Accepted manuscript

Enhancing the Understanding of Dietary Total Antioxidant Capacity and Skeletal Muscle Mass: Addressing Key Limitations and Future Directions

Zhongxing Liu[1,2#], Mengzhe Tian[3#], Lincheng Duan[2]*

[1]Dujiangyan Traditional Chinese Medicine Hospital, Chengdu, Sichuan, China

[2]Chengdu University of Traditional Chinese Medicine, Chengdu, Sichuan, China

[3]Chengdu Sport University, Chengdu, Sichuan, China

#These authors have contributed equally to this work and share first authorship

Corresponding author: Lincheng Duan, Chengdu University of Traditional Chinese Medicine, Chengdu, Sichuan, China, **E-mail:** lincheng@stu.cdutcm.edu.cn

Conflict of interest statement: The authors declare no conflicts of interest that pertain to this work.

Financial support statement: No fundings were received for this research.

Authors contributions: Zhongxing Liu: Methodology, Formal analysis, Writing - Original Draft; Mengzhe Tian: Methodology, Writing - Original Draft; Lincheng Duan: Conceptualization, Methodology, Supervision, Writing - Review & Editing.

This peer-reviewed article has been accepted for publication but not yet copyedited or typeset, and so may be subject to change during the production process. The article is considered published and may be cited using its DOI

10.1017/S0007114525000285

The British Journal of Nutrition is published by Cambridge University Press on behalf of The Nutrition Society https://doi.org/10.1017/S0007114525000285 Published online by Cambridge University Press

To the Editor:

We have carefully read the article by Zhang et al., titled "Dietary Total Antioxidant Capacity is Closely Associated with Skeletal Muscle Mass: A Cross-Sectional Study"[1], published in The British Journal of Nutrition. This study provides valuable insights into the association between dietary total antioxidant capacity (TAC) and skeletal muscle mass, particularly among middle-aged individuals, through large-scale data analysis. It offers important implications for dietary interventions. However, we believe that certain aspects of the study design and analysis warrant further discussion and refinement.

First, while the authors accounted for multiple confounding factors, such as age, sex, race, and socioeconomic status, some critical variables might have been overlooked. For example, chronic conditions (e.g., diabetes, cardiovascular diseases, or chronic inflammatory disorders) and associated medication use (e.g., statins or anti-inflammatory drugs) could significantly influence the relationship between TAC and skeletal muscle mass[2–4]. Chronic diseases are often associated with heightened oxidative stress, while medications might directly or indirectly modulate antioxidant status and muscle metabolism. Future studies should incorporate these variables to minimize potential bias.

Second, the exclusion of individuals with incomplete demographic, dietary, or questionnaire data reduced the sample size from over 39,000 to 4,009 participants. Although this approach ensured data completeness, it may have introduced selection bias, especially if the missing data were not missing at random (MNAR). We recommend using multiple imputation and sensitivity analyses to handle missing data, which would help retain a larger sample size and improve the generalizability of the findings[5].

Third, while the study adjusted for overall physical activity levels, it did not explore the differential effects of various exercise types and intensities on the relationship between TAC and skeletal muscle mass. Evidence suggests that resistance training and aerobic exercise have distinct mechanisms of action in muscle preservation and oxidative stress reduction[6–8]. Stratified analyses by exercise type could elucidate the moderating role of physical activity in this relationship.

Additionally, the stronger association observed between TAC and skeletal muscle mass in women raises questions about the role of sex hormones. For instance, the regulatory effects of estrogen on the antioxidant system might explain the pronounced association in postmenopausal women(9–11). Similarly, declining testosterone levels in men are closely linked to muscle mass loss(12,13). Incorporating hormonal data in future studies could provide deeper insights into the mechanisms underlying sex differences.

In conclusion, this study establishes a critical foundation for understanding the potential benefits of dietary TAC in middle-aged populations. Addressing the influence of chronic conditions and medications, optimizing data handling methods, and stratifying analyses by physical activity and hormone levels in future research could further elucidate the mechanisms of TAC and enhance the translational value of the findings.

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https://doi.org/10.1017/S0007114525000285 Published online by Cambridge University Press