*SWACSM Abstract*

# Validation of the Work Capacity Test for Wildland Firefighters

CASSANDRA MCFARLAND, ZACHARY HOFHEINS, JANNA THOMPSON, LEXI SORENSEN, ANDREW CREER, & SHANE DRAPER

Applied Human Performance Laboratory; Department of Exercise Science and Outdoor Recreation; Utah Valley University; Orem, UT

*Category: Undergraduate*

*Advisor / Mentor: Draper, Shane (ShaneD@uvu.edu)*

ABSTRACT

Much of the reported Wildland Firefighter (WLFF) data use prediction equations which tend to underestimate oxygen consumption (VO2) during load carriage. As a result, the reported metabolic and oxygen consumption data values may actually be higher creating a larger gap between the US Forest Service arduous pack test (APT) and true occupational demand. The reported data regarding the energy cost upon which the APT has been based (22.5 mL/kg/min of oxygen) has overwhelmingly been tested in current WLFF with few participants. However, no studies have recently examined the current energy expenditure of men and women who want to qualify to become wildland firefighters. **PURPOSE:** Evaluate the aerobic intensity of the US Forest Service APT in a large population of non-wildland firefighters to determine if the APT is an accurate assessment of aerobic capacity as it relates to the current data of energy being expended by wildland firefighters. **METHODS:** To date, 40 active individuals have participated in this study (23±1.7 yrs; 175.4±9.9 cm, 77.3±15.2 kg), both male (n=22) and female (n=18). Subjects underwent one rest stage and two 7 minute trials on the treadmill walking at 1.8m/s, with a 1% grade with and without a pack weighing at 20.4 kg, as required by the APT. Oxygen consumption (ml/kg/min), and heart rate (HR) were measured continuously throughout each trial. A 3x1 repeated measures ANOVA was used to analyze differences between the three stages. **RESULTS:** Significant increases in VO2 ($p < 0.001$), heart rate ($p < 0.001$), and % max heart rate ($p < 0.001$) were observed when comparing the unloaded to loaded stages. Measured values of VO2 increased from 18.9±1.7 mL/kg/min to 25.5±3.0 mL/kg/min when comparing unloaded to loaded stages. Heart rate increased from 125.8±20.3 bpm (unloaded) to 155.4±24.3 bpm (loaded), thus increasing the % max heart rate from 65.4±10.5% to 80.7±12.5%. **CONCLUSION:** When comparing the VO2 from previous research of WLFFs in the field, to that elicited during this study of the APT, the pack test requires a lower metabolic demand (22.5 mL/kg/min) than that of this study (25.5 mL/kg/min at 80% of max HR) and active WLFFs (27 mL/kg/min). Based on these observations, the APT does not fully elicit the aerobic capacity necessary to participate in all activities congruent with that of current WLFFs in the field.