

The increasing number of people facing mental health challenges, such as depression and cognitive decline, highlights the urgent need for effective interventions and a deeper understanding of how to enhance mental well-being. While research shows that cardiovascular exercises like cycling or running can offer mental health benefits, their effectiveness can vary greatly from person to person. For instance, two people doing the same exercise might experience different effects on their mood and cognitive function. This inconsistency complicates our understanding of how exercise impacts mental health and raises questions about its overall effectiveness.

Our initial findings suggest that this variability stems from the traditional method of prescribing exercise, known as the cardiac-standardized (CS) approach. The CS approach aims to standardize exercise intensity by focusing on heart rate, which leads to uniform cardiovascular responses. For example, all individuals are advised to exercise at a similar heart rate. While this method is effective for improving cardiovascular health, it may lead to unpredictable effects on brain function. Considering that the brain is a key regulator of mood and cognitive function, we regard the current approach as limiting and propose a groundbreaking paradigm shift: customizing exercise prescriptions based on brain activity.

Therefore, our project aims to develop and validate a novel brain-standardized (BS) approach to exercise prescription. Instead of focusing on heart rate, the BS approach will tailor exercise based on brain activity in order to maximize the effects of exercise on mental well-being.

Our project will involve an interdisciplinary team and be carried out in three phases:

1. **Identifying Neural Markers:** We will use advanced brain monitoring techniques (EEG) to record participants' brain activity during various cognitive and emotional tasks. This will help us identify brain patterns linked to optimal cognitive performance and peak emotional states.
2. **Developing Exercise Protocols:** Based on these findings, we will create personalized exercise protocols to stimulate the identified beneficial brain patterns. We aim to develop a standardized test to understand how to tailor each participant's training to specifically stimulate the brain activity linked to their well-being.
3. **Testing and Evaluation:** We will evaluate the new BS approach through both short-term (single exercise session) and long-term (12-week) interventions. Participants will follow training programs designed to boost their mental functioning. We will compare the outcomes with those from the traditional CS approach to see if the BS approach leads to better improvements in mood and cognitive performance. At the same time, we will analyze various brain metrics to understand the underlying brain mechanisms.

We expect that the BS approach will revolutionize the way the relationship between exercise and mental health is studied. We believe it will establish new standards in the design of exercise interventions, enabling us and future researchers to better understand the mechanisms linking exercise with mental well-being. We also believe that, in the future, the proposed method could contribute to the development of more personalized and targeted interventions aimed at improving mental health. Health practitioners will be able to use this method to tailor exercises to address specific psychological issues, such as improving mood in people with depression or enhancing cognitive performance in those experiencing cognitive decline.