, Tenzing Chogyal Sherpa, Praveen Kumar Singh, Inka Koch and Sean Birkel writing in the *Nature* group journal, *Climate and Atmospheric Science*, describe an expedition of 2019 with a more focused objective than Mallory's. The *National Geographic* and *Rolex's Perpetual Planet Everest Expedition* is "the most comprehensive scientific investigation of the Nepalese side of Mt Everest thus far undertaken, including studies in biology, geology, glaciology, meteorology, and mapping," the paper says.

Surveys of the lower Himalayas have been undertaken as part of the Survey of India since the early 1800s. Progress deeper into the Himalayas, however, was hampered because Nepal was reluctant to allow access to English surveyors. And not surprisingly, as it was the time of the "Great Game" and States in and around the Himalayas were suspicious. Surveys of the higher peaks hence had to be from a distance, and the highest known was Kanchenjunga. More than one observation had shown that there was a higher peak, but given the distances, there was not enough data to be sure.

It was in 1852, that Radhanath Sikdar, an Indian surveyor from Bengal, identified the world's highest peak. This was based on data collected by James Nicholson, who had made several observations from distances of over 174 kms away but was prevented by malaria from completing the analysis. The discovery was refined and verified over the next few years and in 1856, Andrew Waugh, Surveyor General of India, declared Kanchenjunga, designated Peak IX, to be at 8,582 metres while the higher peak, then known as Peak XV, was at 8,840 m.

This figure is now more accurately known and is accepted at 8,848.86 m (29,031.7 feet). And over the last century, Mt Everest, as Peak XV has come to be known, has been a popular mountaineering objective. Apart from being the highest peak in the world, the ascent of Mt Everest has challenges like powerful winds and changing conditions. And the region is one of the most glaciated in the world, outside the poles. But formal, scientific enquiry into the key factors that affect climatic conditions has not been conducted so far, the paper says.

The area, however, is of great ecological significance, and particularly as the source of sustenance for large populations. The world over, it is estimated that some 300 million people depend directly on glaciers and 1.6 billion people depend on mountains for fresh water. And 50 per cent of the Earth's biodiversity centres are in mountain regions, the paper says. And with glacial melt that has set in with global warming, understanding the mechanics of the climate at high altitudes has become urgent, the paper says.

The thrust of the 2019 scientific expedition was hence to study the "key drivers influencing atmospheric circulation, changes in snow and ice extent over time, and climate model verification." These factors, the paper says, "together will decrease uncertainty in the climate change projections needed to plan a sustainable future."

A peak that is adjacent to Mt Everest is *Lhotse* (South Peak in Tibetan), which is the fourth highest (after K2 and Kanchenjunga) peak in the world. And the lowest point, or the *col*, of the ridge that separates the two peaks, is *South Col* at 7,900 m (26,000 ft), from where the final assault on Everest is launched by mountaineers. And over *South Col* flows the South Col glacier, or SCG. As the region is swept by high velocity winds, most of the glacier's snow cover is blown away and the glacier's ice face is exposed.

The SCG has been facing severe loss of ice mass in recent years. An objective of the expedition was hence to assess the timing and causes of this loss, and the implications for other high mountain glacial systems. To this end, a 10-metre-deep ice core, which records conditions over past years, was recovered, at the SCG. And automatic weather stations, the world's highest, to monitor current conditions, have been established at the SCG and a nearby feature called the *Balcony*.

The ice core is only 10 m, from 30-50 m of ice, because the average temperature of -26 °C, low oxygen, and winds, only permit two hours of drilling into the ice. The age of the upper 10-69 centimetres (about two ft) of ice was estimated from the micro-sized aerosol particles trapped in annual snowfall that builds up the ice, and the age comes to 1,800 to 2,000 years.

Techniques that have proved effective in a nearby glacier were able to identify the rate of build-up of ice as 27 millimetres every year. Over 2,000 years, this should grow to 54 m of ice. Using the data of the nearby glacier, after allowing for differences in age and snowfall, the depth expected is estimated at 108m – which suggests about 55 m less ice thickness at the SCG. It is a figure that would be close to the ice thickness loss.

To work out the timing of this ice loss, the authors used existing records, photo-records, ice core and meteorological records, and statistical analysis. Putting together the records of 112 Himalayan glaciers, covering the period 1812-1965, showed that glaciers had begun to recede, in parts as early as 1860. Glacial loss got more common and became the trend by 1950, and really sped up by 2000, the paper says.

Another analysis of climate trends, going back to 1950, showed that there was large-scale warming over Asia, with significant warming

Mt Everest is at top centre and Lhotse is at the top right. South Col runs in between.
(from The Ascent of Everest, by Sir John Hunt, leader of the 1953 expedition)

over the Tibetan plateau from the late 1990s. The focus of the study over Mt Everest shows a sharp contrast between the pace of warming before 1950 and the intense warming after late 1990s, the paper says.

In order to see whether the trend of glacial ice loss correlated with this trend of warming, the authors carried out trials with how changing air temperature, relative humidity, wind speed, snowfall, short and long wave radiation affected the pace of loss of mass at the surface. What they found, over the period from 1950-2019, is that the main process of mass loss is "sublimation", when ice, or snow cover, turns into vapour without first thawing as water. While rising temperature is found to be the key factor, over the SCG, the high wind speeds accelerate sublimation, although they could be expected to retard melting.

A next trial was with exposed ice, that is, without a snow cover. There again, sublimation was the main process, except that it was now 20 times more marked, over melting, than when there was snow cover. This is significant, the paper says, for the SCG, which has scant snow cover. And in other places too, the faster sublimation of snow would deplete the snow cover!

The finding shows that current theories of glacial shrinking need refinement. The primacy of sublimation in the process adds to how sensitive high-altitude land masses are to changing conditions. "Climate predictions for the Himalayas all suggest continued warming and continued glacier mass loss…even glaciers such as SCG that are above 8,000m may disappear by mid-century," the paper says.

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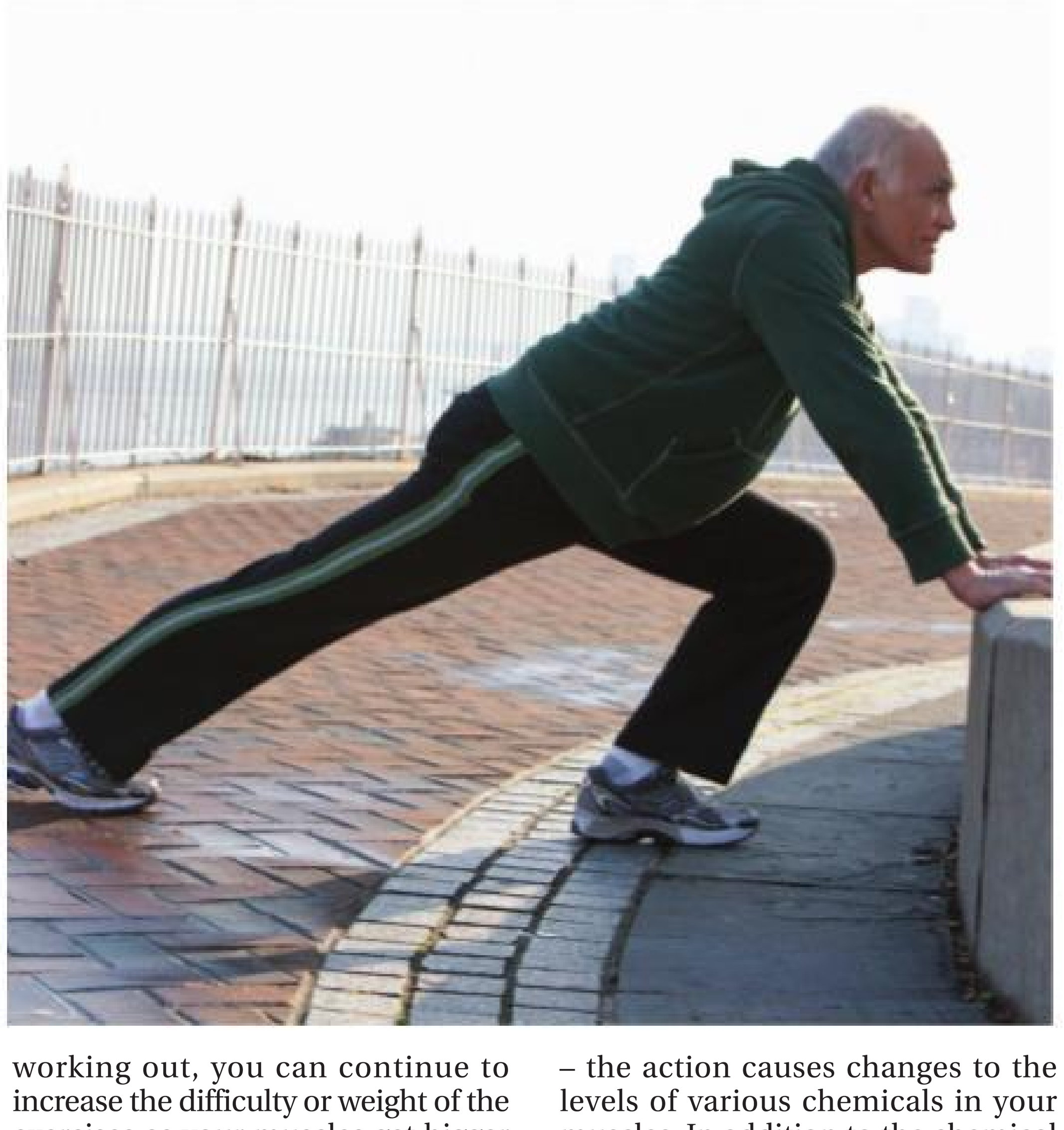
Building strength as you age

Here's why 50-year-old muscles just can't grow big like they used to, but it shouldn't deter one from exercising they get older

ROGER FIELDING



There is perhaps no better way to see the absolute pinnacle of human athletic abilities than by watching the Olympics. But at the Winter Games this year – and at almost all professional sporting events – you rarely see a competitor over 40 years old and almost never see a single athlete over 50. This is because with every additional year spent on Earth, bodies age and muscles don't respond to exercise the same as they used to.

I lead a team of scientists who study the health benefits of exercise, strength training and diet in older people. We investigate how older people respond to exercise and try to understand the underlying biological mechanisms that cause muscles to increase in size and strength after resistance or strength training.

Old and young people build muscle in the same way. But as you age, many of the biological processes that turn exercise into muscle become less effective. This makes it harder for older people to build strength but also makes it that much more important for everyone to continue exercising as they age.

How the body builds muscle

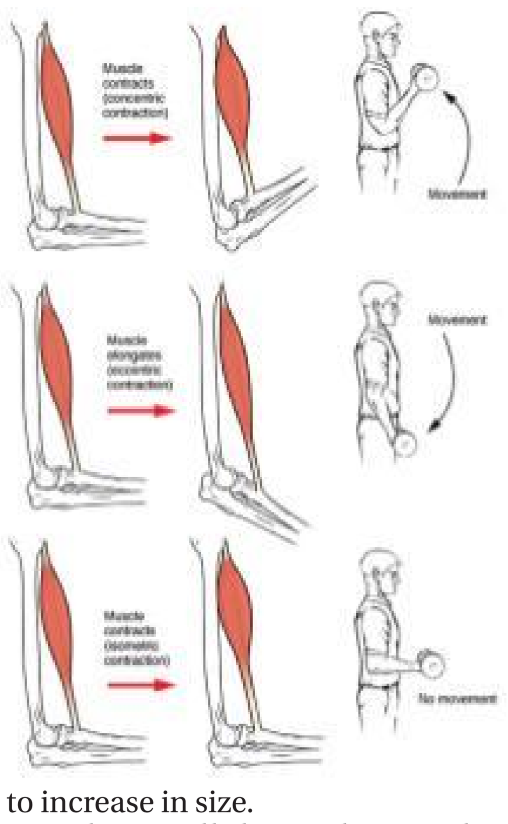
The exercise I study is the type that makes you stronger. Strength training includes exercises like push-ups and sit-ups, but also weightlifting and resistance training using bands or workout machines.

When you do strength training, over time, exercises that at first felt difficult become easier as your muscles increase in strength and size – a process called hypertrophy. Bigger muscles simply have larger muscle fibres and cells, and this allows you to lift heavier weights. As you keep working out, you can continue to increase the difficulty or weight of the exercises as your muscles get bigger and stronger.

It is easy to see that working out makes muscles bigger, but what is actually happening to the cells as muscles increase in strength and size in response to resistance training?

Any time you move your body, you are doing so by shortening and pulling with your muscles – a process called contraction. This is how muscles spend energy to generate force and produce movement. Every time you contract a muscle – especially when you have to work hard to do the contraction, like when lifting weights – the action causes changes to the levels of various chemicals in your muscles. In addition to the chemical changes, there are also specialised receptors on the surface of muscle cells that detect when you move a muscle, generate force or otherwise alter the biochemical machinery within a muscle.

In a healthy young person, when these chemical and mechanical sensory systems detect muscle movement, they turn on a number of specialised chemical pathways within the muscle. These pathways in turn trigger the production of more proteins that get incorporated into the muscle fibres and cause the muscle



to increase in size.

These cellular pathways also turn on genes that code for specific proteins in cells that make up the muscles contracting machinery. This activation of gene expression is a longer-term process, with genes being turned on or off for several hours after a single session of resistance exercise.

The overall effect of these many exercise-induced changes is to cause your muscles to get bigger.

How older muscles change

While the basic biology of all people, young or old, is more or less the same, something is behind the lack of senior citizens in professional sports. So, what changes in a person's muscles as they age?

What my colleagues and I have found in our research is that in young muscle, a little bit of exercise produces a strong signal for the many processes that trigger muscle growth. In older people's muscles, by comparison, the signal telling muscles to grow is much weaker for a given amount of exercise. These changes begin to occur when a person reaches around 50 years old and become more pronounced as time goes on.

In a recent study, we wanted to see if the changes in signalling were accompanied by any changes in which genes – and how many of them – respond to exercise.

Using a technique that allowed us to measure changes in thousands of genes in response to resistance exercise, we found that when younger men exercise, there are changes in the expression of more than 150 genes. When we looked at older men, we found changes in the expression of only 42 genes. This difference in gene expression seems to explain, at least partly, the more visible variation between how young and old people respond to strength training.

Staying fit as you age

When you put together all of the various molecular differences in how older adults respond to strength training, the result is that older people do not gain muscle mass as well as young people.

But this reality should not discourage older people from exercising. If anything, it should encourage you to exercise more as you age.

Exercise still remains one of the most important activities older adults can do for their health. The work my colleagues and I have done clearly shows that although the responses to training lessen with age, they are by no means reduced to zero.

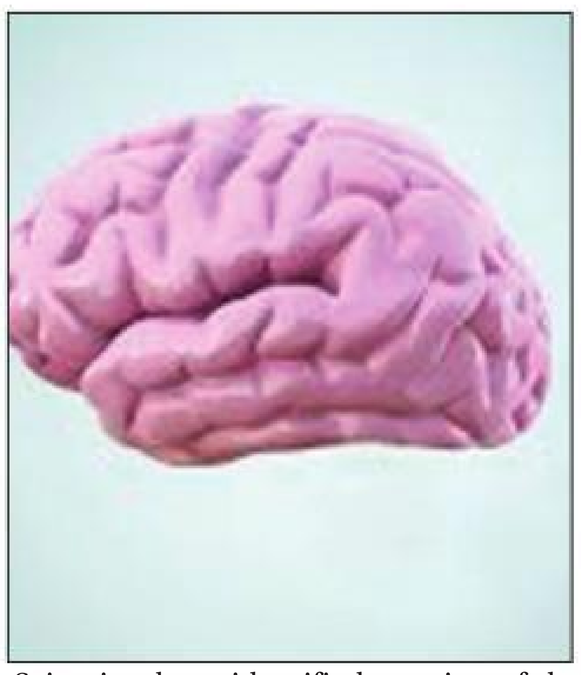
We showed that older adults with mobility problems who participate in a regular programme of aerobic and resistance exercise can reduce their risk of becoming disabled by about 20 per cent. We also found a similar 20 per cent reduction in risk of becoming disabled among people who are already physically frail if they did the same workout programme.

While younger people may get stronger and build bigger muscles much faster than their older counterparts, older people still get incredibly valuable health benefits from exercise, including improved strength, physical function and reduced disability. So, the next time you are sweating during a workout session, remember that you are building muscle strength that is vital to maintaining mobility and good health throughout a long life.

The writer is associate director of the Jean Mayer USDA Human Nutrition Research Center on Aging, Professor of Medicine, Tufts University, United States. This article first appeared on www.theconversation.com

PLUS POINTS

Brain & words



Scientists have identified a region of the brain that is responsible for making sure people say words as intended, an advance that could lead to the development of new therapies to treat speech problems.

This region called the dorsal precentral gyrus – crossing the folded surface of the top of the brain – plays a major role in helping people use the sound of their voices to control word pronunciation, the study, published last week in the journal *PLoS Biology*, noted.

In the new research, scientists led by a team from New York University's Grossman School of Medicine analysed half-dozen subregions of the brain's surface layer – or cerebral cortex – that are known to control how people move their mouth, lips, and tongue to form words. These regions, the researchers say, are also known to help people process what they hear themselves saying.

This process by which the brain assess feedback signals from the body as people speak – known as the auditory feedback control of speech – is impaired in various neurological disorders ranging from stuttering to aphasia, the study noted. They say, however, the precise role of each of the brain subregions involved in this process in real-time has remained unclear due to technical difficulties in assessing the brain directly while people are alive and talking.

The new study assessed the brain's feedback mechanisms for controlling speech, particularly whether the dorsal precentral gyrus is responsible for generating the brain's initial memory for how spoken words are "supposed" to sound. It also assessed whether this brain region played a role in noticing errors in how words were actually spoken.

It found that while three cortical regions were primarily involved in correcting errors in speech, only the dorsal precentral gyrus, dominated when delays in speech – meant to signify feedback errors – were maximised. These brief feedback delays ranged from zero milliseconds to over 200 milliseconds and were designed to mimic real-life slurring of speech, the researchers explained.

Study senior author and neuroscientist Adeen Flinker said in a statement, "Now that we believe we know the precise role of the dorsal precentral gyrus in controlling for errors in speech, it may be possible to focus treatments on this region of the brain for such conditions as stuttering and Parkinson's disease, which both involve problems with delayed speech processing in the brain."

The independent

Why they bite

Pesky mosquitoes are more attracted to people who wear red, orange or black clothes, according to new research. But they are put off by those in green, purple, blue or white clobber, say scientists.

You will, however, need to cover up as they "see" human skin of whatever colour as red and home in on it. The insects fly towards specific colours – once they have smelled a plume of carbon dioxide from human breath. After sniffing the gas, they home in on particular hues that take their fancy.

Senior author professor Jeffrey Riffell, of the University of Washington, Seattle, said, "When they smell specific compounds, like carbon dioxide from our breath, that scent stimulates the eyes to scan for specific colours and other visual patterns, which are associated with a potential host, and head to them."

The findings in *Nature Communications* shed light on why mosquitoes attack some individuals – and leave others alone. Human skin, regardless of overall pigmentation, emits a strong red or orange "signal" to their eyes. The mosquito's sense of smell, or olfaction, influences how it responds to visual cues.

Knowing what lures the hungry pests also opens the door to developing better repellents, traps and other methods to keep them at bay.

The independent/agencies