PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Bone mineral density, rib pain and other features of the female athlete triad in elite lightweight rowers
AUTHORS	Dimitriou, Lygeri; Weiler, Richard; Lloyd-Smith, Rebecca; Turner, Antony; Heath, Luke; James, Nic; Reid, Anna

VERSION 1 - REVIEW

REVIEWER	Ackerman, Kathryn Boston Children's Hospital USA
REVIEW RETURNED	05-Dec-2013

GENERAL COMMENTS	This is a very important topic and the study population can be challenging to assess. I commend the authors on their work. Unfortunately there is no control group, either non-athletes, athletes from other sports, or non-lightweight rowers with which to compare. Comparing current to recently retired lightweights doesn't clarify the findings. Thus it is mostly a descriptive paper that could be made much stronger with a control population. If all comparisons are to be made within a lightweight population only, greater numbers are suggested to compare oligoamenorrheic vs. eumenorrheic athletes. I recommend recruitment of a control group and further recruitment of lightweights to strengthen this paper enough for BMJ. Alternatively, this paper may be well-suited with its preliminary data and smaller sample size for a sports journal with a lower impact factor, to get the concept published for future citation.

REVIEWER	Sundgot-Borgen, Jorunn The Norwegian School of Sport Sciences, department of Sports medicine Norway
REVIEW RETURNED	09-Dec-2013

GENERAL COMMENTS	#5. need to explain how they presented the study initially for the athletes (the text in the advertisement) “Bone mineral density, rib pain and other features of the female athlete triad in elite lightweight rowers: new concepts for injury prevention” The aim of this study was to; Determine bone mineral density (BMD) and the associations among

	BMD, menstrual history, disordered eating (DE), training history, and intentional weight loss and rib pain for the first time in female lightweight rowers. The methods used to assess BMD and fat mass was: Dual-energy X-ray absorptiometry measured total body (TB) composition and BMD at the spine, femoral neck (FN), radius and TB. To assess disorded eating the EAT-26-questionnaire was used and to measure menstrual function, rib pain, training history and nutritional support a self-developed questionnaire was administered to 21 elite female lightweight rowers (12 active, 9 retired). Results showed that DE was reported in 6 of the rowers and that the active with DE started rowing younger (P<0.05) than those without, and their amount of intentional weight loss (IWL) was associated with EAT-26 score (P<0.05). Some participants reported a history of oligo/amenorrhea 17 (76%) and/or rib pain 7 (32%) with those with rib pain having lower spine and TB Z-scores (P<0.05) than those without. Those with oligo/amenorrhea had lower spine Z-scores (P<0.01) than those without. Twelve participants had low BMD; three at spine; one at FN; and eight at radius. 13% of mean total training hours (18.6 • }9.1h.week-1) were spent strength training (2.4 • }2.2h.week-1). Conclusions: Upper-body exercises incorporating multidimensional high peak bone strain were not reported and may need to be considered in their strength training to improve radialBMD. Results suggest IWL and high-level training at a young age increases the likelihood of DE and there may be a lack of quality nutritional support for these athletes. General Comments Although this is a small scale study this is an important well-presented study adding information about a group of athletes which is understudied. Specific comments Although the finding is of interest there are a number of questions regarding the methodology and discussion that the authors have to clarify Introduction: The scientific background and rationale for the investigation being reported and the objectives are appropriate. Methods: The study design is also appropriate, but there are some important questions that need to be answered and included in text Recruitment: The authors write that (p 7 l 9); “No mention of DE, menstrual disorders and other aspects of the Triad were included in the advert to avoid possible sample selection bias. The authors argue that they wanted to avoid possible sample selection bias. I would like the authors to comment on that since as a researcher you should always inform your study subjects what the aim of the study is when you announce the study. Therefore, I would like the authors to explain the initial description of the study announcement. Participants: I realize that the total sample of eligible rowers that season was only 79 females, and that only 29 volunteered to participate (p7, l. 21-22). However, I would like to know 1) those who were excluded and those who did withdraw from the study, did they differ from those finally included in terms of variables such as stature, weight, years of training, menstrual history, EAT score and pathogenic weight control strategies. Variables (and discussion): In addition to the EAT questionnaire they authors also had questions related to self-reported history of diagnosed eating disorder. The authors should present the number of athletes reporting a history of ED and discuss that result in

	association with the findings regarding EAT scores and use of pathogenic weight control methods. The authors need to (in the discussion) discuss the validity of the EAT as a screening instrument for DE in this sample. Specifically also take this into consideration when arguing (p 16, l. 38-40) that “in this study no association was found between symptoms of DE and BMD, which is contrary to previous studies (4, 16). In the referred studies different methods to assess DE and energy deficiency was used. This has to be taken into consideration and will probably effect the author’s statement. Results When it comes to the descriptive data in table 1 there is a need for more information regarding the retired athletes. Are the data presented in table1 (training hours, menstrual status) and Table 2 (eating attitude) retrospective for the former athletes or is the training hours, eating attitude present behavior? Discussion The discussion is good, but I would like the authors to emphasize that in addition to the excellent advice that (p 18, 18-29) current training paradigms should also address the current and future health of their athletes- to emphasize the importance of nutritional guidance to help prevent extreme dieting and DE in this group of athletes. Also it would be interesting to learn more about the authors suggestion about considering changing the weight rules to discourage unhealthy weight loss practices.

VERSION 1 – AUTHOR RESPONSE

We prefer titles that are limited to the research question and study design; please remove 'new concepts ...' as this is more of a headline.

-Recommendation has been addressed.

Might causality of the opposite direction apply? People looking to lose weight may take up sport to do so (rather than seek to lose weight because they are doing sport).

-This is probably not likely to be true for a high volume/intensity training endurance sport like lightweight rowing for young girls. Although there is no evidence to support this statement either way, so difficult to speculate. However the findings of our study would strongly support that this area is better understood as the health and injury implications are significant and based upon other studies, interventions may prevent harm.

Some papers covering similar ground have appeared in other journals from BMJ:
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1663815/pdf/bmj00196-0024.pdf
http://ard.bmj.com/content/50/7/487.short

-This was the 1st big paper on the topic but compared weight restricted athletes with athletes from other sports. However, this paper had no weight restrictions on competing. It was a comparison of athletes across different sports.

The limitations section in the main text needs to be developed to acknowledge that the participants were both self-selected and providing self-reported data.

-In terms of self-selection of participants, the sample was purposely selected through an advertisement recruitment (see pg 7, under Participants section) that specified the characteristics of

the sample as being: current and retired lightweight rowers. Those that fitted the criteria and provided consent were recruited in the study. The latter comment re “providing self-reported data” has been addressed in pg 3 under Strengths and limitations section.

Strengths in the strengths and limitations of this study section should be methodological rather than claims about novelty. The first strength bullet point should be reworded because conclusive stress fracture information was not provided.

-Claims of novelty have been removed and a further strength of this study has been added in Strengths and limitations section.

I recommend recruitment of a control group and further recruitment of lightweights to strengthen this paper enough for BMJ.

-We would like to say that the specific comment is very valid, (clearly explained in our limitations section) and we have certainly taken it on board for future directions of this study. Nevertheless, due to time constrains of return of the amended version of the paper, this was not viable. There are challenges, as can be seen from other papers (above) finding adequate control groups. It appears that is not possible to draw easy comparisons with athletes from other sports, recruitment numbers are consistent with other studies, but more importantly our paper seeks to understand the relationships between physical findings and psychological findings over a long time period within one group of athletes. However, we have added a sentence to address this comment in the paper (see pg 20, under Discussion section) presenting it as a future direction/limitation of the study. Furthermore, the small sample size of the study has also been addressed in pg 3 under Strengths and Limitations section.

Are research ethics (e.g. participant consent, ethics approval) addressed appropriately?

-Yes, research ethics have been addressed appropriately in the paper, (see pg 6 under Methods-Ethics section).

Need to explain how they presented the study initially for the athletes (the text in the advertisement).

-We have added further details on pg 6 and 7 under Ethics and Participants sections describing concisely the text within the initial advert.
Please see below the exact advertisement that was presented to this study’s participants:

“LIGHTWEIGHT FEMALE ROWERS

Volunteers needed for a research project.
Find out about your bone health with a

FREE DEXA SCAN
(normal cost ~ £200)

This will give you accurate data on your
BONE MINERAL DENSITY and TOTAL BODY COMPOSITION

Both Current and Retired female lightweight rowers are needed.

Volunteers will need to travel to north London and various questionnaires will need to be completed. The scan takes approximately one hour.

This study is being conducted by Univerity College London, School of Human Health and Performance, in collaboration with London Institute for Sport, Middlesex University.

If interested, or for more information please contact by email: annaereid@gmail.com or telephone 07824 337826

Please pass this information on to any retired female rowers who may be interested."

Methods: The study design is also appropriate, but there are some important questions that need to be answered and included in text
Recruitment: The authors write that (p 7 l 9); "No mention of DE, menstrual disorders and other aspects of the Triad were included in the advert to avoid possible sample selection bias. The authors argue that they wanted to avoid possible sample selection bias. I would like the authors to comment on that since as a researcher you should always inform your study subjects what the aim of the study is when you announce the study.

- In the actual advert we did not mention any Triad aspects, for the reasons we explained in the paper, however when participants made contact with us we specified and explained verbally, over the phone, and in written, via the participant information sheet, that they would have to respond to self-reported questionnaires on menstrual history, eating attitudes, musculoskeletal injuries and other health, medical and training information.

Therefore, I would like the authors to explain the initial description of the study announcement.

-This comment has been addressed above, and the text of the initial advert has been pasted as well above.

Participants: I realize that the total sample of eligible rowers that season was only 79 females, and that only 29 volunteered to participate (p7, l. 21-22). However, I would like to know 1) those who were excluded and those who did withdraw from the study, did they differ from those finally included in terms of variables such as stature, weight, years of training, menstrual history, EAT score and pathogenic weight control strategies.

- We can only provide you with information about those that were excluded. Their mean weight: 61.3kg, height: 168.8cm and BMI: 20.7 was similar to the respective means of both active and retired rowers (see table 1). Their years of training as lightweight was 10 Vs 4.0 (see table 1),which is much greater but this is because as one of these two rowers was a veteran and a 59 years old. Their years of oligoamenorrhea was 4.6 Vs 4.4 (see table 1), and their EAT-26 score was <20. No pathogenic weight control strategies were reported. Furthermore, one rower was active and a veteran and the other retired. Those that withdrawn from the study were not tested neither responded to any of our questionnaires as they never reported into the lab mainly because they could not find a suitable time within this study's time frame.

Variables (and discussion): In addition to the EAT questionnaire they authors also had questions related to self-reported history of diagnosed eating disorder. The authors should present the number of athletes reporting a history of ED and discuss that result in association with the findings regarding EAT scores and use of pathogenic weight control methods.

- Only one rower reported history of ED and was treated by professionals, therefore we believe we

cannot really go into depth based on that one person.

The authors need to (in the discussion) discuss the validity of the EAT as a screening instrument for DE in this sample. Specifically also take this into consideration when arguing (p 16, l. 38-40) that “in this study no association was found between symptoms of DE and BMD, which is contrary to previous studies (4, 16). In the referred studies different methods to assess DE and energy deficiency was used. This has to be taken into consideration and will probably effect the author’s statement.

-This has been addressed in pg 17 and in pg 21, line 7.

Results
When it comes to the descriptive data in table 1 there is a need for more information regarding the retired athletes. Are the data presented in table1 (training hours, menstrual status) and Table 2 (eating attitude) retrospective for the former athletes or is the training hours, eating attitude present behavior?

-Current Eating attitudes (EAT-26) in the Retired and Active rowers were assessed, this has been addressed in pg 7-8 under EAT-26 and Pathogenic Weight Control Strategies section.

-This study has not determined menstrual status but rather menstrual history (see pg 8, under Menstrual History Questionnaire section.

- Mode of training including type of resistance training exercises and average weekly training volume (hours) were determined at highest competitive level for both retired and active rowers, this has been addressed in pg 9 under Additional Questionnaires Section and we have added this information also under table 1, pg 12.

Discussion
The discussion is good, but I would like the authors to emphasize that in addition to the excellent advice that (p 18, 18-29) current training paradigms should also address the current and future health of their athletes- to emphasize the importance of nutritional guidance to help prevent extreme dieting and DE in this group of athletes.

- We have added a short paragraph detailing this on page 18, but have not gone into great depth as it is not a key focus of the paper, but an important additional issue to support bone health and general health of athletes - a very good point from the reviewer.

Also it would be interesting to learn more about the authors suggestion about considering changing the weight rules to discourage unhealthy weight loss practices.

- We have added a paragraph at the end of the discussion, pg 22 supported by evidence and suggesting categories are explored based on height rather than weight.