

A typical western diet has shifted towards greater intake of omega-6 fatty acids at the expense of intake of omega-3 fatty acids. Considering proinflammatory functions of omega-6 fatty acids, this type of diet can increase inflammation in the body. This is particularly alarming considering negative health consequences associated with inflammation. Apart from physical symptoms, inflammation to the brain can also cause behavioural and mood disturbances, including negative affect and low mood. Meanwhile, studies have demonstrated anti-inflammatory properties of omega-3 supplements. Particularly, effectiveness of one of the omega-3 fatty acids, *Docosahexaenoic acid* (DHA), has been reported to reduce inflammation. Numerous studies have been conducted on the effects of anti-inflammatory properties of omega-3 fatty acids on mood. However, the results from those studies are not consistent and most research in this area implemented supplementation protocols shorter than 3 months – time crucial to achieve a significant increase of DHA in human blood cells. Moreover, inflammation seems to be only one of the triggers of negative affect and low mood. Mood disturbances seem to be additionally mediated by psychosocial stress. For example, data from animal models have shown that different types of psychosocial stress may enhance changes in the brain resembling those observed in depressed patients. The biological mechanism that might explain the role of inflammation and psychosocial stress in mood disturbances is kynurenine metabolism, which seems to change under psychosocial stress and inflammatory factors. Meanwhile, a recent animal study has suggested that physical activity protects from stress-induced mood disturbances. Specifically, an increased activity of PGC-1 α in skeletal muscle, which is activated during endurance-type activity, mediated resilience to stress-induced depressive behaviour.

The purpose of the current study is to explore the effect of omega-3 fatty acids supplementation on stress-induced changes to mood. Furthermore, to explore a potential biological mechanism involved in the relationship between psychosocial stress and mood, kynurenine metabolism will be assessed. Finally, based on the findings that PGC-1 α overexpression in skeletal muscle might protect against stress-induced depressed mood, the study will compare two groups of participants: sedentary and physically active individuals. Such study design will additionally allow to investigate the interrelationship of the long-term endurance training on kynurenine metabolism and mood.

This will be the first human study to test how omega-3 supplementation, psycho-social stress, and physical activity affect kynurenine metabolism and mood. Considering a constant rise in the consumed ratio of omega-6/omega-3 as well as a more sedentary lifestyle and higher experienced stress in western countries, this study could have a great therapeutic potential in targeting low mood.