

The Alphabet of Sport Science Research Starts With Q

The training stimulus in competitive sports is usually described as a combination of training intensity, volume and frequency. It is generally believed that these three factors produce an adaptive response in the body that should lead to improved performance.
1,p395

These were the introductory words of my first scientific publication as first author back in 1995. That study was primarily designed to describe a method for estimating the mean intensity of training, training volume, and frequency over a season in a group of elite swimmers and to determine the relationships between these 3 training components and variations in performance throughout the season. Eighteen years and dozens of publications later, I still consider the quantification of training a cornerstone of athletic preparation for competition and a key issue when it comes to good sport science research.

To analyze and establish causal relationships between the training performed by an athlete and the resultant physiological and performance adaptations, it is absolutely crucial to quantify precisely and reliably the training load undertaken by the athlete. In other words, it is not possible to identify the effects of training without a precise quantification of the workload. In this sense, it is important to emphasize 2 considerations that coaches and sports science researchers should always bear in mind when it comes to training quantification:

- There are 3 distinct training loads that may vary significantly within a training program—the load planned before the season (or study) starts, the load prescribed on a daily basis, and the actual load completed by each individual athlete.
- The actual load is the load that should be quantified and reported, not the load planned in the long or medium term or the short-term load prescribed by the coach or researcher.

Prof Carl Foster, Editor of the *International Journal of Sports Physiology and Performance*, has spent many years of his outstanding career as a sport physiologist analyzing relationships between training load and athletic performance. Of course it is impossible to study these relationships unless the load is adequately quantified. “The ability to monitor training is critical to the process of quantitating training periodization plans,”^{2,p109} in Carl’s own words.

Some of the great authors in the field of sport and exercise science have previously underlined the importance of proper training quantification. Prof Michael L.

Pollock indicated in 1973 that “many investigators have reported their results without quantifying their training procedures, i.e., no mention of energy cost, heart rate intensity, miles covered, etc.”^{3,p157} Along the same lines, Prof Will G. Hopkins indicated in his classic 1991 work on the quantification of training in competitive sports that, given that the links between training and outcomes such as performance and injury are so strong, it is surprising

that the methodology of measurement of training has not been a focus of attention in the sport science literature. Indeed, this is such a blind spot that some papers reporting the effects of training neglect to describe or state the method by which the measures of training were obtained.^{4,p162}

More recently, authors like Prof Michael I. Lambert have thoroughly described the methods available for coaches and researchers to quantify the external training load (ie, an objective measure of the work an athlete completes), measured independently of the internal workload (ie, the biological stress imposed by the training session, defined by the disturbance in homeostasis of the physiological and metabolic processes during the training session), and made recommendations regarding their practical use in both sports and research.^{5,6} Such recommendations, however, are sometimes neglected by authors.

As a reviewer, I recently recommended rejection of a submitted manuscript because I considered the lack of a precise description of the training contents, in terms of volume, intensity, and frequency before and during the training intervention, a fatal limitation of the study. Precise information about training quantification is absolutely necessary, as manipulation of a training program is the basis of many studies in our field. A training study is basically useless without this information.

From this Associate Editor’s point of view, the most important information for a study on training manipulation is the information about training (ie, training quantification). Without precise, thorough, and in-depth information about training, the findings of a training study are of very little or no value. Authors submitting their research papers to the *International Journal of Sports Physiology and Performance* and reviewers evaluating those papers are strongly encouraged not to neglect the importance of training quantification. As stated in the title of this editorial, the alphabet of sport science research starts with Q for quantification.

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