

BME 9531 - Biomechanics of Human Joint Motion

Research Project Proposal

Amina Tabassum - 251390976
atabass4@uwo.ca

November 20th , 2024

Biomechanical Analysis to Understand the Impact of Backpack Load on Postural Sway and Stability

1 Project Goal

The objective of this project is to investigate the effect of backpack load on postural sway during static standing and walking. Kinematic and kinetic metrics, such as joint angles, COM trajectory during movement, COP displacement, ground reaction forces, joint moments, joint reaction forces, and energy expenditure, will be evaluated for the hip joint.

2 Hypothesis

- Wearing a backpack leads to a significant increase in postural sway during standing and walking.
- It increases the range of motion (ROM) in the hip joint and causes a shift in the center of mass (COM).
- To counteract the posterior moment induced by the load and keep the COM vertically aligned, the trunk leans forward.
- Uneven backpack distribution leads to pelvic tilt and COP displacement, amplifying postural instability.
- Backpack load increases energy expenditure.

3 Biomechanical Analysis

The study will utilize motion capture and kinematic data that we collected during an experiment conducted at the Wolf Orthopedic Biomechanics Lab (WOBL) at the Fowler Kennedy Clinic to measure joint angles and the positions of the pelvis with and without a backpack under static and walking conditions. Joint angles, range of motion (ROM) of the joints, ground reaction forces, center of pressure (COP) displacement to measure postural stability, and joint torques will be calculated. Data will be processed and statistically analyzed to quantify changes in posture.