THE EFFECT OF PROGRESSIVE RESISTANCE TRAINING ON BIOMECHANICS OF ARTHRITIC GAIT: A SINGLE-BLIND RANDOMIZED CONTROL TRIAL

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INTRODUCTION: Osteoarthritis (OA) is prevalent in elderly and is associated with muscle weakness. OA progression is related to biomechanical characteristics of gait such as knee adduction moment (KAM). Progressive resistance training (PRT) improves muscle strength in this population, but PRT effects on biomechanics of gait related to OA progression are unknown. We hypothesized that PRT would reduce KAM, mediated by improvements in the strength of all lower limb muscle groups.

METHOD: 40 women (age: 65±7; BMI: 32.5±7.3; total WOMAC score: 32.0±15.4) with OA in at least one knee according to the American College of Rheumatology criteria were randomized into a high intensity PRT or sham-exercise group. The PRT group trained (knee flexion/extension, leg press, ankle plantar flexion, hip abduction/adduction muscle groups) using digital K400 Keiser pneumatic resistance machines at 80% of maximum strength (1RM) progressing 3%/session, 3 times/week for six months. The sham group trained on the same equipment (without hip adduction) with minimal loads and no progression. Three-dimensional biomechanical gait data were collected during self-selected habitual speed at baseline and six-months and internal moments were calculated using inverse dynamics. Secondary outcomes included gait velocity, muscle strength and total WOMAC score. Group comparisons and interactions were explored using repeated measures ANOVA at $p<0.05$.

RESULTS: Gait velocity and total WOMAC score were significantly improved in both groups over time and the improvement in the strength of all lower limb muscle groups was significantly greater in PRT group compared to the sham group ($p< 0.001$). KAM was not significantly different over time or between groups (Table1), and was unrelated to changes in strength ($r=-0.046$, $p=0.785$).

Table1

	Sham (n=22)		PRT (n=18)		P	P (Time
Variables	Pre	Post	Pre	Post	(Time)	*Group)
Gait velocity (m/s)	1.11 ± 0.2	1.23 ± 0.18	1.14 ± 0.16	1.24 ± 0.15	0.001	0.392
Knee adduction m*	2.28 ± 1.15	2.35 ± 1.07	2.34 ± 1.45	2.63 ± 1.42	0.162	0.475
Total WOMAC	34.18±15.2	26.12±16.94	29.93±14.94	20.77±13.28	0.001	0.809

* %BW*H, Percentage Body Weight/Height; m, moment; WOMAC score, Western Ontario and McMaster Osteoarthritis index, lower score equals to less symptoms (range 0-96).

DISCUSSION/CONCLUSION:
Both high and low intensity resistance training increased gait velocity and WOMAC score but made no significant difference to KAM in this cohort. Only PRT improved strength, but muscle strength was unrelated to baseline or changes in KAM. Further investigation is required to establish links between the biomechanics of gait and incidence and severity of OA.