Author's response to reviews

Title: Validation of Digit-length Ratio (2D:4D) Assessments on the Basis of DXA-derived Hand Scans

Authors:

Michael Romann (michael.romann@baspo.admin.ch)
Jörg Fuchslocher (joerg.fuchslocher@baspo.admin.ch)

Version: 3
Date: 5 November 2014

Author's response to reviews: see over
Dear Editor,

thank you for the opportunity to revise our manuscript. We would like to thank the reviewers for the very valuable and helpful comments. We believe that we were able to address the reviewers comments. As a result, the paper has improved in quality. Please find enclosed a tracked version of our revised manuscript. In the following we list a short summary of the study, the statements of the reviewers and our corresponding comments.

Short summary of the study

A large body of literature highlights the potential importance of the ratio between the length of the second and fourth digits (2D:4D) for predicting talent for sports. Several methods have been used to assess 2D:4D. These techniques include the direct measurements with calipers, inked handprints, measurements from photocopies, scanned images, digital photographs, scaled tubes, self-report online, and X-ray measurement (Hönekopp & Schuster, 2010).

Each of these methods has limitations relating to feasibility and costs but in general, direct measurements, photocopies and scanned images are the most commonly used techniques. In comparison to these methods, radiographic measurements deliver the most accurate measurement of bone length and X-ray measurements are more accurate and precise than direct or photographic methods (Auger et al., 2013). However, the main problem with X-ray imaging with children and adolescents is the exposure to radiation. Reducing the radiation dose when assessing 2D:4D is an important issue, and methods involving less radiation are preferable, particularly in childhood and adolescence. Evaluating 2D:4D via hand radiographs using DXA produces a 10-fold lower effective dose (0.1 µSv) than using X-ray (1 µSv), with results that appear to be comparable to those of standard radiographs (Gordon et al., 2008; IAEA, 2006). To the best of our knowledge, no study have investigated the agreement between DXA and X-ray hand imaging as a technique for assessing 2D:4D. Our results show for the first time that DXA offers a replicable technique for assessing 2D:4D.

Response to Reviewers

Carla Caffarelli (Reviewer 1):

C1: “This manuscript in the present form seems suitable for publication BMC medical imaging”.

A1: We are very pleased that you support our manuscript. We are convinced that this article will significantly contribute to 2D:4D research and has a high relevance in this field.

Donald Dengel (Reviewer 2):

We are very pleased that you support our manuscript with minor revisions. In the following we list your comments and our corresponding answer.

C1: “Page 5 line 1 means for age, height and weight should be placed in the results section.”

A1: Thank you for this advise, we moved the information in the results section.

C2: “Page 5 line 11 Authors should provide version of software that was used as well as the scan type that was used for the hand analysis.”

A2: We added the information in the method section.

C3: “Page 5 line 11. Did the authors do a total body composition scan? If so this information should be provided in the manuscript.”
A3: The software can perform a scan of the “left hand wrist”. Therefore we used this option to minimise the exposure to radiation. We added the information in the method section.

C4: “Page 9 line 15 Another disadvantage of the DXA is the longer scan time allows for the possibility of greater movement artefact.”

A4: We totally agree and added this disadvantage to the conclusion.

Discretionary Revisions

C1: “Page 4 line 7 a lot of the introduction discusses prediction of performance in sport. This paper little to do with that, but is many a validation study of using DXA to determine the 2D:4D ratio.”

A1: We agree. We work in the setting of high performance sport. In this area there is an increasing discussion, if 2D:4D can be used as a biomarker for performance in elite sports. Therefore the first part of the introduction should highlight the relevance of the study in the field of elite sports. As a consequence to your comment and the comments of reviewer 3 we adapted and shortened this section.

Manuel Coelho-e-Silva (Reviewer 3):
We are very pleased that you support our manuscript with minor revisions. In the following we list your comments and our corresponding answer.

C1: The first paragraph was from specific aspect (“The underlying reason for this might be that a correlation may exist between 2D:4D and the amount of prenatal testosterone”) towards a less specific sentence (“Sexual dimorphism appears early in the human fetus [9] and stays stable during childhood and adolescence”). I would be delighted to suggest the authors the following rationale sequence:

a) the concept of 2D4D, its link with prenatal environment, exposure to testosterone
b) sexual dimorphism and variation of 2D4D within males
c) protocols in the literature: x-ray, DXA, picture and photographs of the hand
d) evidences about the importance of the ratio in the context of sport performance and interest to include the characteristic in talent identification programs
e) research question

A1: Thank you for this advise. We changed the introduction accordingly.

ABSTRACT:
C2: “Please inform the age range of the sample”.
A2: Adapted.

METHODS (1)
C3: “I believe that information about the distribution was useful, in particular, test for checking normal distribution.”
A3: We checked the data for normality and linearity. Both assumptions were given.

METHODS (2)
C4: “Would also be delighted to contact with assumptions of linearity between 2D and 4D. In other words, CV of 2D divided by CV of 4D should be within 95%CI of the correlation between 2D and 4D.”
A4: Thank you. The ratio of CV of 2D(0.0921) and CV(0.0959) of 4D is: 0.9604; the correlation between 2D and 4D is 0.966; 95% CI [0.943 – 0.979]. We additionally did a lack of fit test and added this information to the manuscript.

RESULTS (1)
C5: “Technical error of measurement should also be reported in absolute values and as a percentage of the mean (CV%)”.
A5: Adapted in tables (1-3).

GRAPHICS (1)
C6: “Each should be include information about the correlation between axes (Y: difference between measurements; X: individual means)”.
A6: We added this information in the results section.

DISCUSSION
C7: “This section is substantially redundant and is not a real discussion. Try to clearly
split the contents in sections results and discussion. My suggestion is also to consider a short review of the literature about the link between 2D4D and endocrine parameters (Jurimae et al, Eur J Appl Physiol), athletes (Journal of Sports Sciences: 2010: rugby players; 2010: athletes from different sports @ Aspire academy; Scand J Med Sci and Sport 2010: fencers). It is important to demonstrate that the topic has real interest."

A7: Thank you. We revised the discussion section, wrote a summary of the results and added a short review of the literature to show the importance of 2D:4D research.

We are looking forward to receiving your reply.

Sincerely,

Michael Romann

References