RUNNING INTO MIDDLE-AGE: A COMPARITIVE STUDY

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Studies have shown that spinal range of motion (ROM) decreases through aging[1]. However, little is known about how this degradation effects spinal movements while running. It has also been reported that gait parameters change with age[2], but how this affects running is not as well known. The relationship between vertebral segment ROM (cervical, thoracic, lumbar and sacral) and age are also not known. Understanding normal ROM of spinal segments and ROM while running can be used to properly assign safe exercises for rehabilitation.

Purpose: Compare spinal ROM in the transverse plane while running at self-selected speeds as a percentage of total ROM between younger and middle-aged adults.

Methods: Two adult groups, *young adults* (YA: n = 20; 21-40yr; 33.2±4.8yr) and *middle-aged adults* (MA: n = 22; 41-65yr; 54.7±7.8yr), were involved (respectively: mass = 68.9±15.4kg, 69.5±12.0kg; height = 1.7±0.1m, 1.7±0.3m; moderate to vigorous physical activity = 7.0±3.4hr/wk, 9.0±10.0hr/wk). Placement of 59 reflective markers in a complete body anatomical model were captured (8-camera Vicon system, 120Hz) during participant running at self-selected speeds (respectively: running speed = 2.8±0.3m/s, 2.6±0.4m/s) and during maximal trunk ROM tasks in the transverse plane. Relative angles between adjacent spinal segments (upper [UP]: C7- T8; middle [MID]: T9-T12; lower [LOW]: L1-L5) and pelvis (PEL) were calculated; maximum angular displacements were averaged across 10 strides. ROM in running as a percentage of total available ROM from the rotation trials were compared between groups using MANCOVA ($p<0.05$; running speed = covariate) and 95% confidence intervals of mean difference (95% CI). Displacements in the 3 planes were compared between groups using MANOVA ($p<0.05$, 95% CI). Running speeds were compared between groups using an Independent t-test ($p<0.05$).

Results: There was no differences found for the transverse plane trunk angles during maximal rotation ROM test ($F(3,38) = 1.852$, $p = 0.154$, Power = 0.442) or while running ($F(3,37) = 2.182$, $p = 0.107$, Power = 0.510). Young Adults comparatively ran faster than Middle Aged Adults (2.779±0.259m/s, 2.565±0.385m/s, respectively, $p = 0.042$).

Conclusion: The results indicated no significant differences in spinal movement or complete trunk ROM between young and middle aged adults in the transverse plane. These results contradict existing literature that states decreasing vertebral ROM due to age in all three planes[3]. A possible explanation for these findings could be our participants were all active and healthy, which could prevent them from showing age related changes in ROM from degeneration of vertebral structures. Although not directly measured in this study, these structural changes may be seen in more sedentary populations, therefore resulting in the contradictory findings. Also, self-selected treadmill running speeds may not be suitable and maybe a maximal test is needed for showing possible changes due to age in the spine. The lack of difference in trunk movement and vertebral rotation could conclude that running at self-selected speeds is safe for those in the aging population. Research into an aging, but active, population to test the findings is warranted.

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[3]Van Herp G, Rowe P, Salter P, Paul J.P. Three-dimensional lumbar spinal kinematics: a study of range of movement in 100 healthy subjects aged 20 to 60+ years. *Rheumatology (Oxford).* 2000 Dec;39(12):1337-40.