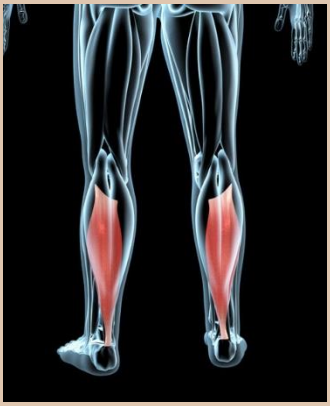
A New Type of Pushup

Soleus pushup has remarkable metabolic effects



The incidence of metabolic dysfunction has been increasing for years. This metabolic dysfunction is caused by insulin resistance, which is known to cause inflammation and higher insulin (and eventually glucose) levels, resulting in fat gain, prediabetes, metabolic syndrome, and over time, diabetes. Most of us spend a good part of our days sitting, most people sitting on average 9-11 hours daily. Sitting results in a decreased metabolic rate (the rate we burn calories). Too much sitting has been shown to increase the risk of heart disease, diabetes, and dementia. We all know we should be walking more and getting more activity. But what if there was a way to raise our metabolism for hours without fatigue? What if using only one muscle (1% of our body weight) could significantly increase our metabolic health?

Abstract

- Slow oxidative muscle, most notably the soleus, is inherently well equipped with the molecular machinery for regulating blood-borne substrates. However, the entire human musculature accounts for only ∼15% of the body's oxidative metabolism of glucose at the resting energy expenditure, despite being the body's largest lean tissue mass. We found the human soleus muscle could raise local oxidative metabolism to high levels for hours without fatigue, during a type of soleus-dominant activity while sitting, even in unfit volunteers. Muscle biopsies revealed there was minimal glycogen use. Magnifying the otherwise negligible local energy expenditure with isolated contractions improved systemic VLDL-triglyceride and glucose homeostasis by a large magnitude, e.g., 52% less postprandial glucose excursion (∼50 mg/dL less between ∼1 and 2 h) with 60% less hyperinsulinemia. Targeting a small oxidative muscle mass (∼1% body mass) with local contractile activity is a potent method for improving systemic metabolic regulation while prolonging the benefits of oxidative metabolism.

This is an innovative study that found that repetitive contractions of the soleus muscle sustained an elevated oxidative metabolism to improve blood glucose regulation for hours. Instead of breaking down glycogen (stored glucose that is usually used for exercise), the soleus muscle uses other fuels such as blood glucose and fats. After consuming a glucose drink, the researchers found that the soleus pushup caused a 52% improvement in blood glucose and 60% less insulin was required over three hours. Fat metabolism was doubled when the exercise was performed fasted with lower triglycerides and VLDL particles noted.

I know the next question is how to do a soleus pushup? While seated with feet flat on the floor and muscles relaxed, the heel rises while the front of the foot stays put. When the heel gets to the top of its range of motion, the foot is passively released to come back down. The aim is to simultaneously shorten the calf muscle while the soleus is naturally activated.

A couple of things to keep in mind. The study was done using EMG feedback to help subjects know they were doing the exercise properly which isn't available outside of a lab setting; the authors are not promoting this to everyone at this time. They had two protocols; one was 130 minutes daily and the other 270 minutes daily. That is a lot of soleus pushups! They didn't comment on a pace but watching the video it looks like about once a second and they were using a single leg although I don't see why one couldn't alternate. They also don't comment on the intensity of contractions but since the subjects didn't get fatigued or sore it seems like just the motion was enough to stimulate the response without much of a contraction at the end. It would be interesting to see if a TENS unit could be used to specifically stimulate the soleus muscle which would take the consciousness out of it and make it easier to do while completing other tasks. In the meantime, I am doing them while writing this!

Hamilton MT, Hamilton DG, Zderic TW. A potent physiological method to magnify and sustain soleus oxidative metabolism improves glucose and lipid regulation. *iScience*. 2022 Aug 5;25(9):104869. doi: 10.1016/j.isci.2022.104869.