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Reply to: "Ref: Ferreira Pedrosa *et al.* More Training, Less Trainability: True? A muscle Swelling Analysis"

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We sincerely appreciate the comments and criticisms received regarding our manuscript, "More Training, Less Trainability: True? A muscle Swelling Analysis" (1). In this study (1) we aimed to compare muscle swelling between groups with greater (MEG) *versus* lesser (LEG) training experience using a similar training load configuration in the preacher barbell curl exercise. Our findings demonstrated that the group with greater experience exhibited less muscle swelling than the group with less experience. However, these results were questioned by V.N.O. due to the statistical procedures employed.

In this response letter, we present how each recommendation and comment was addressed in clear and detailed terms. Below, you will find an organized list of the responses to the points raised by V.N.O in the order in which they were mentioned in his report. Moreover, our results were carefully re-evaluated with the support of a statistician, co-author of this letter (A.T.A.N.), who ensured the adequacy of the analyses and interpretations presented.

1. "*This analysis* – use of percentage change – *is sensitive to baseline values of the participants. If a group has a low baseline value, even small changes can result disproportionately. This can distort the effect and comparison between groups, for example: group A has pre = 10 and post = 20 (percentage change = 100%), while group B has pre = 100 and post = 110 (percentage change = 10%)".*

Some of the literature discourages the use of percentage changes. However, the dependent variable in our study was muscle swelling, which is commonly detected by a percentage change in muscle CSA or muscle thickness from pre- to post-treatment (3-7). In this context, calculating the percentage change in CSA allows us to identify the effect of treatment on the variable under analysis. Changes are expressed as a proportion of the baseline value, facilitating the assessment between unequal groups. They allow us to understand the change in percentages relative to the baseline, which helps contextualize the results in a clear and meaningful way (8).

2. When using relative percentages, we lose information about "*the actual magnitude of the change, due to percent change focuses on proportionality rather than the actual amount of change. Understanding the absolute change provides a clearer picture of the real-world impact*".
We disagree on this point. Drawing a parallel with a variable related to swelling and muscle hypertrophy, suppose that at baseline, muscle A has a CSA of 10 cm^2 and muscle B has a CSA of 15 cm^2. After treatment, muscle A increased to 13 cm^2 and muscle B to 18 cm^2, representing a similar absolute difference of 3 cm^2 but a different relative change, being greater for muscle A (30%) than for muscle B (20%). If asked which muscle hypertrophied more, the absolute analysis shows similarity, while the relative analysis shows more significant growth in muscle A. This highlights that the decision about statistical analysis rests with the researchers and their complete understanding of the dependent variable (9). In the example cited, the percentage analysis suggests that muscle A was more susceptible to changes in its size than muscle B, following a procedure standard in many studies (3-7).
3. "Better alternatives exist that directly compare the absolute pre- and post-values between groups, such as a repeated measures analysis of variance or a linear mixed model. These methods consider measures within and between groups while adjusting for baseline difference, leading to a more accurate analysis of the effect".

We complied with the request and used R software to implement an analysis of variance. The P-value is 0.0459. This indicates the probability of observing an F-value as extreme as the one calculated if the null hypothesis is true (*i.e.*, if there is no difference between the groups). Since the P-value is less than 0.05 (the commonly adopted significance level), this suggests a statistically significant difference between the MEG and LEG groups regarding swelling.
In light of the above and with the complementary analysis using ANCOVA (data available in the **supplement 1**), we hope to have adequately addressed V.N.O.'s concerns and brought clarity, transparency, and reliability to the responses found in our study (1). It is worth noting that a scientifically valid result is not established solely by statistical procedures but by a body of evidence that accumulates and contributes to guiding trends.

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We invited Professor Thiago Alexandro Nascimento De Andrade, PhD in Statistics, to contribute to the analysis of the critiques and conduct an additional statistical approach. The inclusion of Professor Thiago as an author added robustness to the writing and improved the overall quality of the final work. I confirm that all previous authors have agreed to the inclusion of Professor Thiago.

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