

Our journals generally write the title of the Letter the same as the original article. Can I modify it to "Does obesity affect the severity of exercise-induced muscle injury?"?

# Letter: Physical Activity and Obesity in Women during the COVID-19 Pandemic: The Linking Role of Inflammation (J Obes Metab Syndr 2021;30:132-40)

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We have read with great interest the article "Does obesity affect the severity of exercise-induced muscle injury?" by Kim and Yoon<sup>1</sup> and found it of interest in prevention of muscle injury related to obesity. In this literature review, the authors investigated the effects of obesity on exercise-induced muscle injury and reexamined the potential mechanisms of exercise-induced muscle injury related to obesity. With reference to the findings reported in the paper, we would like to make the following contribution to the discussion. The current Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)/coronavirus disease 2019 (COVID-19) pandemic is characterized by increase in stress and anxiety leading to an unhealthy lifestyle.<sup>2,3</sup> Unhealthy lifestyle includes sugar and fat-rich diet, reduced physical activity, and decreased quality of sleep.<sup>3</sup>

In order to improve physical activity and to reduce sedentary habits, the World Health Organization (WHO) has published helpful advice titled "Stay physically active during self-quarantine," which contains practical suggestions such as online exercise classes and video- or app-led workouts at home.<sup>4</sup> Despite these helpful suggestions, several articles have shown that physical activity decreased during quarantine, and diet and sleep quality worsened.<sup>2,3</sup>

This unhealthy lifestyle led to an increase in obesity. Obesity causes a systemic inflammatory state due to both the increase in cytokines and the higher infiltration of macrophages in the adipose tissue. In fact, obese subjects have higher level of leptin, a pro-inflammatory adipokine, and lower level of adiponectin, an anti-inflammatory adipokine.<sup>5,6</sup> Kim and Yoon<sup>1</sup> reported that excess body fat is associated with increased levels of inflammatory markers such as interleukin-7 and C-reactive protein in postmenopausal women and in elderly obese women, supporting the relationship between obesity and inflammation. The researchers also underline that obesity-induced inflammatory responses are highly likely to contribute to the increase in post-exercise delayed onset muscle soreness (DOMS) severity.<sup>1</sup> Although the causes of DOMS are unclear, a major hypothesis suggests inflammatory responses as one cause.<sup>1</sup> Obesity is an important cardiovascular risk factor in women, especially visceral obesity that develops during menopause and is associated with high levels of inflammation.<sup>2,7</sup>

Furthermore, obesity is associated with other co-morbidities that are no less dangerous than obesity itself, such as essential hypertension, atherosclerosis, coronary artery diseases, type 2 diabetes mel-

litus, and cerebrovascular stroke.<sup>2,7</sup> Regular physical activity helps in the fight against obesity and inflammation.<sup>6,7</sup> However, women are less likely to perform regular physical activity due to their roles at work and in the family as a result of traditions and stereotypes.<sup>2,8</sup> In addition, government-induced closures of gyms and sports facilities during the pandemic contributed to less exercise and more sedentary time.<sup>8</sup> Moreover, it should be emphasized that physical activity at home and without adequate supervision can lead to an increase in muscle and joint injuries. It is necessary to introduce spontaneous physical activity with caution, suggesting that people, especially untrained subjects, go for long walks, short bike rides, or engage in water activities.

Changes in lifestyle during the COVID-19 pandemic have been reported in women more than in men and were mainly related to diet and development of food cravings to cope with stress.<sup>7,9</sup> Food craving is defined as “a multidimensional experience” since it includes cognitive and emotional feelings (e.g., thinking about food and desire to eat), as well as behavioral (e.g., seeking and consuming food) and physiological (e.g., salivation) aspects.<sup>2,9</sup> Food craving often is associated with reduced physical activity and increased sitting time. During the pandemic, the consumption of fresh fruits and vegetables, foods rich in antioxidants, decreased while intake of preserved foods rich in fats and sugars increased.<sup>2</sup>

The WHO recommended engaging in relaxing activities such as yoga and chi-kung. A review on the effects of yoga in managing stress reported that, in the majority of trials, yoga intervention significantly reduced stress. However, there are some limitations related to the characteristics of the studies included in the review, such as small sample sizes, lack of randomization, and lack of control groups. The word yoga, meaning “union,” is a complex mind-body-spirit practice that can include meditation, breathing awareness, postures, and relaxation. It is possible that all these activities alter nervous system regulation and improve psychological well-being.<sup>10</sup>

In the current pandemic, it is important to find strategies to control weight, and an increase in physical activity could provide a solution.<sup>8</sup> For this purpose, new technologies and the web could be a useful tool to improve physical exercise even when at home. Many trainers and sports groups have developed online courses to stimulate the recovery of physical activity, useful for prevention of chronic diseases and for weight control. The greatest limitation is the lack

of support from the group and the absence of sociality that arises from attending gyms or sports facilities.

Given the difficulties experienced by women in adhering to physical activity and exercise over the long term, it is important that future research focus on identifying social and psychological obstacles and barriers and suggesting actions to promote long-term maintenance of exercise.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## AUTHOR CONTRIBUTIONS

Study concept and design: \*\*\*; acquisition of data: \*\*\*; analysis and interpretation of data: \*\*\*; drafting of the manuscript: \*\*\*; critical revision of the manuscript: \*\*\*; statistical analysis: \*\*\*; obtained funding: \*\*\*; administrative, technical, or material support: \*\*\*; and study supervision: \*\*\*.

Please write out the authors' initials for their contributions as per journal format.

## REFERENCES

1. Kim J, Yoon JH. Does obesity affect the severity of exercise-induced muscle injury? *J Obes Metab Syndr* 2021;30:132-40.
2. Mattioli AV, Sciomer S, Maffei S, Gallina S. Lifestyle and stress management in women during COVID-19 pandemic: impact on cardiovascular risk burden. *Am J Lifestyle Med* 2021;15:356-9.
3. Mattioli AV, Puviani MB. Lifestyle at Time of COVID-19: How Could quarantine affect cardiovascular risk. *Am J Lifestyle Med* 2020;14:240-2.
4. World Health Organization. Stay physically active during self-quarantine [Internet]. Geneva: World Health Organization; 2021 [cited 2021 May 8]. Available from: <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus->

- covid-19/publications-and-technical-guidance/noncommunicable-diseases/stay-physically-active-during-self-quarantine#:~:text=WHO%20recommends%20150%20minutes%20of,equipment%20and%20with%20limited%20space
5. Kang KW, Ok M, Lee SK. Leptin as a key between obesity and cardiovascular disease. *J Obes Metab Syndr* 2020;29:248-59.
  6. Mattioli AV, Pinti M, Farinetti A, Nasi M. Obesity risk during collective quarantine for the COVID-19 epidemic. *Obes Med* 2020;20:100263.
  7. Nasi M, Patrizi G, Pizzi C, Landolfo M, Boriani G, Cas AD, et al. The role of physical activity in individuals with cardiovascular risk factors: an opinion paper from Italian Society of Cardiology-Emilia Romagna-Marche and SIC-Sport. *J Cardiovasc Med* 2019;20:631-9.
  8. Bali S, Dhatt R, Lal A, Jama A, Daalen KV, Sridhar D, et al. Off the back burner: diverse and gender-inclusive decision-making for COVID-19 response and recovery. *BMJ Glob Health* 2020;5:e002595.
  9. Rodríguez-Martín BC, Meule A. Food craving: new contributions on its assessment, moderators, and consequences. *Front Psychol* 2015;6:21.
  10. Li AW, Goldsmith CA. The effects of yoga on anxiety and stress. *Altern Med Rev* 2012;17:21-35.