Study investigates how running affects brain response to food cues

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A single bout of exercise increased reactivity to food cues in parts of the brain associated with attention, anticipation of reward and episodic memory, according to research published in *Human Brain Mapping*.

Researchers from the UK's Loughborough University, University of Bristol, University of Nottingham and the University of Leicester, and Waseda University in Japan investigated the impact of running on blood flow in the brain and how this influenced brain activity in relation to appetite. They found that changes in how participants responded to visual food cues happened independently of the overall changes to blood flow in the brain.

How much we eat is influenced by systems in the brain that are sensitive to changes in our body and the food environment we are in. Previous studies have shown that single bouts of exercise such as running can temporarily suppress appetite. However, we don't fully understand the extent to which exercise impacts how likely we are to eat.

Food cue reactivity is the way our body responds to food. It's the way we react (both physically and psychologically) to the sight or smell of food, for example. Food cue reactivity can have an impact on our appetite and how much we end up eating.

The study team wanted to explore whether exercise-induced blood flow changes in the brain can influence how people react to food. These changes can be captured using functional magnetic resonance imaging (fMRI). fMRI scans help us evaluate what is happening in the brain by detecting small changes in blood flow.

For this study, twenty-three men underwent fMRI scans before and after 60 minutes of running or rest. During the scan, they were asked to look at three types of images ranging from low-energy dense foods such as fruits and vegetables to high-energy dense foods such as chocolate, as well as non-food items such as furniture.

Researchers found that the bout of exercise suppressed how hungry participants said they felt but it increased the reactivity of multiple parts

of their brain to food cues. Using a different type of fMRI, the study team also detected changes in blood flow in the brain after exercise, although these changes did not appear to influence the food cue reactivity signals.

Dr. Alice Thackray, a Senior Research Associate in Exercise Metabolism from Loughborough's School of Sport, Exercise and Health Sciences (SSEHS) was the lead author for the study. She said, "Our findings confirm individuals feel less hungry during and immediately after an exercise session and provide some insights into the short-term influence of exercise on brain appetite responses.

"Although additional research is needed to determine the implications of these findings, we know the brain plays an important role in the control of appetite and food intake. This study is part of an exciting collaboration that we plan to develop further as we continue to explore how exercise and appetite interact, including the influence on central (brain) responses."

David Stensel, Professor of Exercise Metabolism in SSEHS, added, "The role of exercise in modifying appetite and assisting with weight control remains a hotly debated topic. This research demonstrates that how our brains respond to food cues can be altered by exercise.

"The study provides a springboard for further work to characterize appetite responses to exercise more precisely and comprehensively. This, in turn, will give us a better understanding of the role of exercise in preventing and managing unhealthy weight gain."

Dr. Elanor Hinton from the university of Bristol, said, "This research began as a small pilot collaboration between two NIHR BRCs in Loughborough and Bristol. We are delighted that our initial plans have grown to produce this publication in *Human Brain Mapping*, in which we

have shared our respective expertise. A further publication is now pending from this fruitful collaboration, demonstrating the value of collaboration across our research groups."

More information: Alice E. Thackray et al, Exploring the acute effects of running on cerebral blood flow and food cue reactivity in healthy young men using functional magnetic resonance imaging, *Human Brain Mapping* (2023). DOI: 10.1002/hbm.26314

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