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The combined effects of age and athletic status on muscle function and structure in master track cyclists

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Ageing is associated with a decline in physical capacity. The effects of an increasingly sedentary lifestyle on physical performance in later life are often overlooked. Masters athletes maintain high levels of physical activity into old age, mitigating the effects of sedentary lifestyles. The aim of this study was to determine the age-related changes in muscle structure and function in elite Master Cyclists and age-matched non-athletes. Male Masters Cycling athletes were tested at the 2019 UCI Track Cycling World Masters Championships and recreationally active controls were recruited from the general population. Groups were stratified by age and athlete status: 26 *middle-age athletes* (mean age:50.2±6.7years, body mass:85.5±11.7kg), 33 *older athletes* (mean age:69.8±5.7years, body mass:77.2±10.6kg), 11 *middle-age controls* (mean age:46.8±7.6years, body mass:83.1±17.9kg) and 23 *older controls* (mean age:69.7±6.8years, body mass:72.4± 12.6kg), (mean±s). Receiving ethical approved from the Institutional Ethics Committee at Manchester Metropolitan University vastus lateralis (VL) muscle thickness, pennation angle, and fascicle length were measured using real-time B-mode Ultrasonography. Maximum relative power ($W \cdot kg^{-1}$), maximum relative force ($N \cdot kg^{-1}$), take-off velocity ($m \cdot s^{-1}$), maximum velocity ($m \cdot s^{-1}$), force efficiency and maximum counter movement jump height (m), were measured using jump mechanography. The data from the 'older' groups (athletes and controls) were expressed as a percentage of their respective mean 'middle-age' group values. Comparisons using t-tests and Mann-Whitney U tests were made between the percentage difference between middle-age and older athletes, and the percentage difference between middle-age and older controls. Regression models assessed relationships between force and muscle measurements across age, and athletic status. Controls showed a greater percentage decline with age in maximum relative power ($P < 0.001$), maximum velocity ($P < 0.001$), force efficiency ($P < 0.001$) and jump height ($P < 0.001$) compared to athletes. However, athletes showed a significantly greater percentage decline with age in maximum relative force ($P < 0.001$) in comparison to controls. Maximum relative power and maximum take-off velocity correlated with VL muscle thickness in older athletes (R^2_{adj}=0.13-0.33, P =0.001 - 0.031). Master cyclists maintained a greater percentage of power, velocity, force efficiency and jump height capabilities when compared to controls. As maximum relative force values showed a greater decline in athletes, the maintenance relative power was likely due to maintenance of muscle shortening velocity. This suggests chronic exercise training can prevent or attenuate the age-related slowing of skeletal muscle and attenuate loss of power in old age. Muscle thickness was a key determinant of muscle function for older athletes.