

*The science behind the X-Force
machines and the 3-1-5 concepts*



3-1-5



Negative training made easy

The science behind the X-Force machines and the 3-1-5 concepts

The following paragraphs outlines the scientific studies that are the foundation that inspired the development of the X-Force machines and the 3-1-5 concept.

A statement below outlined in bold letters is followed by a presentation of key research supporting the claim.

The concepts of machine resistance training and the concept of progressive training

The real founder of these principles was Arthur Jones (Founder of Nautilus) more reading on his theories; The Arthur Jones Collection; Athletic Journal articles, page 299-305

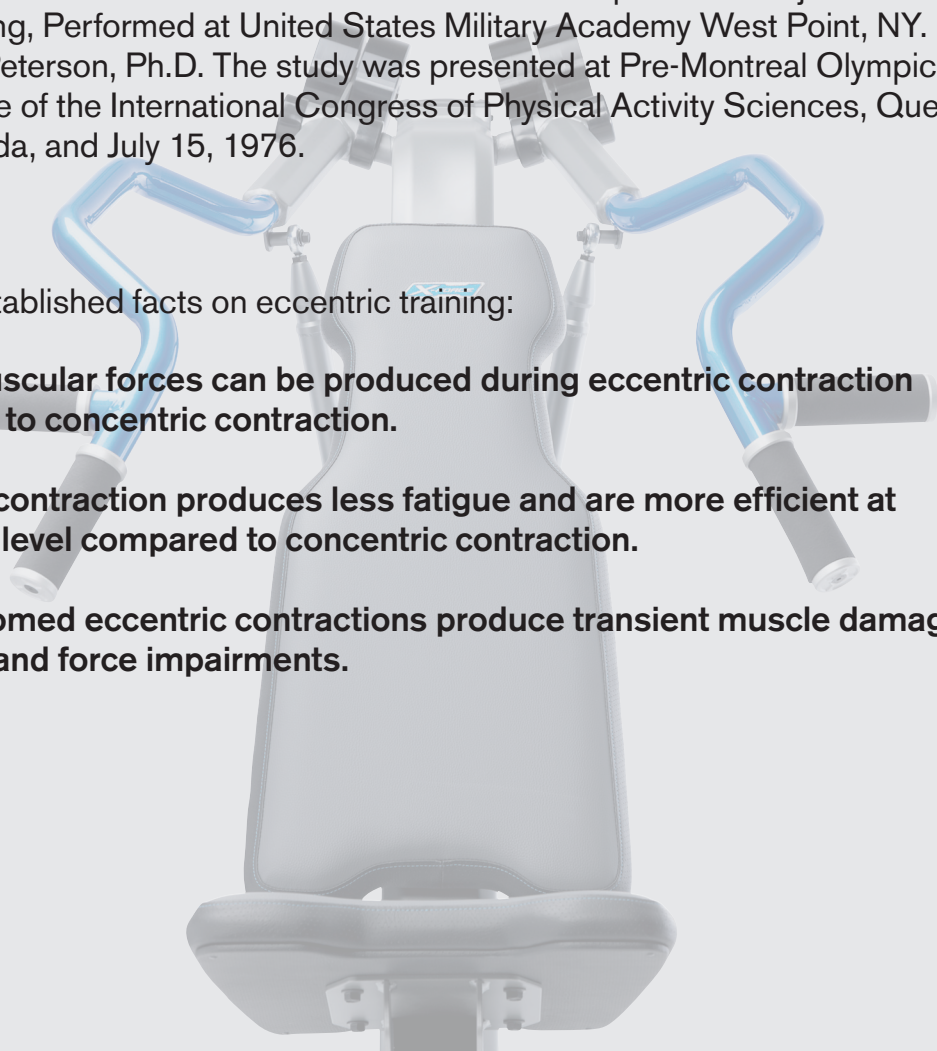
The background of his research can be found in excerpts from: Project Total Conditioning, Performed at United States Military Academy West Point, NY. James A. Peterson, Ph.D. The study was presented at Pre-Montreal Olympic Conference of the International Congress of Physical Activity Sciences, Quebec City, Canada, and July 15, 1976.

Already established facts on eccentric training:

Higher muscular forces can be produced during eccentric contraction compared to concentric contraction.

Eccentric contraction produces less fatigue and are more efficient at metabolic level compared to concentric contraction.

Unaccustomed eccentric contractions produce transient muscle damage, soreness and force impairments.



This is textbook knowledge and can be obtained by reading for example:

Physiology of sports and exercise (1)

ACSM; Position stand on progression models in resistance training for healthy adults (2)

The interested should also look at the NSCA's Performance Training Journal: (3)
Where on-going strength training research can be found

Eccentric training is more effective to increase total and eccentric strength than Concentric training.

Eccentric training appears to be more effective to increase muscle mass than concentric training.

The superiority of eccentric training to produce adaptations in strength and muscle mass is possibly mediated by the higher forces developed during this type of exercise.

Adaptations after eccentric training are highly specific to the velocity and type of contraction.

The claims above was first supported by the research of Colliander & Tesch (4), Hillard - Robertsson (5), Gur et al (6), Bird et al (7). And is then further supported by the eloquent meta-analysis by Marc Roigh et al. (8), David Garcia-Lopez has republished another review of the pertinent eccentric training literature (9)

Higher eccentric loading than concentric is more effective

Supported by the meta-analysis by Marc Roigh et al. (8)

An eccentric loading time of 4-5 seconds safely gives maximal training intensity
This time span is supported by studies in the review David Garcia-Lopez (9)

Greater increases in strength

Alone or in combination with concentric training eccentric training will increase the muscular growth response, Hortobagyi (10), Farthing (11)

Eccentric works for women as well

Already proven for conventional resistance training Tesch et al (12) proved eccentric equally effective for women

Strength training is important and effective for seniors

Lexell et al (13,14) has proven the great benefits of resistance training for elderly

Strength training is important and effective for the youth

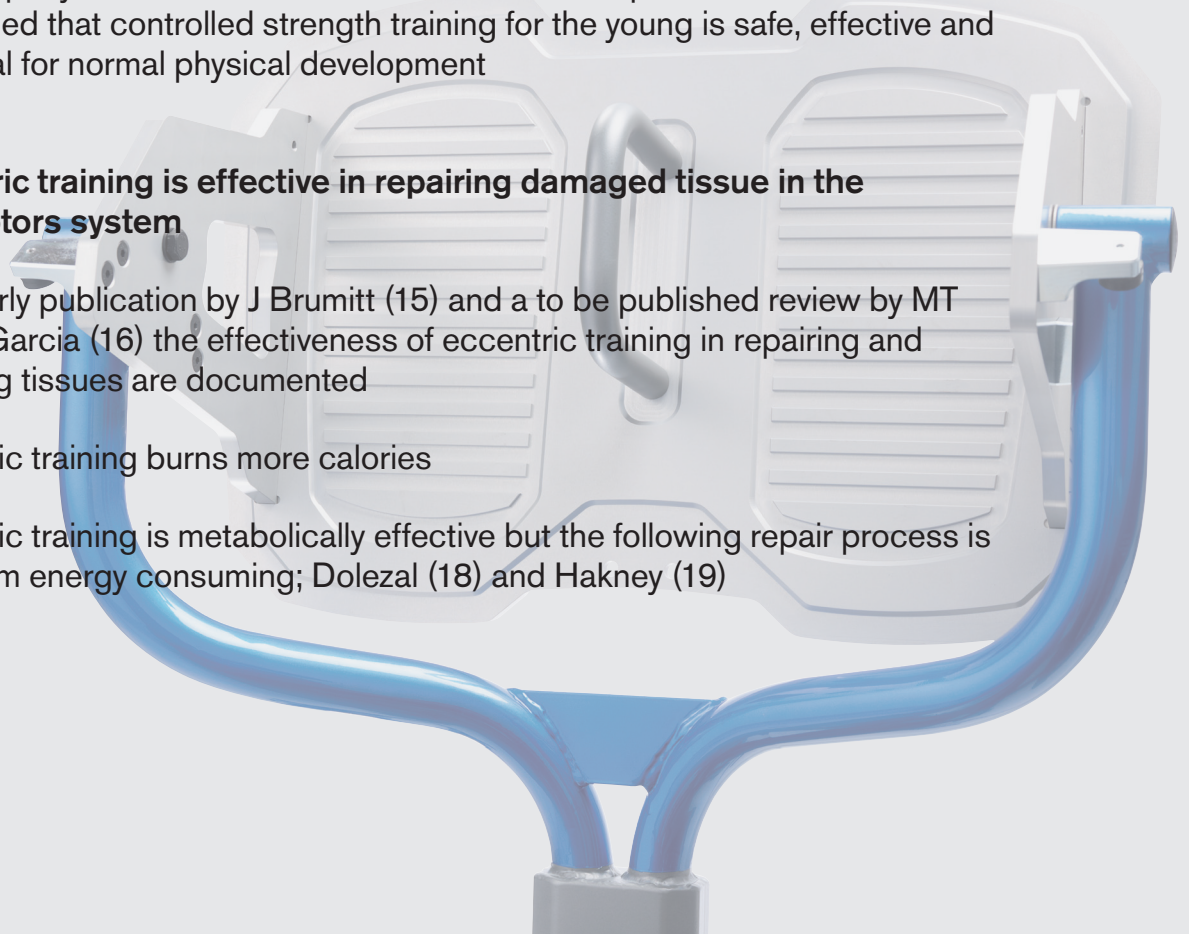
In a review of current peer reviewed studies on youth and strength training done by Michail Tonkonogi of the Swedish Medical Society of Sports Medicine (15) (Not properly defined in the reference list due to its publication in Swedish) it is concluded that controlled strength training for the young is safe, effective and essential for normal physical development

Eccentric training is effective in repairing damaged tissue in the locomotor system

In an early publication by J Brumitt (15) and a to be published review by MT Florez-Garcia (16) the effectiveness of eccentric training in repairing and restoring tissues are documented

Eccentric training burns more calories

Eccentric training is metabolically effective but the following repair process is long term energy consuming; Dolezal (18) and Hakney (19)



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- (4) Colliander EB and Tesch PA (1990) Effects of eccentric and concentric muscle actions in resistance training. Acta Physiol Scand, 140 (1): 31-9.
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- (10) Hortobagyi T, Barrier J, Beard D, Braspennincx J, Koens P, Devita P, Dempsey L and Lambert J (1996) greater initial adaptation to submaximal muscle lengthening than maximal shortening. JAppl Physiol. 81(4): 1677-82.
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- (15) Tidskriften Svensk Idrottsmedicin om ungdomar och styrketräning 4/09.
- (16) Jason Brumitt; Eccentric Training to Reduce Hamstring Injuries in Sprinters *NSCA's Performance Training Journal* 6(3) 8-11
- (17) Mt Florez-Garcia, C Eschavarri Perez, M Pavon de Paz, Review: exercise programmes with tendinopaties, *Rehabilitacion (Mad)* 2003; 37(6) 354-62
- (18) BA Dolezal, JA Potteiger, DJ Jakobsen, SH Benedict. Muscle damage and resting metabolic rate after acute resistance exercise with an eccentric overload. *Med Sci Sports Exerc*, 2000 jul; 32(7); 1202-7,
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N.B. The intention of the X-Force research group is to further elaborate on this reference list.

