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Importance of Eccentric Training in Corrective Exercise Continuum: Hints for Corrective Exercise Specialists

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Dear Dr. Tartibian

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Please find enclosed my manuscript, "Importance of Eccentric Training in Corrective Exercise Continuum: Hints for Corrective Exercise Specialists" by Hashem Piri, which we would like to submit for publication as a letter to the editor in the journal of New Approaches in Sport Sciences.

Eccentric training (ET) is used for performance enhancement, injury prevention, and rehabilitation, but the importance of ET in corrective exercise and correction of postural abnormalities is not clear, thus this study purpose was to identify the position and importance of ET in corrective exercise. Eccentric muscle activations include active elongation of musculature against an external resistance (Suchomel et al., 2019). ET increases strength (Kaminski, Wabbersen, Murphy, 1998; Roig et al., 2009), cross-sectional area (Schoenfeld, Ogborn, Vigotsky, Franchi, Krieger, 2017) and power (Elmer, Hahn, McAllister, Leong, Martin, 2012) of the muscles. ET improves the flexibility of muscle, too (Nelson & Bandy, 2004; O'Sullivan, McAuliffe, DeBurca, 2012; Ruslan, Norman, Muhamad, Madzlan, 2014). National Academy of Sports Medicine (NASM) described four phases in corrective exercise continuum (CEC) including: inhibit, lengthen, activate and integrate (Clark & Lucett, 2010). In the second phase of this continuum it has been mentioned that stretching training can be used in order to increase muscle length in shortened muscles (Clark & Lucett, 2010). However, in previous studies it has been reported that ET can increase muscle length. This action accomplished by sarcomerogenesis that associated with ET (O'Sullivan et al., 2012; Brughelli & Cronin, 2007). By sarcomerogenesis and increment in muscle

length, maybe stretching exercise is not a necessity anymore. It has been shown that ET has an equal (Nelson & Bandy, 2004; Ferreira et al., 2007), or more (Aijaz, Hameed, Quddus, 2011; Jang, Kim, Jang, 2014; Nelson, 2006) capacity to increase flexibility compared to stretching exercise.
In third phase of CEC, strengthening training has been prescribed to improve the strength of weak muscles. Previous studies have shown that ET is more effective at increasing muscle strength and hypertrophy in comparison to concentric training (Kaminski et al., 1998; Roig et al., 2009; Schoenfeld et al., 2017). In order to increase muscle strength and volume in weak muscles, ET can be used in the third phase of CEC. In the fourth phase of CEC the main aim is integration, for this purpose integrated dynamic movements have been prescribed, and because of the complexity of these movements, muscles have eccentric activity in the negative phase of movements.

It is obvious that prescribing ET in the second phase of CEC, namely, lengthening of shortened muscles, is a better strategy compared to stretching exercise, because in ET there is an improvement in muscle strength, in addition to increment in flexibility. In the third phase of CEC for enhancement in muscle mass and strength, ET is preferable to concentric training. The need for ET in the fourth phase of CEC is easily comprehensible.

Sincerely,

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