

Regular aerobic exercise - like running, swimming, or cycling - is considered one of the **most effective techniques to target mental health by improving mood**. Exercise has been robustly associated with reduced stress, anxiety, and depression, as well as increased happiness, vitality, and energy levels. So far, however, the mechanisms underlying the positive influences of exercise on mood are not well understood.

The positive effects of exercise on mood are typically attributed to the brain changes that accompany exercise (brain approach, hereafter). Although the brain is the essential organ responsible for shaping our mood, aerobic exercise primarily affects the heart. This is why this type of exercise is sometimes called cardio exercise. Moreover, not without reason, we often say that we feel lighthearted or heartbroken - the heart is another essential organ in creating our mood. Finally, the heart and the brain are anatomically and functionally connected, and they constantly interact with each other. Therefore, **rather than depending solely on the brain changes, the benefits of exercise for mood are likely to be an outcome of dependencies between the heart and brain**.

Our main objective is to fully and comprehensively understand the mechanisms underlying exercise-induced changes in mood by introducing a **novel approach that we call "the heart & brain approach"**. Our approach posits that the positive effects of exercise on mood result from mutual dependencies between two distinct body organs, i.e., heart and brain, that dynamically adapt and interact in response to exercise. To precisely assess the heart & brain interactions in the context of exercise, we have planned **a six-month intervention combined with advanced brain, heart, and mood measures**.

We will invite seventy participants leading a sedentary lifestyle to the project. Half of them will be asked to stick to their usual habits, whereas the other half will attend stationary bike classes three times a week, under the supervision of exercise physiologists. In the course of this intervention, we will use electroencephalography (EEG) to measure brain changes, electrocardiography (ECG) to measure heart changes, and special questionnaires and scales to measure mood changes. Crucially, advanced calculations will allow us to understand how the heart and brain communicate and how these communication patterns change during the intervention. We expect these interactions to provide a more precise and comprehensive understanding of the exercise-induced changes in mood compared to the brain approach. This will **challenge the view currently favored in the literature** that the brain mechanisms are the only driving force of the exercise effects on mood.

Overall, the proposed research program should answer one of the critical questions of psychological research on exercise: **What is the mechanism behind the positive effect of exercise-induced mood changes?**

The outcomes of this project will allow proposing a **comprehensive theoretical model** of the relationships between exercise and mood, advancing scientific understanding of the relationship between exercise and emotional health. The outcomes of the proposed project are also expected to be **transferable into recommendations for public health**, forming a well-grounded basis for the development of alternative, low-cost, no side-effects treatments against mood disorders or interventions aimed at improving our everyday functioning.