

ELECTROMYOGRAPHY ANALYSIS OF RECTUS FEMORIS AND BICEPS FEMORAL MUSCLES ACTIVATION IN ADULTS WITH ACHONDROPLASIA

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INTRODUCTION

Achondroplasia (ACH) is one of the most prevalent skeletal dysplasias, a rare bone condition, occurring in 1:25 000 births [1]. People with ACH have a large head and disproportionate short stature with shortening of the upper and lower limbs [2]. Final adult height is of 127 cm (men) and 119 cm (women)[, 6.0 standard deviation score below average population [3]. Anatomic features lead to postural changes frequently aggravated by obesity [5]. Muscle activity patterns have yet not been described in this population.

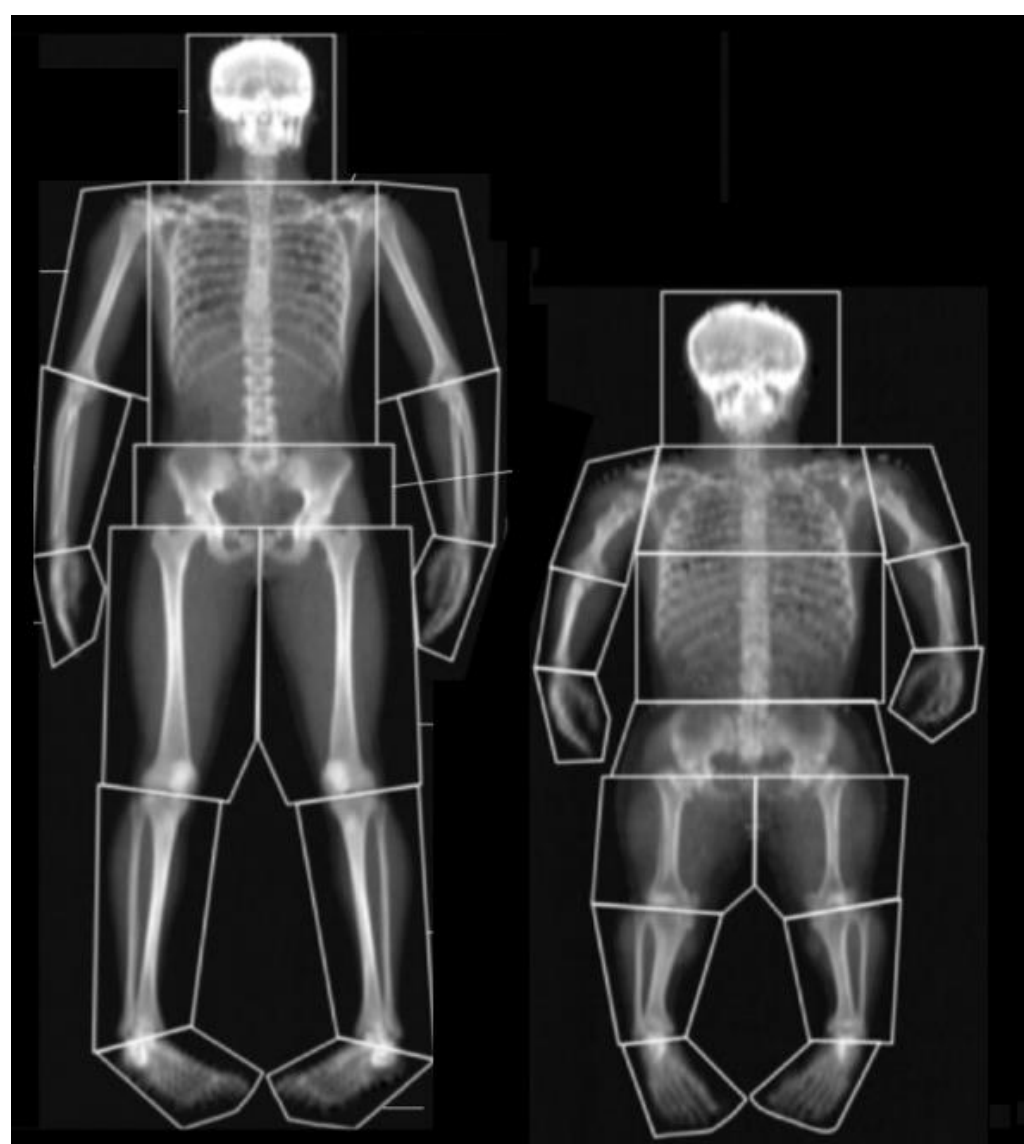


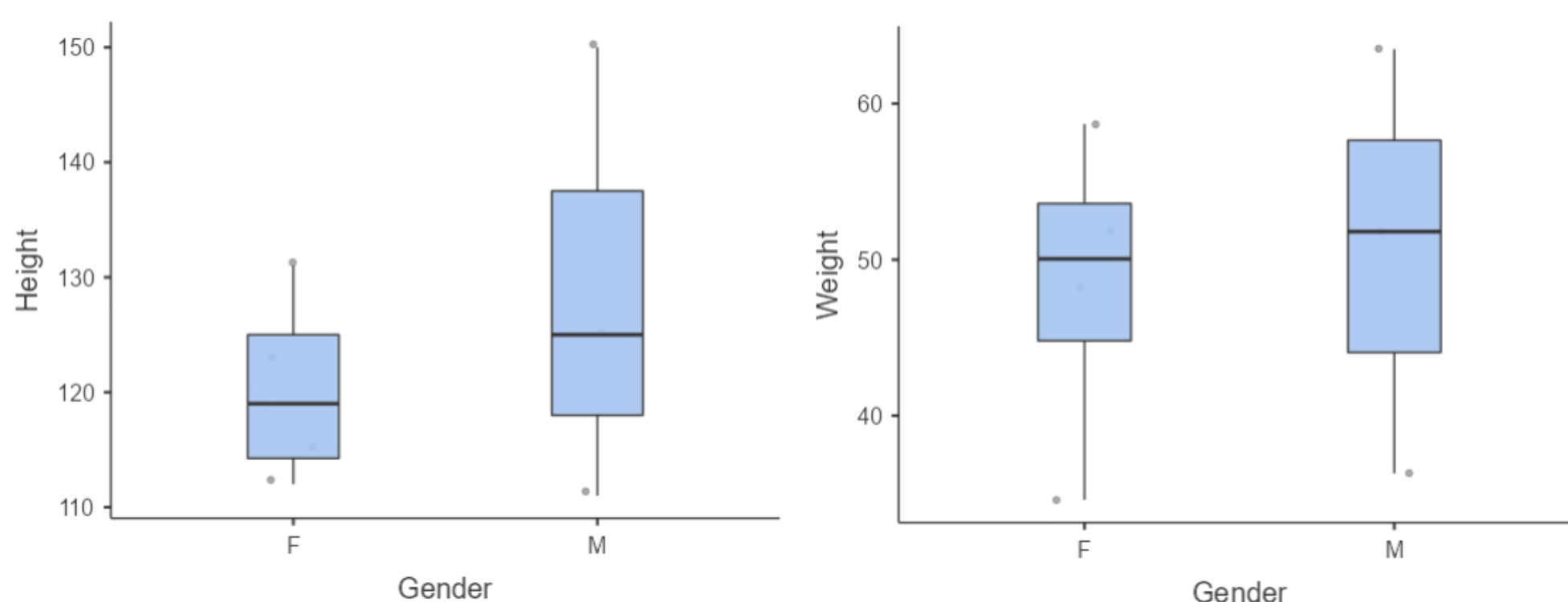
Figure 1. Men with average height (left) and with achondroplasia (right) [6]

METHODOLOGY

Table 1. Participants characteristics (N=7), mean and standard deviation (SDS)

Gender	Age, years	Weight, kg	Height, cm
Women (n = 4)	35.50 (±13.77)	48.35 (±10.14)	120.25 (±8.54)
Men (n = 4)	39.67 (±15.12)	50.53 (±13.64)	128.67 (±19.76)

Graph 1. Participants height and weight, mean and standard deviation (SDS)



Surface electromyography (sEMG) activity of Rectus femoris (RF) and Biceps femoral (BF) was collected with PLUS® EMG at 1000 Hz. sEMG data normalization was performed through four maximum voluntary contractions (MVC) tests applying manual resistance by a trained researcher using SENIAM recommendations. EMG data was normalized to the maximum values applying a 60 milliseconds frame to analyse the MVC muscles amplitude peak. Eight squat cycles of each participant were analysed through a MatLab® routine. EMG data was smoothed with a cut-off frequency of 13 Hz, order 7.

AIM

Analyse muscle activity of Rectus femoris and Biceps femoral using surface electromyography in adults with achondroplasia during squat movement



Figure 2. Man and women with ACH performing a squat movement

RESULTS

Squats increase lower limb muscle strength and coactivation, improving knee stability promoting functional muscle mobilization patterns [8].

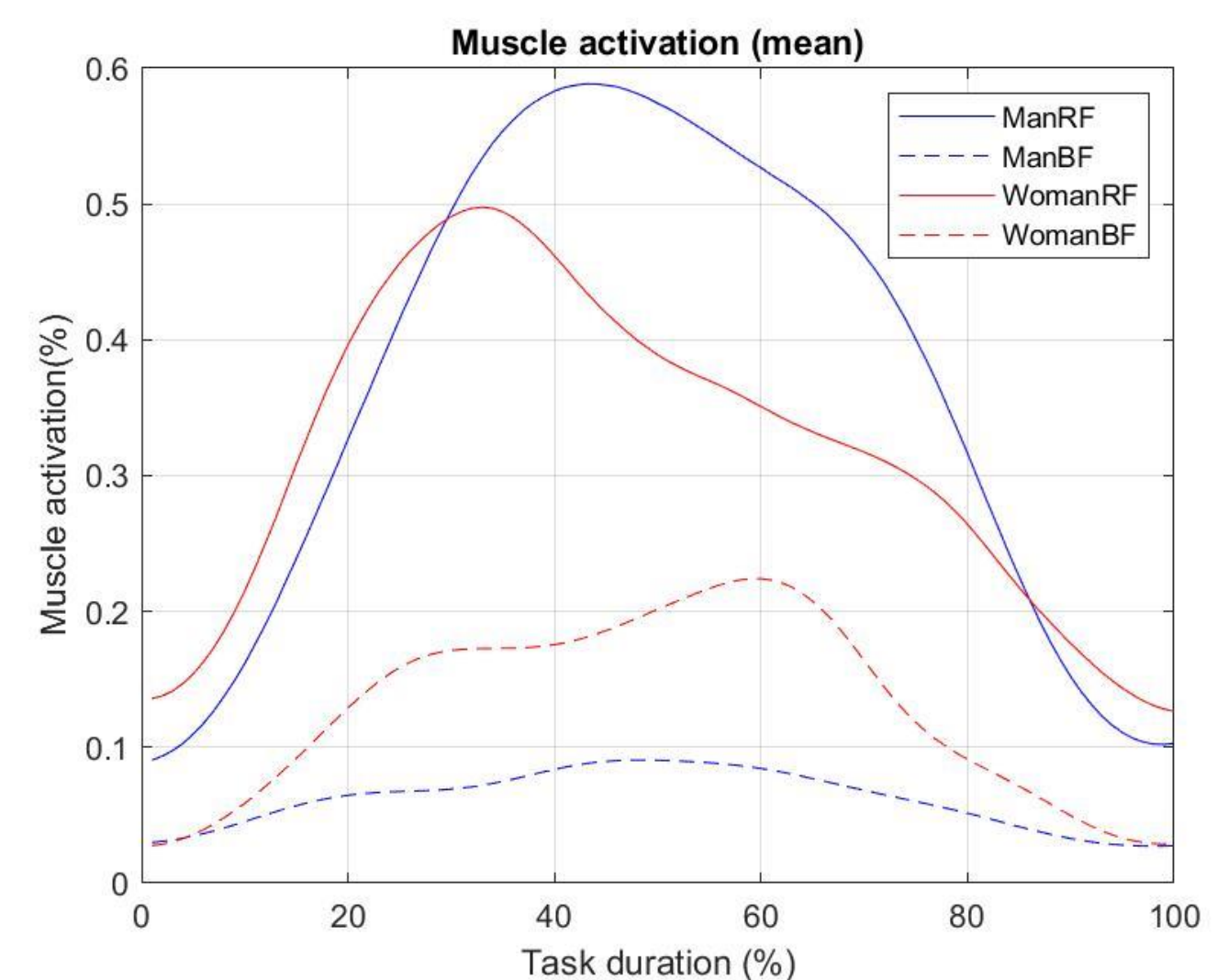


Figure 3. Mean (±SD) normalized EMG rectus femoris (RF), biceps femoral (BF) during squat movement

Women presented lower RF activation but higher activation on BF, the men shown lower BF activation. (figure 2). The lower activation of BF in men is possibly related to insufficient stimulus from the squat for knee flexor muscles. The higher RF activation in men is aligned with previous findings in athletic men with ACH that shown higher RF coactivation in knee extension comparing to AP [9].

CONCLUSIONS

Muscle size is a predetermining factor for strength. With shorter stature, muscles in adults with ACH are more compacted which may interfere in muscle activation. Also, these preliminary findings show a tendency of different knee muscle activation pattern in women and men with ACH.

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