

[Letter to the Editor]

Concentric and Eccentric: Muscle Contraction or Exercise?

Dear Editor:

This inclusion considers the use and possible misuse of the terms *concentric* and *eccentric* in 3 possible contexts: first, the origin of the terms; second, different approaches; and third, possible uses. To the best of our knowledge, 4 articles have been published in *Sports Health* misusing the term *concentric/eccentric exercise*,^{1,3,6,7} while no articles have used the terms correctly.

WHEN THESE TERMS INITIALLY APPEARED AND WHAT THEY MEAN

The origin of the terms *concentric* and *eccentric* are related to muscle contraction in basic physiology science. Back in 1925, Hill defined 2 types of muscle contractions⁴: isometric (muscle length does not change during contraction) and isotonic. In this latter contraction, tension remains unchanged while the muscle's length changes. There are 2 types of isotonic contractions: concentric and eccentric.⁵ In a concentric contraction, the muscle tension rises to meet the resistance then remains stable as the muscle shortens. During eccentric contraction, the muscle lengthens as the resistance becomes greater than the force the muscle is producing.

WHICH AREAS DO THE TERMS CONCENTRIC/ECCENTRIC COVER?

In the following years, these terms were much used in scientific articles in different areas, including physiology, biomechanics, and neuromechanics. On PubMed, a search concerning the years 1975 to 2012 found 190,087 articles using the words *muscle contraction* versus 2302 and 1582 articles with *eccentric* and *concentric exercises*, respectively. Several authors have misused concentric/eccentric work or exercise for an exercise with upward displacement of the body to overcome gravity (positive work) or landing (negative work). Although the terms *eccentric* and *concentric* are linked to a muscular behavior, this cannot be used in all contexts.

IS IT JUDICIOUS TO USE ECCENTRIC/CONCENTRIC FOR EXERCISES?

During positive or negative work, some muscles are in eccentric and other muscles are in concentric phases (agonist/antagonist).

For instance, a flexion of the arm necessitates a concentric contraction of the biceps brachii whereas the antagonist muscle, the triceps brachii, lengthens in an eccentric action. Further, the use of these terms in both exercise and muscle contraction has created confusion. Considering the need to clarify this question, we propose that the term *positive* or *negative work*² is more appropriate for describing some exercise, while in another context, it would be more correct to use *flexion/extension* or *adduction/abduction*.⁸

Knowledge of the correct use of the terms *eccentric* and *concentric* can be valuable for understanding results in a journal article and deciding whether the authors' conclusions are justified by the data. To avoid confusion, positive (concentric) or negative (eccentric) exercise is preferable. These terms indicate the importance of the outcome and, hence, what was probably intended. We believe sports science still presents some confusion regarding other concepts, and we invite our colleagues to discuss them in letters to the editors, as we did in this short text.

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