REGION SPECIFIC PATELLA TENDON CSA IN YOUNG AND OLD
Couppé Christian, Kongsgaard Mads, Justesen Ll, Hansen Phillip, Bojesen-Moller Jens, Kjaer Michael, Magnusson S.Peter, Suetta Charlotte
(Institute of Sports Medicine, Bispebjerg Hospital, Denmark)

Introduction
The tendon transmits force from the muscle to the bone during locomotion. The average stress of the tendon for a given load at any location along the tendon is given by the cross-sectional area (CSA). A larger CSA will thus provide lower stress to the tendon. However, it remains largely unknown if old and young individuals differ in patella tendon CSA. The purpose of this study was therefore to examine the patella tendon CSA along its length (proximal, mid-portion and distal) in old compared to young individuals.

Methods
Eight old (66.1 ± 4.1 yrs, 82 ± 16.5 Kg BW) and 8 young men (23.1 ± yrs, 76 ± 11.4Kg BW) were included. All individuals were healthy, moderately physically active (1-6 hrs physical activity/wk) with no history of patella tendon soreness or diagnosed Jumpers knee. Axial plane images of the patella tendon were obtained by MRI (General Electric Sigma Horizon LX, 1.5 T, T1-weighted spin-echo, repetition time – to-echo ratio, 400: 14; FOV, 20; matrix, 256 x 256; slice thickness 5 mm, 0 mm spacing. The images were obtained with the subject lying supine. The mean of 3 measurements at each site, proximal, mid-portion and distal were calculated and reported as mm2 and mm2/ Kg BW (mean ± SD) respectively. Friedmans test including Dunns Multiple Comparisons test and Mann Whitney U test was used for statistically analysis on paired and un-paired data respectively. An alpha level of p < 0.05 was accepted as significant.

Results
There was a significant effect of tendon level for both absolute and BW adjusted CSA in young and older persons, P<0.001. The distal CSA was significantly larger than the proximal tendon part in older (133±24 vs. 82±16 mm2, P< 0.001) and young persons (133±14 vs. 76±11 mm2, P< 0.01). The distal CSA was also significantly larger than the mid-portion in young (85±17 mm2, P<0.05), but not in older persons (93.8±16 mm2). Weight adjusted distal CSA was also significantly larger than the proximal measurements in older (2.02±0.82 vs. 1.39±0.2 mm2/kg, P<0.01) and young (2.52±0.28 vs 1.45±0.3 mm2/kg, P<0.001). Moreover, the distal CSA was significantly larger than the mid-portion in young (1.62±0.32 mm2/kg, P<0.05), but not in old (1.60±0.2 mm2/kg). There were no differences between older and young.

Discussion
The present study demonstrates that the CSA of the distal part of the patellar tendon is larger in both old and young males compared to the proximal part. This finding indicates that for a given load the average stress is 45 – 73% greater in the proximal region of the tendon compared to the distal region during locomotion. However, it still remains unknown if this greater region specific stress is related to the injuries sustained in this region, since patella tendinopathy is far more prevalent at the proximal region compared to the mid-portion and distal tendon regions. Interestingly, a recent study by (Kongsgaard et al.2006) have shown increased patella tendon CSA at both the proximal and distal region induced by twelve weeks of resistance training, which theoretically reduces tendon stress for a given load, which may reduce the risk of overuse tendon injuries.

Keywords: Tendon, Adaptation, Knee

12th Annual Congress of the ECSS, 11–14 July 2007, Jyväskylä, Finland