Acute Responses During FES-assisted Cycling in Spinal Cord Injured Individuals: 797: Board #4 9:00 AM - 11:00 AM

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(No relationships reported)

Spinal cord injury (SCI) and subsequent wheelchair confinement often leads to an enforced sedentary lifestyle resulting in physical deconditioning. Functional electrical stimulation (FES) - evoked leg exercise has the potential to improve cardiorespiratory fitness and provide other health benefits. However, the physiological responses during such exercise and the capacity for exercise conditioning differ from able-bodied individuals, and also may differ between voluntary upper-limb versus FES-evoked leg exercise.

PURPOSE: This study compared acute exercise responses during arm cranking, FES-assisted leg cycling and combined arm and leg ("hybrid") exercise modalities in SCI individuals.

METHODS: Seven individuals possessing long-standing neurological lesions from C7-T12 were recruited. All subjects performed arm crank ergometry (ACE), FES-leg cycle exercise (FES-LCE), combined ACE+FES-LCE and hybrid-FES cycling. They were assessed for their peak exercise responses in all four modalities. Subsequently, their submaximal HR, cardiac outputs (Q), stroke volumes (SV) and arterio-venous oxygen extractions (a-vO$_2$) were measured at 40%, 60% and 80% of their mode-specific VO$_2$peak.

RESULTS: Submaximal VO$_2$ during FES-LCE was significantly lower than all other exercise modalities, across the range of effort intensities (p<0.05). ACE elicited 44-48% higher VO$_2$, and the hybrid exercises produced 52-58% higher oxygen uptakes compared to FES-LCE. Steady-state FES-LCE also developed significantly lower Q, HR, and a-vO$_2$ (p<0.05). There were no other significant differences of exercise responses amongst ACE and hybrid exercise modes across all exercise intensities. Arm exercise alone elicited 26-28% higher Q, 19-31% greater HR and 24-35% wider a-vO$_2$ than did FES-leg exercise. Combined arm plus leg exercise elicited 24-33% greater Q, 22-33% higher HR and 34-42% wider a-vO$_2$ than FES-LCE.

CONCLUSIONS: Combined arm and leg ("hybrid") exercise can develop a higher oxygen uptake and greater cardiovascular demand compared to ACE or FES cycling alone. Whether these higher submaximal exercise responses in the 40%-80% VO$_2$peak training range can promote cardiorespiratory fitness to a greater degree than arms or legs only exercise is currently unresolved.