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Comment on: "Explosive is not a Term Defined in the International System of Units and Should not be Used to Describe Neuromuscular Performance"

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Dear Editor,

We read with great interest the article "*Explosive is not a Term Defined in the International System of Units and Should not be Used to Describe Neuromuscular Performance*", which aims to discuss the potential misuse of the term "*explosive*" in the sports science literature to describe neuromuscular performance. We would like to thank the authors for initiating this important discussion on the appropriate use of terminologies to describe human movement, particularly in the field of strength and conditioning. In fact, disagreement and debate are common to all scientific disciplines, including sport and exercise science, and serve to improve our understanding. This debate also provides an opportunity to clarify and specify the use of the term "*explosive*" in the scientific literature.

As an example of different interpretations of well-established terminology, in their introduction the authors discuss "*muscle strength*", where "*strength*" implies a ceiling of force production, while "*muscle*" insists that this force originates from the contractile tissue. However, such simplification is misleading and erroneous as it ignores the role of the central and peripheral nervous system along with tendon properties. There is no doubt that the authors are aware of these influencing factors, however, simplification can lead to these misunderstandings; while at the same time, simplification is sometimes required and consequently the term "*muscle strength*" is used frequently in the context of sports, exercise and health. Similarly, the authors use the term "*ballistic contraction*" which has been defined as "the flight of an object through space", although in sport science it is a description of the contraction's (ballistic) intent (e.g., Behm and Sale 1993) and is not associated with a sport-specific International System of Units (SI). Accordingly, we aim to provide additional context regarding the use of the adjective or term "*explosive*" in describing neuromuscular performance and training that will shed further light on the possible misconception brought forward by Ide and colleagues (2023). Here, we provide additional arguments that support

the use in the context of strength and conditioning.

The authors base their reasoning for not using the term "*explosive*" on its lack of being a recognized term of the SI. However, the term "*explosive strength training*" was introduced to the scientific literature by Häkkinen and colleagues in 1985, describing "maximal effort in order to improve strength and especially fast force production" (p. 588). As an extension, in our understanding, the term "*explosive strength*" simply refers to the intention to increase force or torque as fast as possible or with the fastest anticipated movement or contraction velocity during a rapid voluntary action and was never intended to represent a measurable quantity (necessitating SI unit usage). This perception is akin to usage of "*maximal strength*" as a descriptor for maximum force production, where force is a metric defined by a SI unit and "*maximal*" is considered a descriptor. Ide and colleagues (2023) suggested using "*high-velocity and high-load*" as an alternative, but that does not transfer the information to the practitioner that the intention is really to lift as fast as possible, regardless of the amount of external load. Accordingly, "*explosive*" refers to the intention to contract a muscle explosively, irrespective of the load under investigation (Dinn and Behm 2007) and is also needed to contextualize SI units as testing outcomes. Along these lines, the term "*explosive*" should also not be confused with the term "*power*", which simply refers to the physics equation force multiplied by velocity but does not imply the fastest anticipated movement velocity per se. Thus, "*explosive force*" and "*explosive strength*" represent a distinct descriptive domain of neuromuscular performance/adaptation, but should not be a replacement nor synonym for metrics based on Newtonian law.

Ide and colleagues (2023) further state that "the use of these superfluous terms may cause confusion and misunderstanding as readers may believe that these constructs represent different parameters beyond those which were measured". On the contrary, in our view the purpose of the term serves to bring clarity to practitioners and scientists, not confusion, in that they understand that performance of the action is/was intended to be as fast as possible. In this regard, it is important to remember that there are numerous different approaches and protocols to derive neuromuscular performance indicators such as "*maximal strength*", that may be assessed by incremental one-repetition maximal tests (1RM) expressed in kg as well as an isometric maximal voluntary contraction (MVC) expressed in N or isokinetic testing expressed in Nm. The same is also true for indicators of "*muscle hypertrophy*", which may be considered a descriptive umbrella term for muscle cross-sectional area (measured in cm^2), muscle volume (measured in m^3) or lean mass (measured in kg). In a similar manner, also "*explosive strength*" may be considered a neuromuscular domain that may be quantified through various metrics like rate of force development (RFD, measured in $Nm \cdot s^{-1}$) and jumping height or its derivates as the authors mention themselves. Despite being expressed in different SI units, these measures reflect very similar underlying physiological capacities but not all MVCs are performed with a maximal intended contraction velocity. Thus, by using categories such as "*explosive strength*" we not only highlight the intended execution of the task but also emphasize the distinct characteristics and physiological mechanisms of "*explosive*" muscle contractions (Balshaw et al. 2016, Del Vecchio et al. 2019). Thus, instructing to contract muscles explosively provides the intention to act in a manner that yields neuromuscular adaptations specific to fast execution of the movement and could, therefore, be referred to as "*explosive strength training*". Instead of causing confusion, it is our understanding that this allows for much better comparisons but also contrasts between different aspects of neuromuscular function that contribute to overall performance. Furthermore, we think the term "*explosive*" captures nuances in neuromuscular performance that other descriptors may not fully convey, thereby distinguishing them from other efforts, such as slow RFD.

In summary, "*explosive*" is not a metric and should not be confused for an SI unit but rather reflects a descriptive category used to characterize a certain type of neuromuscular performance. This distinction is important because Ide and colleagues' (2023) title implies that the term "*explosive*" is being misused as a specific metric within the context of neuromuscular performance assessment. Thus, while we acknowledge the importance of and encourage discussions evolving around terminologies, we are of the opinion that the term "*explosive strength*" and "*explosive strength training*" are justified and should be used, appropriately, in the context of sport and exercise science.

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