

**Poster #23****Shelby Francis****PhD Candidate, College of Liberal Arts and Sciences  
Health and Human Physiology****Title of Research:** Cross-Validation of Single-Stage Treadmill Tests for Predicting Aerobic Fitness in Adolescents with Type I Diabetes**Other Authors:** Ajay Singhvi, Alex M. O'Donnell, Eva Tsalikian, Michael J. Tansey, Kathleen F. Janz**Introduction/Purpose:**

High aerobic fitness is associated with better disease management in individuals with type 1 diabetes mellitus (T1DM). The criterion measure of aerobic fitness is a maximal test using indirect calorimetry. However, the Ebbeling and Nemeth protocols were developed to predict maximal oxygen consumption (VO<sub>2</sub>max) using submaximal work rates, without measuring oxygen consumption. The Ebbeling equation has been validated in adults against maximal testing using indirect calorimetry (R<sup>2</sup>=0.86, SEE=4.85 ml/kg/min), and the Nemeth equation has been validated in obese children (R<sup>2</sup>=0.75, SEE=3.36 ml/kg/min). Neither has been validated in adolescents with T1DM. The purpose was to cross-validate the Ebbeling and Nemeth equations to predict VO<sub>2</sub>max in adolescents with T1DM.

**Experimental Design:**

Adolescents with T1DM (n=10 males, 10 females) completed a progressive treadmill walking test to volitional fatigue. Indirect calorimetry measured O<sub>2</sub> uptake and CO<sub>2</sub> production. After a warm-up, participants completed one 4 min stage at a self-selected speed between 2.0 and 4.5 mph and 5% grade (Ebbeling/Nemeth protocol). Speed was increased by 0.5 mph for 2 min, after which grade was increased by 2% each min until exhaustion. Volitional fatigue was defined as meeting 2 of the following: heart rate  $\geq$ 200 beats per min; respiratory exchange ratio  $>$ 1.0; or  $\leq$ 2 ml/kg/min change in VO<sub>2</sub> in the final min. Predicted VO<sub>2</sub>max values were calculated using the Ebbeling and Nemeth regression equations and compared to observed VO<sub>2</sub>max. Spearman correlation coefficients, 95% confidence intervals, coefficients of determination (R<sup>2</sup>), standard error of the estimate (SEE), and total error (TE) were calculated.

**Results:**

The mean observed, Ebbeling prediction, and Nemeth prediction of VO<sub>2</sub>max were 47.0, 42.4, and 43.5 ml/kg/min, respectively. The association between the Ebbeling prediction and the observed VO<sub>2</sub>max was r=0.92 (95% CI=0.81, 0.97), R<sup>2</sup>=0.81, and TE=6.47 ml/kg/min. The association between the Nemeth prediction and the observed VO<sub>2</sub>max was r=0.77 (95% CI=0.50, 0.90), R<sup>2</sup>=0.66, and TE=5.57 ml/kg/min.

**Conclusions:**

Aerobic fitness can be accurately predicted with a submaximal, single-stage treadmill protocol that does not require indirect calorimetry. The Nemeth regression equation is a better fit than the Ebbeling for adolescents with T1DM.