# PEER REVIEW HISTORY

## ARTICLE DETAILS

| | |
|---|---|
| **TITLE (PROVISIONAL)** | Variation in physical development in schoolboy rugby players - can maturity testing reduce mismatch? |
| **AUTHORS** | Hamilton, David ; Nutton, Richard; Hutchison, James; Mitchell, Martin; Simpson, Hamish; MacLean, James |

## VERSION 1 - REVIEW

| | |
|---|---|
| **REVIEWER** | Professor Mike Lambert, University of Cape Town, South Africa |
| **REVIEW RETURNED** | 25-Mar-2012 |

| | |
|---|---|
| **GENERAL COMMENTS** | Variation in physical development in schoolboy rugby players – can maturity testing reduce mismatch? <br><br> General comments <br><br> This is an interesting study which as the potential to make a contribution to eradicating the mismatch of youth rugby players. However, there are a few points that need to be considered before the paper is suitable for publication. Firstly, although the objectives are described clearly, the results are not presented in a way in which these objectives are fulfilled. At the end of the results I was left wondering about the "normative data for physical characteristics" – for this purpose the data are best presented as percentiles. Furthermore, it might be a bit ambitious to mention physical characteristics when the only measurements were height, mass and grip strength. <br><br> Secondly, the objective of "assessing the efficacy of an objective measure of physical maturity" was not clearly communicated. If figure 2 was re-drawn with better annotation, it would go a long way to improving the communication of these findings. <br><br> Thirdly, the data should have been analysed with an analysis of variance and it would have been helpful to also calculate effect sizes. <br> More specific comments follow below. <br><br> Specific comments <br> ABSTRACT <br> The objective – "……to obtain normative data for physical characteristics of current day schoolboy rugby players…." – this is rather broad and should be tightened to reflect the study (height, weight grip strength) <br><br> INTRODUCTION <br> Page 3, Line 18 – isn't it more accurate to replace "'sexual maturity" |

with "physical maturity"?

MATERIALS AND METHODS
(correct spelling: MATREIALS)
page 3, line 3 – the front row is the high risk position – why were these players excluded from assessment?
Page 4, line 3 – more detail needs to be provided for dynamometer testing – did the players warm up? Was there any familiarization? How many attempts? Dominant side? Vocal encouragement? Were they blinded to the measurement?
Page 4, line 6 – elaborate a bit on the definition of "mature" - this can mean different things to different people. (i.e. sufficiently mature to play in a particular age group).
Page 4, line 18 – my understanding is that an analysis of variance is a preferred analysis to multiple t- tests (which in any case should have had a Bonferonni adjustment of the p value). In this type of study it would also have been useful to calculate effects sizes.

RESULTS
Page 4, line 2 – with such a large sample it would have been useful to calculate the percentile scores and use the nomenclature used in the EuroFit tests i.e. less 20% - low score; 20 – 40% - below average score; 40-60% average score; 60-80% above average score; above 80% high score. This would also allow for a more evidence- based approach to the interpretation of the data and would be more closely aligned to the objective of generating normative data.
Page 5, Table 1 – this table can be tidied up by aligning the means and SD and also keeping the decimal points of the means and SD constant. The significant differences in the table should be annotated. Effects size statistics would be useful.
Page 5, Table 2 – the sample size of the different age groups = 381. In the text on page 4 authors refer to 382.
Page 5, Table 2 – the arithmetic of the regional injuries and the total injuries do not tally

DISCUSSION
Page 6, line 4 – I would interpret the 7 injuries per 1000 player hours in South Africa with caution – this study was done in 1987 and cannot really be compared to the more contemporary New Zealand studies. I do not think there are sufficient data to make the point that injuries differ between countries.
Page 6, line 10 – "If immature individuals play against more mature opponents with a greater muscle mass, a mismatch occurs placing the less mature individual at a greater risk of injury". This point needs to be teased out a bit more. Is the main cause of the problem the level of maturity, or the increased muscle mass? In some countries, players with the same level of maturity might have different muscle mass because of the socioeconomic differences (see Malina for reference). Therefore, I think this sentence should be clarified – for example, all things being equal, a more mature player will more than likely have more muscle mass, and it is the muscle mass per se, that is associated with risk of injury?
Page 7, line 20 – a coefficient of variation provides a more informative marker of variability than just range (which may be affected by extreme values).
Page 8, line 22 – change Rugby smart to Rugbysmart
Page 8, line 22 – "It followed a similar programme, "Rugbysmart , in New Zealand commenced in 2001……….." – check the sentence structure.

| | Page 9, line 2 – why do the front row get exempted? Surely the conditions should be stricter with them?

The references are rather old – I suggest add a few more recent examples such as:
Erlandson - Does Controlling for Biological Maturity Improve Physical Activity Tracking? Med Sci Sports 2011.
Figure 1: the legend is rather brief – perhaps it can be expanded by including sample size? (work on the principle that the figure plus legend should be able to stand alone)
Figure 2: once again the legend can provide more information. What do the lines represent on either side of the mean?. More detail should be provided in the numbering on the Y axis. The figure should be annotated clearly. |

| REVIEWER | John Brooks
King's College
London
UK |
| REVIEW RETURNED | 01-Apr-2012 |

| THE STUDY | The authors of this study have attempted to address a potentially very important issue in rugby union - that of physical mismatch within the schoolboy game.

The study had 2 main objectives:

1. To obtain normative data for physical characteristics.

2. To assess the efficacy of an objective measure of physical maturity.

The first objective was met, although it would be incredibly useful for the distribution of the data to be shown using graphical representation rather than just displaying means, ranges and standard deviations.

I don't believe the second objective was met. Previous studies (as cited in the article) have correlated height and grip strength with physical maturity (Tanner score). Unfortunately these are not contemporary studies and they have not used rugby players (or players of similar sports that use gripping during competition). The authors conclude that body weight and grip strength may be more appropriate measures of physical maturity in school-boy rugby players aged 15 wanting to play senior school rugby.

However, it is very possible (even likely) that many school-boy rugby players have better grip strength and greater body weight relative to their physical maturity due to the demands and nature of the sport and additional weight training. Therefore using grip strength and weight to assess physical maturity in 15 year old rugby players may actually be putting them at greater risk (for example if they have good grip strength due rugby but poor physical maturity).

As the authors suggest using the mean grip strength and weight of 17 year olds may mitigate some of this risk, but the study has missed an enormous opportunity to assess the validity of grip strength, weight and height as measures of physical maturity in this |

specific population. Equally, it may be that the school rugby playing population is self-selecting to be more physically mature than the general population but this is still unknown. The Tanner score of these individuals (or other physical development parameters that can't be altered by training) should have been measured in this study if the second objective was to be met.

There is still important data in this paper. However, I think it needs to be a paper that maintains the first objective (but displays the distribution of the physical characteristics) with a second objective that is revised according the data that this study has collected.

I also see no benefit of including the injury data because of major weaknesses (please see my comments in the materials and methods section below).

Below are some more specific points.


INTRODUCTION
- Lines 3-5: There is contemporary literature in the professional era that you have referenced in the discussion (see: Haseler, C. M., M. R. Carmont, et al. (2010). "The epidemiology of injuries in English youth community rugby union." British Journal of Sports Medicine 44(15): 1093-1099.) that can be compared with pre-professionalism data.

- Lines 7-9: This anecdotal increase in catastrophic injuries appears to contradict much of the published evidence in other countries (see: Quarrie KL, Gianotti SM, Hopkins WG, Hume PA. Effect of nationwide injury prevention programme on serious spinal injuries in New Zealand rugby union: ecological study. BMJ 2007;334:1150–1153. and Silver, J. R. and D. Stewart (1994). "The prevention of spinal injuries in rugby football." Paraplegia 32(7): 442-453.). Is there a reason for this increase? Eg. Closure of other units, increase in playing population, improvements in record keeping, an unusual spike that will average out. Or is this a genuine and worrying sustained increase? This is a major and significant finding if true and needs to be appropriately referenced or discussed.

- Lines 16-17: Are Scottish 15 year olds involved in senior rugby more regularly or is this just the perception? Also if they leave earlier due to exams, presumably this results in fewer older senior players making the age range more equitable?


MATERIALS AND METHODS
- Line 55: Currently it suggests that if you play in the front-row you don't need to be maturity tested you can just play

- Line 7: You need to mention that this is testing for grip strength

- There is no benefit of including injury data in this paper. The injury data collection has many weaknesses (lack of exposure and severity data, retrospective recall etc.) so does not stand up as data on its own (for example: the current definition suggests that a graze requiring dressing could be included along with a fractured leg (without severity figures or a stricter inclusion criteria the data are largely meaningless)). The limited injury data may have provided a useful adjunct to be linked with the physical parameter data but this

| | |
|---|---|
| | has not been done and it doesn't appear that there are enough injuries for this to be done.<br><br>- Lines 34-35: Is a manual check for normality an acceptable method (apologies I'm not an expert on this). |
| **RESULTS & CONCLUSIONS** | The points raised in the previous section are also relevant here along with a few specifics:<br><br>RESULTS<br>- Line 4: I'm very surprised there was a significant increase in grip strength between 16 (42) and 17 (43) year olds?<br><br>- Table 1: There are no units & it would be useful to know the number of children in each age group<br><br>- Line 34: How has incidence between school been assessed? Does it take account of exposure?<br><br>- Table 2: I think "total injuries" should be number of players reporting at least 1 injury?<br><br><br>DISCUSSION<br>- This will probably need some revision if the paper is altered, however, I don't understand how you can make conclusions about a worrying increase in injury rate from your data? |
| **GENERAL COMMENTS** | I think there is a lot of really interesting data here. However, I don't think you can link the parameters you've measured with physical maturity in this population so the second objective needs to be modified.<br><br>I hope my comments have been useful and constructive. |

## VERSION 1 – AUTHOR RESPONSE

To respond to the specific comments;

Both reviewers clearly understood the relevance and potential importance of this project, their concerns lay primarily around the reporting and specifically the validity of the injury data supplied. On reflection we agree with these concerns, and have revised the secondary aim of the project to reflect this. The data analysis has been redone with more comprehensive statistical methodology, which while not affecting the outcome or message of the paper, does allow us to explain the data more thoroughly. Many of the reviewer's specific comments have been addressed by the change in emphasis of the secondary objective, the rest either accepted or better explained.

The one comment we have not act on is Professor Lambert's suggestion of calculating percentile scores. While we appreciate the relevance, the reworked analysis allows us to better explain the data using other parameters. We feel additional percentile scores no longer add to the description in light of the major rewrite.

We hope the document is now clearer in our intentions, the specific methodology used and in presenting our interpretation of the data.

Kind regards

David Hamiton
Richard Nutton
James Hutchison
Martin Mitchell
Hamish Simpson
Jamie Maclean