LETTER

"Read with caution": a reply to Pickett et al

In recent years, psychological issues in bodybuilding have received much research attention. In particular, the popularity of training with weights and the many interesting psychological issues surrounding this phenomenon, research on such issues is clearly warranted. We were pleased therefore to see a recent study by Pickett et al. In this journal, purporting to examine muscle dysmorphia and social physique anxiety in bodybuilders and weight trainers. Muscle dysmorphia is a multidimensional condition where individuals exaggerate the importance of body image, believing themselves to be thin and puny when in fact they are large and muscular. The study of Pickett et al compared three groups of men: competitive bodybuilders (n = 40), men who train regularly with weights (n = 40), and men who do not train with weights (n = 40). Several physiological measures (including weight, height, and body fat percentage) were taken, and participants completed several questionnaires, including the social physique anxiety scale (SPAS) and the eating attitudes test (EAT-26). The authors concluded from their results that competitive bodybuilders are not more "muscle-obsessed" than either non-competitive weight trainers or physically active men who do not train with weights. Although we applaud the attempt of Pickett et al. to examine this important topic, we suggest caution with regard to some of their findings and conclusions because of concerns about the sample and measures used. These concerns are explained in the following paragraphs.

Methodological concerns

Participants

One of our main concerns about the study of Pickett et al. is the choice of participants and the vague description of their characteristics. The study examined competitive bodybuilders, men who regularly trained with weights, and physically active men who exercised but did not train with weights. However, it is unclear whether these "weight trainers" in this study would have classified themselves as bodybuilders. This issue is important as most people who class themselves as bodybuilders do not compete, and previous research has shown that they differ on a range of psychological characteristics from those who weight train for general fitness rather than bodybuilding purposes. In particular, are the weight trainers in the second group non-competitive bodybuilders, power lifters, or just motivated fitness lifters? Previous research suggests that bodybuilders, powerlifters, and fitness lifters may have very different motives for competing, or whether they were down to comparing bodybuilders with non-bodybuilders. In addition, the results of the study show that the weight gain desires of bodybuilders were only marginally higher than those of weight trainers (p<0.08). This is a very surprising finding, given that gaining muscle is the raison d'etre of the bodybuilder, but that many non-bodybuilders weight train for general fitness purposes rather than to build muscle (see, for example, Fussell). The inclusion of a mixture of non-competitive bodybuilders and weight enthusiasts in the weight trainer group may explain this finding. Certainly, without asking participants if they view themselves as bodybuilders, this possibility cannot be ruled out. Therefore the sample in this study has not been defined and delineated clearly enough, and we suggest that a group of non-competitive bodybuilders should have been included as well as a group of non-bodybuilding weight trainers to allow additional comparisons.

This may also be indicated by the lack of significant differences in social physique anxiety between the bodybuilders and the weight trainers and the marginal difference between those groups and the controls. This result contrasts vividly with the findings of Hurst et al. that experienced bodybuilders scored significantly lower on social physique anxiety than non-experienced bodybuilders and weight lifters. The discrepancy between these two findings may again relate to the sample used by Pickett et al. If some of their sample of weight trainers were indeed non-competitive bodybuilders, then perhaps it is not surprising that there is little difference between the two groups in overall social physique anxiety. The finding that the active controls only scored marginally higher in social physique anxiety is surprising and contradicts the findings of Hurst et al. that there are large significant differences between bodybuilders and weight lifters. Unfortunately Pickett et al. chose only to give this finding only cursory attention in their discussion.

Body composition measurement

We have concerns about the body composition analysis, the fat-free mass index (FFMI). The researchers also used the sum of skinfold measurements to complete the FFMI equation.

According to Eston and Reilly's methods of assessing body composition can be ranked in one of three categories according to the validity of the particular method. Level 1 (the most accurate measure) is cadaver dissection. The next best method (level 2) is dual energy x ray absorptiometry (DEXA), and the least accurate (level 3) methods are bioelectrical impedance and sum of skinfolds. The caliper method used by Pickett et al. is classified by Eston and Reilly as level 3, defined as such it uses an equation that represents an empirically derived relation between the result of the skinfold measurements and either hydrostatic weighing or DEXA. A more accurate method would have to use DEXA, as the caliper method used by Pickett et al. incorporated all the assumptions of DEXA and/or hydrostatic weighing (which it was calibrated against) as well as having its own limitations. Therefore DEXA would have been a much better way of assessing body composition, as it does not rely on calibration against underwater weighing, in contrast with the caliper method.

Even if DEXA was not a feasible option of assessment, then we still question the use of the sum of skinfolds method being used. Research suggests that the reliability of anthropometrics depends on standardising the caliper and site of measurement as well as the measurement skill of the anthropometrist, and is therefore prone to measurement error. This is an important limitation that was not acknowledged by Pickett et al. It has also been suggested that the accuracy of caliper measurements is compromised when comparing bodybuilders with non-bodybuilders. Even if DEXA was not a feasible option of assessment, then we still question the use of the sum of skinfolds method being used. Research suggests that the reliability of anthropometrics depends on standardising the caliper and site of measurement as well as the measurement skill of the anthropometrist, and is therefore prone to measurement error. This is an important limitation that was not acknowledged by Pickett et al. It has also been suggested that the accuracy of caliper measurements is compromised when comparing bodybuilders with non-bodybuilders. Therefore DEXA would have been a much better way of assessing body composition, as it does not rely on calibration against underwater weighing, in contrast with the caliper method.

There is also a plethora of research supporting the use of bioelectrical impedance over that of the skinfolds method. Skinfolds have been found to overestimate muscle volume and underestimate adipose tissue, possibly because of the false assumption in the skinfold equation that muscle and limb circumference are circular in nature. In summary, we question the accuracy of the methods used by Pickett et al to measure body composition, and wonder why commonly used, more accurate measures were not used.

Muscle dysmorphia measurement

Our greatest concern with the current study is related to the claims made by the authors about muscle dysmorphia. The authors claim that their findings show that competitive bodybuilders are not more muscle dysmorphic than non-competitive weight trainers and physically active non-weight trainers. However, during this study no self report measure of muscle dysmorphia was attempted.
A further concern is the assertion that the study did not find muscle dysmorphia to be greater in competitive bodybuilders than in non-competitive bodybuilders who lift weights or are athletically active men. A previous study that used a validated measure of muscle dysmorphia, the muscle dysmorphia index (MDI), found it to be significantly higher in bodybuilders than in weight training non-bodybuilders, such as power lifters. The MDI is a valid and reliable multidimensional measure of this construct (see Rhea et al. for a discussion of its development and psychometric properties). Muscle dysmorphia is a complex phenomenon with six clear components and therefore requires a multidimensional measure. Indeed, the research of Rhea et al. revealed six important factors in muscle dysmorphia (size/symmetry, supplement use, exercise dependence, pharmaceutical use, dietary behaviour, and physique protection), all of which are included in the MDI. Another earlier multidimensional measure of muscle dysmorphia symptoms, the muscle appearance satisfaction scale (MASS), has also been initially validated and measures bodybuilding dependence, muscle checking, substance use, injury, and muscle satisfaction. This begs the question as to why Pickett et al. did not use either validated multidimensional measure that first appeared in the literature in 2002, but instead used measures of eating disorders and social physique anxiety, which, at best, tap only partially and indirectly into the muscle dysmorphia construct. We contend that the lack of use of a direct and comprehensive measure of muscle dysmorphia brings the validity of their conclusion on dysmorphia into question.

In addition, we are surprised that the findings of Lantz et al. mentioned above are not discussed by Pickett et al. Given that these findings contradict those of Pickett et al., it seems reasonable to expect Pickett et al. to mention this and explain why they think their findings differ. The absence of any reference to the study of Lantz et al. suggests either an inadequate literature search on the part of these authors or a deliberate omission because of the contradictory findings from their weaker design.

In the same vein, it is also worth mentioning another study omitted by Pickett et al. with findings somewhat contradictory to the present study. Smith and Hale found that competitive bodybuilders scored significantly higher than non-competitive bodybuilders in exercise dependence (an important component of muscle dysmorphia). They also found significant correlations between measures of exercise dependence and muscle dysmorphia. This again appears to contradict the assertion of Pickett et al. that competitive bodybuilders are not more inclined to be muscle dysmorphic than general weight trainers. Again, it is worth noting that Smith and Hale used a much larger sample than Pickett et al. (135 competitive and 150 non-competitive participants compared with 40 of each).

Pickett et al. do acknowledge the lack of a specific measure of muscle dysmorphia as a limitation of their study. However, given that such a measure has been freely available since 2002, it is puzzling as to why it was not used. If such a measure were collected before the publication of the MDI, the conclusions of the study should have been restricted to the body image data rather than forming possibly unwarranted conclusions on muscle dysmorphia.

Conclusion
Muscle dysmorphia and related psychological issues in bodybuilders are both fascinating and worthwhile research topics. However, it is extremely important that such research is carried out with great care and scientific precision. Otherwise, researchers may form unwarranted conclusions on the basis of questionable data. This appears to be the case with the study of Pickett et al. We have shown how inadequate sampling and a lack of specific measurement of an important construct explored in their study may have produced rather misleading research findings and created questionable internal validity. Previous studies using well validated instruments specific to bodybuilders have found evidence of differences in psychological characteristics between competitive bodybuilders and other weight training enthusiasts, which appear to contradict the findings of Pickett et al. However, the reader will search in vain for even a passing reference to any of these studies. It is incumbent upon researchers to familiarise themselves with previous research, to build upon these findings and also to report them to enable readers to scientifically compare methods and findings. In this case, Pickett et al. appear to have failed in this endeavour. This central issue, combined with the problems of sampling, muscle dysmorphia measurements, and body mass measurements noted above, lead us to conclude that the results of Pickett et al. should be interpreted with extreme caution. We also suggest that those conducting further research on this topic should pay close attention to these important methodological issues.

Competing interests: none declared

References
XI Congress of Sports Medicine
Spanish Federation (FEMEDE)
16–19 November 2005, Palma de Mallorca (Balear Islands)
Further details: Website: www.femede.es

8th International Congress of the Society for Tennis Medicine and Science
14–15 January 2006, Melbourne, Australia
To be held immediately prior to the 2006 Australian Open tennis championships, the congress will combine presentations from international and Australian experts, including Professors Tim Noakes, Bruce Elliott, and Mark Hargreaves to stimulate discussion on topical tennis science and medicine issues. Registrations are now open via the congress website.
Further details: Email: stms2006@meeting-planners.com.au; Website: www.stms2006.com

13th Commonwealth International Sport Conference (CISC2006)
9–12 March 2006, Melbourne, Australia

The Second International Meeting on Minor Traumatic Brain Injuries in Sports
12–17 March 2006, St Moritz, Switzerland
This meeting will consider the latest research on TBI with the emphasis first on mechanism, pathology and its clinical correlation as well as on diagnosis, classification, reports, therapy, and secondly on rehabilitation, recovery, return to play, and prevention strategies of TBI in sport (i.e. amateur / professional boxing, ice hockey, soccer, American football, kick boxing, k1, skiing, snowboarding, biking, climbing, etc.). There will be also report on the latest Second International Symposium on Concussion in November 2004 in Prague, Czech Republic.
Further details: http://www.orthopaedic-samedan.ch/mtbi.html

12th European Society of Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA) 2000 Congress
24–27 May 2006, Innsbruck, Austria
Further details: Tel: +49 611 9771635; Website: www.esska2000.com

AIPN 8th National Injury Prevention Conference
27–29 September 2006, University of New South Wales, Sydney, Australia

IV Science and Racket Sports World Congress
21–23 September 2006, Madrid, Spain
The congress will be held at the Spanish National Institute of Sport in Madrid, and in conjunction with the 8th International Badminton Federation (IBF) World Science Congress. The congresses will take place during the World Badminton Championships, also in Madrid.
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BASEM Conference 2006
5–7 October 2006, Oxford, UK
Further details: Email: BASEMinfo@aol.com; Website: www.basem.co.uk