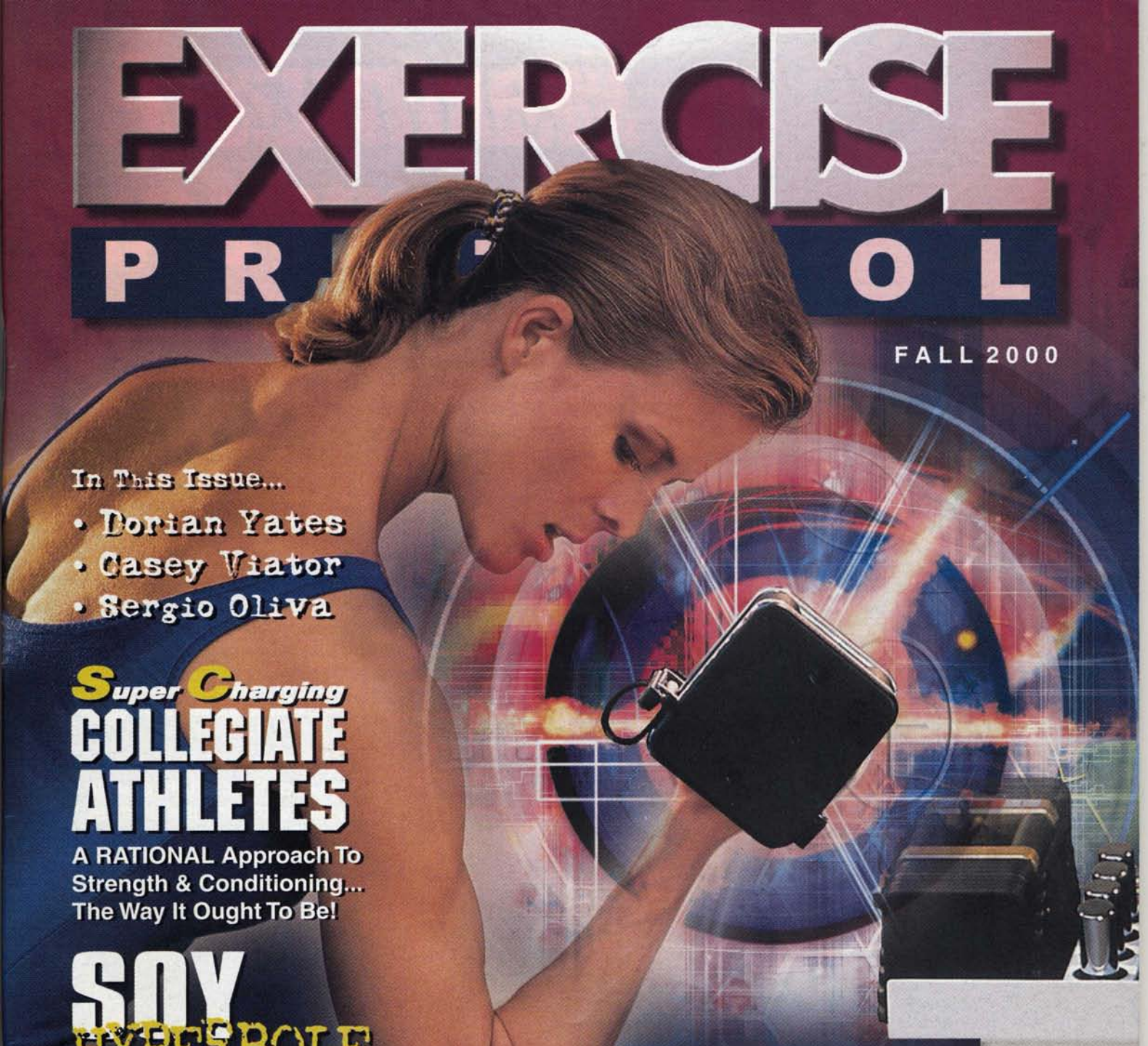
# EXERCISE PRO OL

FALL 2000



In This Issue...

- Dorian Yates
- Casey Viator
- Sergio Oliva

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# ROUNDTABLE

## What, if any role, should peer-reviewed scientific publications have in the development of a training program?


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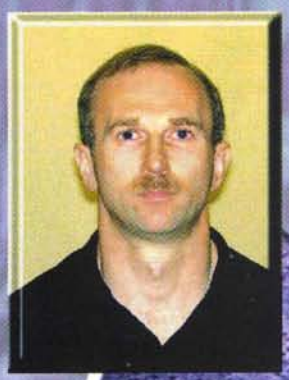
**Richard Winett, Ph.D.**

There's a growing research literature appearing in quality peer reviewed journals on the effectiveness of different protocols and the numerous health benefits of resistance training. One would be foolish to ignore this important work.

However, in order to properly understand the work, much less critique and apply it, you have to understand scientific methodology and some basic statistics. It's not all that involved but does require some study.

A few well known people have over many years maligned this work and scientists in particular. That's been unfortuante because it's convinced people that science isn't honest or there's nothing to learn from it. On the contrary, science is very public and most often self-correcting. There is, by the way, alot of support for some aspects of high intensity training such as the efficacy of using single sets per movement but alot less support for some of the other aspects such as very infrequent training. (Editor: visit Richard's website at http://ageless-athletes.com)



**Matt Brzycki**

I think that scientific publications — or, more specifically, scientific studies — have a purpose in the development of training programs provided that the information is of practical use and of acceptable design without researcher bias. A brief anecdote: I'm not a scientist, I'm a practitioner. As such, most of my writings have appeared in trade publications not peer-reviewed. Several years ago, I submitted a manuscript to a peer-reviewed journal for consideration. A few months later, the manuscript was returned to me with reviewer comments, including a request for referencing the Overload Principle. The Overload Principle is the fundamental premise for many training programs in exercise science, including aerobic and anaerobic conditioning, flexibility and strength training. Its name can be traced back to 1933, coined by Dr. Arthur Steinhaus; its application can be traced back to ancient times, credited for the tremendous gains of the legendary Greek athlete, Milo of Crotona. Asking to provide a reference for the Overload Principle is analogous to asking to provide a reference for the existence of gravity or friction. This made me wonder about the validity of the peer-review process and the knowledge of the reviewers in their assigned areas.

Reading many of the studies published in scientific "journals" has also made me quite suspicious of the peer-review process. Frankly, some studies have design flaws that would not be worthy of a passing grade in a high school science project yet are somehow capable of passing the supposed peer-review process of a scientific publication. The design flaws (and researcher bias) are even obvious to those with little or no experience in research. Indeed, refereed journals are teeming with scientifically unacceptable studies, including those lacking one or more of the following elementary concepts of statistical research: (1) adequate length; (2) appropriate sample size; (3) proper supervision of test subjects to ensure that the training protocols were followed as specified; (4) equating the groups for physical and performance characteristics prior to the study; (5) random assignment of subjects; and (6) control of extraneous variables. Some published studies have made claims in the absence of any supporting data whatsoever. Equally horrific, the conclusions of some researchers often contradict their own data. In one of the most abysmal examples of a design flaw in the history of the peer-review process, one published study pre-tested two groups of subjects in the hang clean. The hang clean was included in the training program of one group but not the other. Then, both groups were post-tested in the hang clean. It is incredible to think that this hideous and blatant design flaw went unnoticed during the peer-review process. Scientific studies used for the development of training programs should be *peer*-reviewed, not *pal*-reviewed. That way, the information will be based upon science fact, not science fiction.

**Brian D. Johnston**

The current situation places us in a catch-22. Of course we need scientific research, in order to learn and expand our knowledge in the physical sciences. The problem, however, is that many researchers use tools incapable of measuring what they intend to measure, such as dynamic, high force testing equipment (e.g, Cybex) to quantify muscular strength (you must eliminate friction, impact forces, gravity and stored energy from the results). Not studying other aspects of physical sciences, I'm uncertain how 'screwed up' other vocations are, but strength training research is anything but accurate. Take, for example, the fact that there are countless studies comparing 1 set to 3 sets. Why not 2 sets, since 2 sets actually doubles the level of metabolic stress? No answer. Man is fixated on the number three, for some reason. Or how about the fact that regardless of the efficacy of one program in a person's career, that program may be completely inappropriate in another 6-12 months of training. Consequently, what did we learn from the study? Not much, except what may have been ideal for a select group of people on average. Science needs to focus more on discovering ways to properly prescribe exercise in accordance to individual needs, rather than randomly selecting a group of people who may not be representational of you or me, then coming to vague conclusions. In logical thinking and analysis there exists the fallacy of appeal to modern science, a qualitative fallacy indicating it is erroneous to openly accept anything uttered by a scientist simply because he or she is a scientist (after all, scientists are not infallible). It should be apparent how chaotic the scientific world is to have a fallacy named after itself.

**Ken Mannie**

The importance of peer-reviewed, scientific publications to the strength and conditioning practitioner is that they serve as a vehicle to provide us with answers based upon experimentation via an information gathering process known as the "scientific method." At the very core of science is the need for observation along with the obligation to describe, explain, and predict.

An experiment must attempt to control as many elements (i.e., variables) as possible, and subsequently make a cause and effect relationship based upon the differences resulting from the introduction of an independent variable(s). If the results are reliable (consistent), certain generalizations can be made with some essence of conviction.

It is at this juncture, however, where the practitioner, if not careful, can stub his/her toe. How reliable is the piece of literature you have just examined? I've been reading the scientific strength training literature for the good part of twenty-five years, and the only conclusive result I've been able to find is that there exists an abundance of inconclusive results. For example, I challenge you to wade through the corpulent stacks of studies on topics such as number of sets, plyometrics, speed of movement, ad infinitum, and, after making the appropriate comparisons, give me a short list of definitive results. Good luck with that adventure! Don't misunderstand me — we desperately need scientific research in the strength training arena. More specifically, we need more good, unbiased research in this area — and a lot less of the orchestrated agendas disguised as legitimate science.

**Greg Bradley-Popovich, MS MS**

Studies are published in peer-reviewed scientific journals. The process of peer-review, whereby other scientists scrutinize a study prior to publication, is certainly an imperfect system, but it is the only system that has been agreed upon in an effort to enhance the quality of published studies. The overall purpose of blinded peer-review, in which reviewers don't know the identity of the authors, is not to determine whether the results themselves are correct, but rather whether the scientists followed established protocols, if they considered alternative explanations for their findings, and if the statistical models were appropriately applied to the problem. Peer-review sometimes fails miserably as evidenced by some journals that are obviously biased in the studies published and the reckless freedom granted to certain authors to present their opinions as facts. Hence, although far from perfect, we can't let every nutty professor publish something conducted under poorly controlled conditions!

Training studies *per se* are not the problem, but rather 1) results are misrepresented, 2) results are misinterpreted, 3) results are misapplied, or 4) a lone study is touted as gospel. Point # 1 is a euphemistic way of saying the authors of the article lied, which happens with undeterminable frequency and perhaps in circumstances where a researcher may have financial or ego-preserving interests. Point #2 is of greatest concern in strength training literature, in which some studies' data do not support the conclusions of the authors. Commonly, bad training research has so many training differences between study groups that the outcomes cannot be attributed to any one manipulation, but the authors make a leap and attribute the findings to whatever training characteristic they promote (e.g., high volume). Point #3 deals with the fact that good research is conducted under very strict conditions, and the application of some findings may be very narrow. Point #4 reinforces that although statistics and peer-review attempt to ensure that a study's results are not due to chance and are indeed genuine, the results need to be substantiated by other researchers to be assured the results are reproducible. A prime example of promoting select evidence is the issue of single versus multiple sets in which high-volume proponents only cite studies supporting their opinion—studies representing a tiny minority of the training volume literature. Most studies are not new contributions to knowledge but are merely repetition of previous studies to test and retest a hypothesis. Exercise science research is important for the continued development of the field. Training research should be viewed critically, applied specifically, and incorporated slowly into training protocols according to the growing preponderance of evidence. I refer readers to a previous article to see how they can incorporate training evidence into their resistance exercise programs: Bradley-Popovich GE. A personal approach to evidence-based resistance exercise. *Master Trainer*. 2000;10(1):13-16.