Bone and Muscle Health is Associated with Physical Activity and Neuromuscular Performance in Older Men

Benjamin K. Weeks, Steven L. Watson, Belinda R. Beck, FACSM, Sean A. Horan. *Griffith Health Institute, Griffith University, Gold Coast, Australia.*
(No relationships reported)

Physical activity exerts a powerful influence on our musculoskeletal health as we age. In fact, some conditions such as osteoporosis and sarcopenia, which are strongly age-related, may be prevented with adequate physical activity participation.

PURPOSE: Our aim was to quantify recent and lifetime physical activity participation to determine their relationship with musculoskeletal health and neuromuscular performance in older men.

METHODS: Thirty-six healthy older men (69.5 ± 5.8 yrs) volunteered to participate. Past and current physical activity participation was estimated with the Bone-specific Physical Activity Questionnaire (BPAQ) and International Physical Activity Questionnaire, respectively. Neuromuscular performance was determined by calculating impulse from ground reaction forces during a maximal vertical jump. Lean mass, fat mass and regional bone mineral density (BMD) measures were obtained using dual-energy x-ray absorptiometry. Osteoporosis was classified according to BMD T-scores, while sarcopenia was identified by relative appendicular lean mass.

RESULTS: Participants in the upper tertile for relative impulse exhibited less fat than those in the bottom tertile (29.9 ± 8.3 vs. 20.6 ± 9.3 kg, $p = 0.04$). Based on absolute impulse, the bottom tertile exhibited lower appendicular lean mass than the middle (26.0 ± 2.0 vs. 29.3 ± 1.5 kg, $p = 0.001$) and upper tertiles (26.0 ± 2.0 vs. 29.6 ± 2.9 kg, $p = 0.001$). Participants who engaged in vigorous physical activity produced larger impulse than those not engaged in vigorous activity (193.5 ± 19.1 vs. 172.2 ± 24.7 Ns, $p = 0.04$). Osteoporotic participants ($n = 10$) had lower childhood BPAQ scores than non-osteoporotic participants (16.1 ± 19.1 vs. 35.5 ± 24.4 , $p = 0.03$). Sarcopenic participants ($n = 7$) produced lower impulse during the maximal vertical jump than non-sarcopenic participants (183.2 ± 21.3 vs. 156.7 ± 33.1 Ns, $p = 0.01$).

CONCLUSIONS: Superior neuromuscular performance was associated with low fat mass, high lean mass and participation in vigorous physical activity. Further, childhood bone-relevant physical activity could differentiate men with and without osteoporosis. Our results highlight the importance of physical activity during development and aging for lifelong musculoskeletal health and function.