Journal of Athletic Training 2011;46(2):168–169

www.nata.org/jat

COMMENTARY

Christopher R. Carcia, PhD, PT, SCS, OCS

Department of Physical Therapy, John G. Rangos Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA

I would like to commend the authors on their work. This study to a large extent mirrored the published work by Cools et al,[1] albeit in a different population. Unique to the present work, however, is the investigation of 2 types of training programs on muscle-performance characteristics in adolescent swimmers. Specifically, after isokinetic pretesting of the scapular protractors and retractors, swimmers performed a supervised program of either strength training or endurance training for 12 weeks, followed by a posttest. The authors did not identify differences in muscle performance between groups after the intervention for any of the dependent measures. Furthermore, the authors reported that muscle endurance, as a function of the fatigue index (FI), decreased between the 2 measures.

Identifying differences between groups and among multiple interventions is influenced by several factors, including variance among the groups, sample size, and the effect size(s) of the intervention(s).[2] In this study, the authors acknowledge that intersubject variance (large SDs) may have contributed to the inability to detect a difference between groups in isokinetic muscle performance measures after the intervention programs. Although this may be a contributing factor, it is my opinion that the inability to identify group differences was minimally influenced by this factor. Additionally, even though the group sizes were small, larger group sizes in this situation would likely have done very little to increase the chance of identifying a statistical, let alone clinically important, difference between groups. The underlying reason the authors were unable to detect differences between groups was probably a function of the similarities in intervention programs. This statistical information could have been ascertained by performing a prospective pilot study. Armed with the information from an a priori pilot study, the authors could have calculated the sample size necessary to identify a statistical difference or realized that the training programs were so similar that further pursuit of the study was not likely to demonstrate differences. Arguably, there are times when identifying no differences between interventions is clinically important. In these cases, when the investigators expect to find no difference, it becomes even more critical to conduct a power analysis. At this juncture, given that neither a pilot study nor power analysis was performed, it would have been helpful to the reader had the authors reported the actual effect sizes (η^2).

With regard to muscle endurance, participants performed a fatigue test (40 repetitions at 180°/s) before and after the training programs. During the pretest, the authors found a negative FI, which indicates that work increased when the data from the last third of the fatigue protocol were compared with those of the first third. The authors reported, "The swimmers had good muscle-endurance capacity, which is a positive result." During the posttest, however, the authors found a positive FI, indicating that work decreased when the last third of the fatigue protocol was compared with the first third. The authors interpreted this result as signifying that the swimmers had less muscle-endurance capacity after training. They theorized that swimming in conjunction with the training program may have created a situation involving overtraining. They attempted to substantiate their findings by citing the work of Su et al,[3] who observed decreased muscular endurance after an acute bout of swimming. Although it is possible that the swimmers became overtrained during the 12-week study, this logic would not explain the results of their FIs. Overtrained or not, the participants' ability to generate force should have been greater at the onset (ie, during the first third of the fatigue protocol) and less during the final phase (ie, during the last third of the protocol). Su et al[3] did identify a decrease in shoulder force production after an acute bout of swimming, reinforcing the fact that the ability to generate force decreases after a period of acute exertion. The factor that most likely explains the negative FI is simply a learning effect. The authors cite reliability data related to the Biodex for the motions of protraction and retraction,[4] but these data were not specific to the faster speed at which the fatigue test was conducted. Although the participants performed a brief (5-trial) familiarization session, this was obviously insufficient. The data from the present study indicate that during the pretest, the participants learned how to use the device; hence, force readings were greater in the last third of the test than in the first third. They retained this experience, and I believe that the posttest data are valid. However, I disagree with the interpretation of the posttest data and suggest that these data are consistent with a normal fatigue test, as shown in other similar work.[1]

Despite these weaknesses, the strength of the current study is the descriptive muscle-performance data in adolescent swimmers. These data are of potential value to researchers and clinicians who work with this population.

REFERENCES

1. Cools AM, Geerooms E, Van den Berghe DF, Cambier DC, Witvrouw EE. Isokinetic scapular muscle performance in young elite gymnasts. *J Athl Train*. 2007;42(4):458–463.
2. Portney LG, Watkins MP. *Foundations of Clinical Research: Applications to Practice*. 2nd ed. Upper Saddle River, NJ: Prentice-Hall Inc, 2000.
3. Su KP, Johnson MP, Gracely EJ, Karduna AR. Scapular rotation in swimming with and without impingement syndrome: practice effects. *Med Sci Sports Exerc*. 2004;36(7):1117–1123.
4. Cools AM, Witvrouw EE, Danneels LA, Vanderstraeten GG, Cambier DC. Test-retest reproducibility of concentric strength values for shoulder girdle protraction and retraction using the Biodex isokinetic dynamometer. *Isokinet Exerc Sci*. 2002;10(3):129–136.

Address correspondence to Christopher R. Carcia, PhD, PT, SCS, OCS, Department of Physical Therapy, John G. Rangos Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA 15282. Address e-mail to carcia@duq.edu.

AUTHORS' REPLY

We agree with Dr Carcia's commentary and thank him for his valuable and useful observations.

Annemie Van de Velde, PT
Patrick Calders, PhD
University Hospital Ghent
Ghent, Belgium
email: annemie.vandevelde@ugent.be

Kristof De Mey, PT
Annelies Maenhout, PT
Ann M. Cools, PhD, PT
Ghent University
Ghent, Belgium