PHYSIOLOGY

**Category:**Physiology

**Session: 602 APS Adaptations to chronic exercise in health and disease Poster Session**

**(602.7) High-Resistance Inspiratory Muscle Strength Training-Associated Increases in Exercise Tolerance in Midlife/Older Adults are Related to Circulating Acylcarnitines**

Sunday, April 3, 2022

10:15 AM – 12:15 PM

Location: Exhibit/Poster Hall A-B - Pennsylvania Convention Center

**Poster Board Number:** E438

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**[Kaitlin Freeberg, MS](https://www.eventscribe.net/2022/EB2022/searchbyposterbucket.asp?f=PosterSessionName&pfp=postersessiontitle" \l "/Poster-info-1227204)**

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Background  
  
Age-related declines in cardiorespiratory fitness (CRF) and exercise tolerance are major independent risk factors for cardiovascular diseases and mortality in midlife/older adults (ML/O; ≥50 years). Aerobic exercise is a well-established strategy to improve CRF and exercise tolerance; however, adherence to time-intensive physical activity (PA) guidelines is poor. High-resistance inspiratory muscle strength training (IMST; 30 breaths/day against resistance, ~5 min/day) is a time-efficient, highly adherable form of physical training but the effects of high-resistance IMST on CRF and exercise tolerance in ML/O adults are unknown. We investigated if high-resistance IMST would increase CRF and exercise tolerance and, if so, whether the improvements would be related to changes in circulating metabolites.  
  
Methods  
  
Thirty-five ML/O adults performed 6 weeks of high-resistance IMST (75% maximal inspiratory pressure [PIMAX], n=17, 9F/8M) or Sham training (15% PIMAX, n=18, 8F/10M). Peak oxygen uptake (VO2peak) was determined with an incremental treadmill exercise test to exhaustion (modified Balke protocol). Exercise tolerance was defined as treadmill time to exhaustion (TTE). Metabolic pathways modulated by high-resistance IMST were assessed using mass spectrometry-based plasma metabolomics.   
  
Results  
  
Adherence was high to both IMST and Sham training (IMST=94% of training sessions completed; Sham=90%). Body weight, body mass index (BMI), and leisure time PA levels remained stable in both groups across the intervention (all pgt;0.05). VO2peak was unchanged after 6 weeks of either high-resistance IMST (pre=27.7±1.2 ml/kg/min, post=27.9±1.2 ml/kg/min; p=0.75) or Sham training (pre=27.2±1.7 ml/kg/min, post=26.7±1.6 ml/kg/min; p=0.20). However, high-resistance IMST increased TTE by 12%, with no change after Sham (IMST: pre=540±42 sec, post=606±33 sec; Sham: pre=562±39 sec, post=553±44 sec; group\*time: p=0.03). TTE increases were related to changes in 18 metabolites (all plt;0.05), predominantly plasma acylcarnitines, which play key roles in energy production and fatty acid metabolism. Indeed, of the 19 carnitines measured, 11 were positively associated with TTE change post-IMST. The strongest relations to TTE were seen with acyl-C14:1 (R2=0.57; plt;0.01), acyl-C10 (R2=0.54; plt;0.01), and acyl-C12 (R2=0.52; p=0.01). These relations were not seen in the Sham group (all pgt;0.05).   
  
Conclusions  
  
In ML/O adults, high-resistance IMST does not increase CRF, but does improve TTE independent of changes in body weight, BMI, or PA. Improved TTE was related to changes in circulating metabolites, particularly increases in plasma acylcarnitines. These preliminary findings suggest 5 min/day of high-resistance IMST is a promising, highly adherable mode of physical training that increases exercise tolerance and modulates metabolic pathways in ML/O adults.  
  
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