SAFETY AND FEASIBILITY OF OSTEONECIC LOADING IN ADULTS WITH LOW BODY MASS: A PRELIMINARY EVALUATION
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Osteogenic Loading
In 1896, Julius WolfE, MD, hypothesized that bones increase in density when exposed to increased demand and decrease in density under less demanding conditions. This observation was later validated by animal studies and coined “Wolf’s Law.” In 2004, the United States Surgeon General confirmed that maximum loading of the skeletal system can increase BMD and prevent or reverse osteoporosis. Mechanical loading has been shown to both inhibit bone resorption and increase bone formation.

Introduction
The benefits of OL for improved bone health are documented but not previously studied in individuals with a history of low body weight in part due to concerns regarding possible bone weakness and injury risk. No study was identified that included adults with low BMI, participating in high force production exercise. Can individuals with low BMI safely participate in osteogenic loading?

Purpose
The purpose of this study was to examine if OL was 1) safe for individuals having low BMI and 2) to consider the potential benefits of OL for individuals with history of low BMI. This study is intended to investigate the capacity of adults with low BMI to safely produce compressive forces via leg press, which are of sufficient magnitude to prompt bone reformation in the femur and head of the trochanter.

Methods
The data base (N = 21,996) was drawn from a pool of adults using one model of osteogenic loading equipment from 2009-2016. The electronic database was deidentified for the purposes of this study to protect participant privacy. However, all activity for each user was electronically documented age, gender, date of exposure, type of activity completed, and degree of force plate productivity achieved. All adults aged 18-60 years who completed a minimum of 24 OL sessions were included in this sample (n = 2194). Only individuals having low body mass were selected (BMI 14-18.5), resulting in an n = 260 (186 female, 74 male). 19 individuals who had a BMI of <14 were excluded from the study.

Results
Of the underweight participants (BMI 14.0-18.5) (n=260; female=186, male =74), 95% (n=247) met or exceeded minimal forces (MOB ≥ 4). A greater percentage of underweight participants were able to achieve sufficient force for bone reformation relative to individuals of average (86.5%), overweight (79.9%), and obese BMI (52.1%). No injuries were reported.

Conclusions
Underweight adults had sufficient strength to safely create compressive forces associated with bone formation. OL may have restorative potential and low injury risk in an underweight population.

Limitations
1. The age range was limited and additional study will be needed to understand potential benefit of OL for children, teens and more senior adults.
2. Data on history of low body weight and other health information were not available.
3. AN may affect bone health differently than low body weight due to other health, genetic and/or idiopathic factors.

References