MYOFASCIAL CHAINS REVISITED: A REVIEW OF SEVERAL SUGGESTED FORCE TRANSMISSION LINES FROM AN EVIDENCE-ORIENTED PERSPECTIVE WITH SPECIAL FOCUS ON LOW BACK STABILITY

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Fascia has traditionally been classified as a passive tissue with limited relevance for the movement system. However, previous research has challenged this assumption. The connective tissue surrounding the skeletal muscles has contractile features (Schleip et al. 2005) and can modify both its water content and its stiffness in response to mechanical stimuli (Schleip et al. 2012).

The impact of altered connective tissue stiffness might not be limited to its localization. Theoretical concepts of myokinetic chains (e.g., Myers 1997) suggest that fascia, in contrast to assumptions conveyed in text books, does not separate, but connect the skeletal muscles forming a body-wide tensional network of myofascial continuity. According to a systematic review (Wilke et al. 2016a), there is good evidence for the existence of at least three proposed myofascial chains (superficial back line, front functional line, back functional line). It might be assumed that strain transmitted across these chains influences the mechanical properties of neighbouring body regions thus explaining remote effects of exercise. Indeed, a mechanical force transmission between the components of the verified muscle-fascia lines has been observed in cadaveric and experimental studies (Krause et al. 2016).

In recent years, efforts have been made to translate basic research findings to in vivo settings. Two myofascial chains, the superficial back line and the back functional line, hold the potential to affect the stability of the low back and lumbopelvic area. For the superficial back line, being composed of the plantar aponeurosis, the M. gastrocnemius, the hamstring muscles, the sacrotuberal ligament and the thorcaolumbar fascia resp. the M. erector spinae (Myers 1997), a couple of studies report non-local effects of therapeutic interventions based on the myokinetic chain. Grieve et al. (2015) demonstrated the effectivity of a self-massage treatment of the plantar foot to increase sit and reach mobility, a measure of hamstring extensibility. Similarly, stretching of the calf and the hamstrings enhances cervical spine mobility in the sagittal plane (Wilke et al. 2016b). Both findings might be indicative of a mechanical force transfer of the superficial back line, which is supported by work done by Montecinos-Cruz et al. (2015). They instructed their participants to tilt their pelvis in the anterior direction while sitting with the knees extended. Simultaneous ultrasound assessment of the M. gastrocnemius fascia demonstrated its displacement in cranial direction during pelvic motion.

The back functional line, which consists of the M. latissimus dorsi, the thoracolumbar fascia, the contralateral M. gluteus maximus and the M. vastus lateralis (Myers 1997) might also play a role in low back mechanics. By analogy with the superficial back line, stretching could cause a myofascial force transfer across its components as, upon passive lengthening of the latissimus muscle, both an altered hip position and an altered mechanical stiffness of hip muscles have been detected (Carvhalais et al. 2013).

Despite the available data pointing towards a possible role of myofascial force transmission in low back stability, there is a lack of trials examining concrete tailored interventions in patients with pain conditions. As a consequence of this, no evidence-based recommendations can be made. In some cases (Marshall et al. 2009), low back pain patients display stiff hamstrings (a part of the superficial back line). Remote exercise interventions such as stretching the calf or the hamstrings themselves might consequently be a method to alleviate pain, but, as indicated, evidence for this is anecdotal. In view of this, future research should evaluate treatment approaches based on myofascial chains and its potential to affect low back health. Another focus should be dedicated to further elucidating the substrate of remote exercise effects. Following stretching of the calf and the hamstrings, cervical range of motion increases not only in the sagittal plane but also in the frontal and transversal plane (Wilke et al. 2016c) which questions the concept of a direction-specific force transfer across myofascial chains. Moreover, besides the connective tissue, also peripheral nerves cross multiple joints and thus have been suggested to represent a potential mechanical force transmitter (Andrade et al. 2016).

Finally, it has to be considered that non-local exercise effects might not be a result of strain transmission. Instead, a cortical response could cause the observed manifestations as a plethora of studies has reported remote effects that cannot be attributed to a mechanical force transfer. For instance, in contract-relax stretching, it does not matter if the target muscle or an uninvolved muscle is contracted prior to stretching (Azevedo et al. 2011), and foam rolling decreases mechanical pain threshold in both legs (Aboordarda et al. 2015).

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