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Evaluating the results of resistance training using ultrasound or flexed arm circumference: a case for keeping it simple?

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1st editorial decision
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Ref.: Ms. No. JCTRes-D-20-00032
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Dear Professor Souza,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, I would be pleased to reconsider my decision.

For your guidance, reviewers' comments are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.Also, please ensure that the track changes function is switched on when implementing the revisions. This enables the reviewers to rapidly verify all changes made.

Your revision is due by Jul 09, 2020.

To submit a revision, go to https://www.editorialmanager.com/jctres/ and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

Yours sincerely

Michal Heger
Editor-in-Chief
Journal of Clinical and Translational Research

Reviewers' comments:

Reviewer #1: Interesting manuscript, well written and well designed.
No comments from my side.

During the proof reading stage, You only need to better highlight the study limitations.

Congrats for the nice study

Reviewer #2: The study aimed to compare changes in muscle size measured by ultrasound and arm circumference using data from young men.

The introduction does not have elements that demonstrate the validity of the use of the US in the measurement of muscle size, as well as its sensitivity in detecting changes with resistance training. It is vital to present the validity of the circumference method to verify the increase in muscle mass through resistance training.

The comparison to which the study proposes requires additional information, such as, for example, the muscle size of the triceps portion obtained by US, as well as the pre and post fat portion to compare with the muscle volume measured by the arm circumference. I request that this information be added to the data presented and analyzed accordingly.

Analyzing relationships between the increase of one measure, and the other will undoubtedly result in positive correlations. Still, the measurements must be based on the same elements, which is not the case in the present study. The US measures the isolated muscle volume of the biceps. At the same time, the arm circumference does not allow this isolation, it also measures the volume of fatty tissue, and the muscle volume of the triceps, making it difficult to understand the reason for the comparison between the methods.

It is vital to demonstrate the knowledge gap better and why this comparison was not clear.

In methods, there is no information about the training program, the number of exercises for each muscle group, series, and repetitions, which allow us to understand how much the muscular volume of the triceps (when measuring by AC) and the amount of fat can influence these comparisons. I request that this information be added.

The absence of this information compromises the analysis of the data presented.

Author’s response

RESPONSE LETTER

Journal of Clinical and Translational Research

Ref.: Ms. No. JCTRes-D-20-00032
Evaluating the results of resistance training using ultrasound or flexed arm circumference: a case for keeping it simple?

Reviewers' comments:

Reviewer #1: Interesting manuscript, well written and well designed.
No comments from my side.

During the proof reading stage, You only need to better highlight the study limitations.

Congrats for the nice study

Thank you for the supportive comments. We have tried to make the study limitations clearer.

Reviewer #2: The study aimed to compare changes in muscle size measured by ultrasound and arm circumference using data from young men.

The introduction does not have elements that demonstrate the validity of the use of the US in the measurement of muscle size, as well as its sensitivity in detecting changes with resistance training. It is vital to present the validity of the circumference method to verify the increase in muscle mass through resistance training.

Respectfully we disagree with this assessment. In the introduction we cite several studies demonstrated that US is sensitive to detect changes in muscle size in addition to those demonstrating that, though the magnitudes differ, US can evidence changes in muscle size similarly to MRI [5,6]. Indeed, we have also cited prior work demonstrating this for AC [15].

The comparison to which the study proposes requires additional information, such as, for example, the muscle size of the triceps portion obtained by US, as well as the pre and post fat portion to compare with the muscle volume measured by the arm circumference. I request that this information be added to the data presented and analyzed accordingly.

Though we acknowledge that this information would be of additional interest (and note this in the limitations section) and likely add further precision to the validity of estimates for changes in muscle size of the upper arm, this is somewhat secondary to the purpose of our study. We merely examined whether or not studies using either of these techniques would lead to similar inferences and conclusions regarding the absence of presence of changes in muscle size. Further, as per your request to add this information, we cannot accede to this. As this study involves the retrospective analysis of datasets from prior studies, we are sadly unable to add information that was not collected during those studies.

Analyzing relationships between the increase of one measure, and the other will undoubtedly result in positive correlations. Still, the measurements must be based on the same elements, which is not the case in the present study. The US measures the isolated muscle volume of the

biceps. At the same time, the arm circumference does not allow this isolation, it also measures the volume of fatty tissue, and the muscle volume of the triceps, making it difficult to understand the reason for the comparison between the methods.

Notably, our study is not intended to examine correlations and as noted our main aim was to examine whether or not the inferences and conclusions would be similar with either methods. Of course, in our case we would want both measures to be representative of the same underlying construct; change in muscle size. However, comparing two methods for providing this information does not require that they are the same as you suggest. Though of course AC includes subcutaneous adipose tissue (as well as epidermis, dermis, hypodermis etc), the dependent variable of interest in our analysis is the delta values (i.e. the change). Though possible, it seems unlikely that a change in AC as a result of a resistance training intervention would be caused by much other than a change in muscle size. Our comparison in principle is no different than studies comparing different methods for estimation of body fat %. DEXA for example does not measures this, but it is estimated from ration of soft tissue attenuation at different photon densities. Air displacement plethysmography is based upon measurement of body volume and calculation of density. Yet, such different methods (among others) for estimating the variable of interest, body fat, are often compared to one another and often for the purpose of determining whether one is more practical to utilize than the other.

It is vital to demonstrate the knowledge gap better and why this comparison was not clear.

We clearly note in the introduction that comparison between AC and US has not been conducted previously for changes in muscle size. Further, that AC represents a far less costly method. Thus filling this knowledge gap may have practical implications for those wishing to examine changes in muscle size and who do not currently have access to US technology due to cost prohibition.

In methods, there is no information about the training program, the number of exercises for each muscle group, series, and repetitions, which allow us to understand how much the muscular volume of the triceps (when measuring by AC) and the amount of fat can influence these comparisons. I request that this information be added.

The absence of this information compromises the analysis of the data presented.

We note in the methods:

"The protocols involved 6 to 12 weekly sets for the elbow flexors and extensors performed one or two times per week with 8-12 maximum repetitions per set. To maintain performance in the target repetition range, the loads were reduced if the participant was unable to perform at least 8 repetitions and they were increased if it was possible to perform more than 12 repetitions. The full details of the training protocols for each study can be seen in the methods of the original publications [18–20]."

Our choice of analysis approach was actually specifically due to variation between studies in characteristics such as training protocols and thus these factors do not present an issue to the results and conclusions we have presented. This approach included the application of multi-level modelling using an individual patient data meta-analysis, and also the inclusion of both Frequentist and Bayesian analyses. The multilevel approach in particulaer allows us to account for between study variance (which in this case comes from a variety of sources including the different populations and subtle variations in specifics of the resistance training interventions) through meta-analytic methods. Further, we have utilized a random effects model to better represents that the studies likely represent a random sample of effect sizes (differing due to differences in study characteristics noted) from some overall effect size distribution (e.g. see Borenstein et al., 2010; https://www.meta-analysis.com/downloads/Intro_Models.pdf). Thus, we are able to draw inferences regarding whether or not the two methods of measurement examined (MT and AC), would yield similar conclusions in studies employing them regarding the absence, or presence, of muscle size change, and whether their magnitudes are similar.

2nd editorial response
21-Jul-2020

Ref.: Ms. No. JCTRes-D-20-00032R1
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Dear authors,

I am pleased to inform you that your manuscript has been accepted for publication in the Journal of Clinical and Translational Research.

You will receive the proofs of your article shortly, which we kindly ask you to thoroughly review for any errors.

Thank you for submitting your work to JCTR.

Kindest regards,

Michal Heger
Editor-in-Chief
Journal of Clinical and Translational Research

Comments from the editors and reviewers:

Reviewer #1: No more comments from my side

Reviewer #2: The authors answered all questions. Thanks. Congrats for the nice study.