

Accepted Manuscript

Why are muscles strong and why do they require little energy in eccentric action?

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PII: S2095-2546(18)30046-2
DOI: [10.1016/j.jshs.2018.05.005](https://doi.org/10.1016/j.jshs.2018.05.005)
Reference: JSHS 459



To appear in: *Journal of Sport and Health Science*

Received date: 29 December 2017
Revised date: 22 January 2018
Accepted date: 24 March 2018

Please cite this article as: Walter Herzog , Why are muscles strong and why do they require little energy in eccentric action?, *Journal of Sport and Health Science* (2018), doi: [10.1016/j.jshs.2018.05.005](https://doi.org/10.1016/j.jshs.2018.05.005)

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Note: This is an invited special issue article.

Review

Why are muscles strong and why do they require little energy in eccentric action?

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Running title: Why are eccentric muscles strong?

Highlights:

- Muscles are stronger in eccentric than isometric and concentric contractions.
- Following eccentric action, muscle force is increased, a phenomenon referred to as residual force enhancement (RFE)
- RFE remains unexplained but is associated with an increase in passive force originating from structural proteins in sarcomeres.
- We identified titin as one of the structural proteins whose force is increased in eccentric muscle action compared to passive muscle stretching.
- We propose a new model of muscle contraction that explains the increased force in eccentric muscle action, the decreased metabolic energy, and the residual force enhancement.

Received 29 December 2017; revised 22 January 2018; accepted 24 March 2018

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