INTRODUCTION:
The rise in overweight and obesity in Ireland is a growing health concern. In Europe musculoskeletal pain has been reported as the most expensive of all disease categories. It seems reasonable to hypothesise that increased weight on the body will lead to altered biomechanics, which may predispose overweight individuals to musculoskeletal pathology. Despite this, the biomechanical implications of overweight and obesity has received little attention in the literature.

AIM:
The purpose of this study was to investigate the relationship between expected and recorded peak vertical (V), anterior-posterior (AP) and lateral (L) ground reaction forces (GRF) in overweight children.

METHODS:
This study was granted ethical approval by the Research Ethics Committee of St. James’s Hospital/ The Adelaide and Meath Hospital, Dublin Incorporating the National Children’s Hospital.

Participants
Participants were recruited from the paediatric weight management clinic at the Adelaide and Meath Hospital, Dublin. Subjects aged 7–16 and with a body mass index (BMI) z score >95 percentile were included in the study. Participants who presented with a leg length discrepancy >2 inches were excluded from the study.

Methodology
Participants attended the gait laboratory at the Trinity Centre for Health Sciences. Anthropometry was conducted on arrival. Subjects fitted with surface markers walked between two Coda cameras on a 10m platform embedded with two AMTI force plates. Observed peak GRF were collected manually from graphs. Expected peak GRF were calculated using published percentage body weight values.

Paired t tests were used to compare means between observed and expected peak V, AP and L GRF. A p value < 0.05 was considered statistically significant.

RESULTS:
Eight males and 15 females completed the study (age 12.04 ± 2.8; BMI 29.51±4.55). All participants had a BMI z score above the 95th percentile. Observed AP and L GRF were found to be significantly greater than expected GRF, p=0.016 and p=0.000 respectively. No significant difference between observed and expected V GRF were noted p= 0.615.

DISCUSSION:
Peak AP GRF, otherwise known as the propulsive force was found to be greater than anticipated for body weight in overweight children. This suggests overweight children need to increase the propulsive force required during gait to overcome their inertia and maintain forward progression. In addition peak L GRF was found to be higher than anticipated. The magnitude of L GRF is dependant on the position of the foot relative to the position of the centre of mass. An increase base of support, improving stability, has been noted in overweight gait. This increased base may be the cause of increased L GRF incurred during overweight gait.

CONCLUSIONS:
From this study, overweight children incur greater AP and L GRF than anticipated for their body weight. These forces may predispose this group to musculoskeletal disorders. This is the first study to investigate ground reaction forces in overweight children. Future research is aimed at investigating the effect of weight on temporal and spatial parameters, kinematic parameters and, joint moment and powers in adults and children.

The authors acknowledge grant support from Trinity College Dublin.

REFERENCES: