Author’s response to reviews

Title: Assessment of peripheral muscle thickness and architecture in healthy volunteers using hand-held ultrasound devices; a comparison study with standard ultrasound

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Author’s response to reviews:

Dear Editor,

Many thanks for your review of our manuscript, and thank you for your understanding in giving us additional time to submit the revision. We have significantly altered the manuscript, and the attached file contains the track changes made to the manuscript.

Editor’s comments:

Page 8, line 16, “Muscle thickness (VLMT) was measured at the widest point between the superficial and deep aponeuroses. Pennation angle (VLPA) was measured using the angle-tool, drawing a line connecting the fascicle to the deep aponeurosis, with the angle between this line and the aponeurosis being measured (figure 2)”. Pennation angle was also measured at the widest point…? Please specify.

It has been made clear that the pennation angle measurement is also made at the widest point in the muscle.

Page 9, line 1, “Thickness measurements of AMT and VLMT were measured again by a second person”. Please specify if the measurements were taken only with the handheld device.

It has been made clear that only one person acquired all of the images from both devices. Double measurement was performed by two people: the acquired images were transferred to a computer, where the measurement of thickness was made.
These measurements were conducted one week apart, with an intra-class coefficient (ICC) of 0.997 (p<0.001). Please add a mention to intra-reader agreement in the methods. Moreover “(ICC) of 0.997 (p<0.001)” for both parameters?? Please address this.

We have added a line to the methods that double measurement of a sample of volunteers' images was performed to establish inter-rater agreement. We have seperated the ICC values so that the values for both consistency and agreement for both muscles using both devices are within the text.

Vscan is not the only handheld device available, so please elaborate also on other handheld ultrasound devices (and the whole category).

In the introduction we have named another handheld device, and in the discussion we have briefly mentioned a smartphone based system. However, having searched for "pocket ultrasound" on PubMed, many of the studies use the Vscan device.

I also suggest to add a few comments and elaborate in the introduction and/or discussion on the use of handheld ultrasound machines for the assessment of muscle and other compartments of body composition too (e.g. adipose tissues), and to take into consideration not only critical ill patients.

We have added that ultrasound can be used to assess both subcutaneous fat layers, and to assess fat distribution within muscle. We have removed much of the reference to critical illness, and have added references to how muscle size estimation with ultrasound can be used in a variety of patient populations.

As an additional point, we have changed the word "hand held" to "pocket-sized" throughout the text to align with the terminology used in other papers.

Reviewer 1:

Throughout the paper authors discuss the use of ultrasound in critically ill patients, however, their study was performed in male healthy young volunteers, those are two very different populations and you can't extrapolate your results to critically ill patients. You could perform the same study in critically ill patients, or discuss the evidence available in your population of study.

We have removed much of the reference to critical illness, and made it clear that extrapolation to patient groups is problematic. We have moved the text on muscle architecture and it's relationship to function to the discussion so that the accurate measurement of pennation angle is placed into a physiological context, and added references based on sport science and volunteer studies. We have however kept some critical illness references, to show that VScan cannot measure cross-sectional area, which is the preferred measurement in critical illness. This strengthens the idea that we cannot easily extrapolate our results.
You mentioned the use of bland-altman plots in the methods, however you didn't put them in the results.

There are now here as figure 2.

How did you decide the sample size? Please add information regarding sample size calculation.

We have a number of studies on going using ultrasound in healthy volunteers, and had ethical approval to perform to separate scans per volunteer. As a result, this study is a by-product of other studies, and so a sample size calculation was never performed.

Background line 9: The techniques for assessment of peripheral muscle size and architecture are well established in many settings, not only healthy subjects or ICU, but also in the chronic outpatient care and rehabilitation. Since this is not a paper regarding the critically ill, you could mention the other references available in different clinical settings (ESRD, BPCO, coronary artery disease)

We have made reference to diabetic, renal, respiratory and elderly populations.

Nowadays, regular ultrasound machines are available in many clinical settings and are very portable, which advantage a handheld device brings?

The text has been amended in the discussion to include the idea that further work is needed to see if pocket-sized devices are better from an ergonomic point of view, and whether they save time compared to standard devices.

Reviewer 2

- (Methods section) It is necessary to explain more about the examiner's experience on these hand-held device and also on classic US. "Ultrasound scanning was performed by the same assessor using both probes" Please add a paragraph in this section about the examiner's experience. Did the examiner perform a training on these devices before the study begun?

A small section has been added to mention that the examiner performing the ultrasound has published before in the topic. There is currently unpublished data in which the author has used ultrasound in a total of 61 healthy volunteers and 35 critically ill patients. The author was taught initially to perform muscle ultrasound by a senior lecturer from Manchester Metropolitan University.

(Discussion) Page 15 "A possible solution could be to move the probe distally to encompass the entire 12 muscle, although this technique may potentially produce smaller values for cross sectional area". I suggest you to delete this sentence.

We have deleted this sentence and the one preceding it.
Page 15 line 1 "providedposition" please separate the words.

This has been done.

(Images) The images you provide are insufficient for an imaging paper. I suggest You to add other figures. It would be appreciated to show the same muscle section evaluated on hand-held US and on standard US to compare images' quality.

Figures 1 and 2 have been merged into one figure. Images from both muscles and both machines are now displayed.