

Backward walking effects on activation pattern of leg muscles in young females with patellofemoral pain syndrome

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Abstract

Background/Aims: Little is known regarding the activation of knee and hip muscles during backward walking in patellofemoral pain syndrome. This study examined the effects of backward walking and forward walking on the activation of knee extensors, hip abductors, and adductors in patients with patellofemoral pain syndrome.

Methods: A total of 20 females with patellofemoral pain syndrome and 20 age-matched typically healthy female controls participated in this study. Surface electromyography from vastus medialis obliquus, vastus lateralis, gluteus medius, and adductor longus muscles were collected during forward walking and backward walking.

Findings: The patellofemoral pain syndrome group had a significantly higher normalised root mean square of the vastus medialis obliquus, vastus lateralis and gluteus medius muscles ($P=0.001$), without significant difference in adductor longus muscle activity during backward walking versus forward walking ($P=0.098$). During forward walking, the patellofemoral pain syndrome group showed significantly higher activation of adductor longus muscle ($P=0.001$) and significantly lower activation of the gluteus medius muscle ($P=0.002$) compared to the healthy group. During backward walking there was a significant increase in the vastus medialis obliquus and adductor longus muscle activity of the patellofemoral pain syndrome group compared to the control group ($P=0.003, 0.001$) respectively.

Conclusions: Clinicians should consider backward walking training to increase the muscle strength of knee extensors and hip abductors when developing rehabilitation programmes for patients with patellofemoral pain syndrome.

Key words: ■ Backward walking ■ Female ■ Muscular activities ■ Patellofemoral pain syndrome

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Patellofemoral pain syndrome is characterised by an anterior or retropatellar pain during ascending or descending stairs, squatting and running (Wilson, 2007). Patellofemoral pain syndrome has a prevalence of 7–40% and is classified to be an overuse condition, which commonly affects highly active young people and females (Zhang et al, 2014). The risk for developing patellofemoral pain syndrome is gender-specific, with females being twice as likely to develop the condition compared to males (Boling et al, 2010). It could progress into chronic diseases such as chondromalacia patella or patellofemoral arthritis if proper treatment is not provided (Crossley, 2014).

Unfortunately, the specific aetiology of patellofemoral pain syndrome is not clearly understood

(Dutton et al, 2014), with multiple risk factors reported to be associated with the development of patellofemoral pain syndrome, such as weakness of the quadriceps muscle, mal-tracking of the patella, soft tissue stiffness, and increasing the Q-angle (the angle of the knee from a frontal view) (Bolgla and Boling, 2011). Patients with patellofemoral pain syndrome have lower electromyography activity of vastus medialis obliquus to vastus lateralis ratio in comparison with typically healthy individuals. This muscular imbalance makes the vastus medialis obliquus cannot antagonise the vastus lateralis muscle that results in excessive lateral patellar tracking which causes articular surface erosion and induces pain (Powers, 2000). Additionally, recent evidence shows that proximal factors in the form of abnormal hip kinematics and hip muscle dysfunction,

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