

## Together We Are Stronger: Multicenter Studies

Multicenter studies are extremely important in research and have several advantages over single-center investigations. In sport science, multicenter studies, especially for interventions, are rare. There are exceptions in the sport-injury area,<sup>1</sup> but these studies are still not common. This is unfortunate, as multicenter studies allow for increased generalizability of the results (higher external validity) through recruitment of more participants (larger sample size). The advantages to multicenter studies do not stop here; there are additional benefits to the experimental approach. In this editorial we highlight some of them.

### More Rigorous Study Protocols (Higher Internal Validity)

To ensure uniform data collection across centers, the study protocol and procedures need to be standardized and well planned. This planning includes identification and specification of the randomization technique, which is an important piece of the information often lacking in intervention studies, despite its importance to evaluate the risk of bias.

### Standardization and Better Selection of the Primary and Secondary Outcomes

It is common to find studies that cover a similar topic of interest; however, unfortunately, variable outcome measures often preclude direct comparison or inclusion of study results in a meta-analysis. Moreover, not all the physiological or performance-based measures have the same responsiveness (eg, time to exhaustion vs time trial).<sup>2</sup> When conducting a multicenter study, all centers involved should agree on common, consistent, and relevant measures

### Less Data Fishing

Since everything is planned and shared among the centers, including, in advance, selection of the analyses and subanalyses, any additional and unplanned analyses should be discussed among all the centers, and it is important that these be specified in the paper. This approach can limit data fishing and generation of post hoc hypotheses.

### Better Quality Control

Multicenter studies necessitate procedures for data-quality checks, and these protocols must be standardized. Quality control involves calibration of testing procedures, ensuring that investigators follow the documented procedures and protocols systematically, standardized instructions for and management of subjects, and checking of raw data prior to statistical analysis. Data should be entered in a database and shared among centers as soon as available.

Multicenter studies require very accurate and comprehensive planning and are usually more expensive (or demanding) than single-center studies. In addition, statistical analysis should take into consideration some specific issues such as nonrandom measurement error between centers.<sup>3</sup> However, multicenter studies (both experimental and observational) are important and useful in research, for example, when investigating elite athletes, who are limited in number. In addition, the contribution of more researchers in multicenter studies would provide the opportunity to benefit from different expertise, experiences, skills, and resources. Initiatives involving different centers and research groups working on single studies and different subquestions around the same topic are also valuable, but, although sometimes referred to as multicenter studies, they are not proper multicenter studies and therefore they do not provide the aforementioned advantages.

In the future, we hope to see more multicenter studies submitted to the *International Journal of Sports Physiology and Performance* and strongly encourage such initiatives.

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### References

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