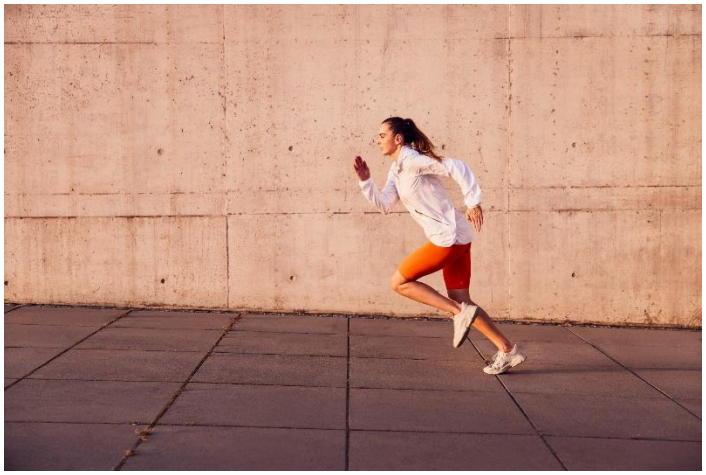
Through the Body Sprint Exercise Sends a very Different Molecular Signal

A human exercise intervention study found that exercise intensity distinctly alters circulating proteins and metabolites associated with predicted inter-organ communication. The responses differed between sprint-interval exercise (SIE) and moderate-intensity exercise (MIE). The findings provide insights into how exercise intensity may influence cardiometabolic health by altering interorgan crosstalk.



Study

The researchers conducted a multi-cohort human exercise intervention involving young, active, metabolically healthy participants assessed before and after training. Participants performed a single session of either sprint-interval exercise (SIE) or moderate-intensity exercise (MIE) before and after eight weeks of training, thus forming comparable pre-training and post-training groups.

In the principal cycling comparison, nine participants performed 90 minutes of MIE, while 10 completed six 30-second all-out SIE bouts separated by four-minute rests. The main cohort was male, and a subset of participants completed the eight-week training intervention.

The investigators analyzed changes in circulating proteins and metabolites associated with the different exercise conditions. They also predicted the tissues of origin and destination of exercise-regulated circulating proteins by combining this data with multi-organ gene and protein expression datasets and tissue sampling.

The study additionally examined associations between exercise-responsive circulating proteins and cardiometabolic health using a large-scale plasma-phenome database.

Findings

The findings showed that SIE and MIE had markedly different effects on the plasma proteome. With SIE, almost a quarter of the 2,884 detected proteins showed an immediate change. This included proteins known to respond to exercise, such as growth hormone 1 (GH1).

In contrast, only seven proteins were altered from baseline after MIE. At three hours post-SIE, there was an approximately 20-fold decrease in the number of regulated proteins, while MIE-related proteins increased to 19.

Despite the small number of MIE-regulated proteins, these included established endocrine factors such as ANGPTL4, follistatin, and insulin-like growth factor-binding protein 1 (IGFBP1). The scientists suggest that these MIE changes might indicate the sustained energetic demands of continuous exercise, including an increased glucagon-to-insulin ratio and liver glycogen depletion, which can stimulate hepatic secretion of FST and IGFBP1.

Some secreted proteins, such as GH1 and NAD-kinase, rose immediately after either type of exercise, while others, such as prolactin, decreased 3 hours after exercise.

Overall, 280 proteins were differentially influenced by SIE versus MIE immediately after exercise. Most of them increased after SIE relative to MIE. Only two proteins showed a significant intensity-by-time difference at 3 hours, both of which were higher after MIE.

Further untargeted mass spectrometry supported these findings.

Notably, similar temporal patterns persisted in trained participants: a delayed rise after MIE versus an acute rise in plasma proteins after SIE, affecting many common components of the proteome.

These findings suggest an exercise-related molecular response that depends strongly on exercise intensity, although the protocols also differed substantially in duration.

Conclusion

The study demonstrates that exercise intensity is an important determinant of changes in circulating signaling molecules, including proteins and metabolites, during and after exercise.

The findings also highlight skeletal muscle and adipose tissue as a potential source and target organ, respectively, of exercise-regulated circulating factors. By connecting these molecular changes with large-scale phenome data, the study outlines potential associations with cardiometabolic health and disease while identifying molecular pathways that may contribute to the distinct effects of different exercise intensities.

Source:

https://www.news-medical.net/news/20260816/Sprint-exercise-sends-a-very-different-molecular-signal-through-the-body.aspx