**Overview**

We have three specific aims for our research proposal. First, determining and analyzing the metabolic cost during walking uphill with a load on the back. Second, understanding the effect of the center of mass displacement on metabolic cost while walking on an inclination with a load. Lastly, we want to analyze how walking uphill with heel wedges affects metabolic cost.

We will be conducting our experiments on 10 healthy male participants (mean ± SD age 25 ± 5 years, weight 70 ± 10 kg, and height 172 ± 10 cm). Participants’ resting metabolic rate will be determined in 3 minutes by standing on a treadmill. The walking speed on the treadmill will be kept constant for all testing at 1.0 m/s and each trial is six minutes long with the last minute being used for data collection to calculate the metabolic cost. For establishing the baseline, subjects will walk level and incline grades with no load. The incline angles that will be tested across all hypotheses are 4°,8°, and 12°. In the second case, a constant load will be distributed around the backpack to change the COM. For the third hypothesis, we will analyze the effect of different heel wedges on metabolic cost.

Instrumented dual-belt treadmill with two six degrees of freedom force plates (R-mill, Forcelink) will be used to measure the ground reaction forces. Joint motion data will be collected using a motion capture system with 10 Osprey cameras and Cortex software (Motion Analysis). 27 markers will be placed on the lower limb of an individual. Indirect calorimetry will be used to calculate the metabolic cost. Pulmonary gas exchange rates will be measured with the COSMED K4b2 system (COSMED, Italy).