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Introduction

- Single leg standing is encountered in many occupational and daily activities such as walking [1], staircase climbing [2], and clearing obstacles.
- Body mass index (BMI) affects postural control in static single leg standing [3].
- Less is known about the effects of BMI on balance control during dynamic tasks requiring prolonged single leg balance such in obstacle clearance that requires displacing ones' center of mass.

Objective:

To quantify performance and compensatory movements in individuals with BMI $\geq 30 \text{ kg/m}^2$ during a simulated obstacle clearance task.

Hypothesis:

Increasing obstacle heights will increase:

1. Task completion time
2. No. of participants displaying compensatory movements.

Methods

Participants: N= 10 individuals with BMI > 30 kg/m²

	Obese (30 < BMI < 34.99 kg/m ²)	Morbidly Obese (BMI > 40 kg/m ²)
Number of participants	5	5
Mean \pm sd BMI (kg/m ²)	32.0 \pm 1.2	47.2 \pm 9.6

Procedure:

Clear Obstacles of 7 heights in 5cm increments



Min height: 36cm (14") Max height: 66cm (26")

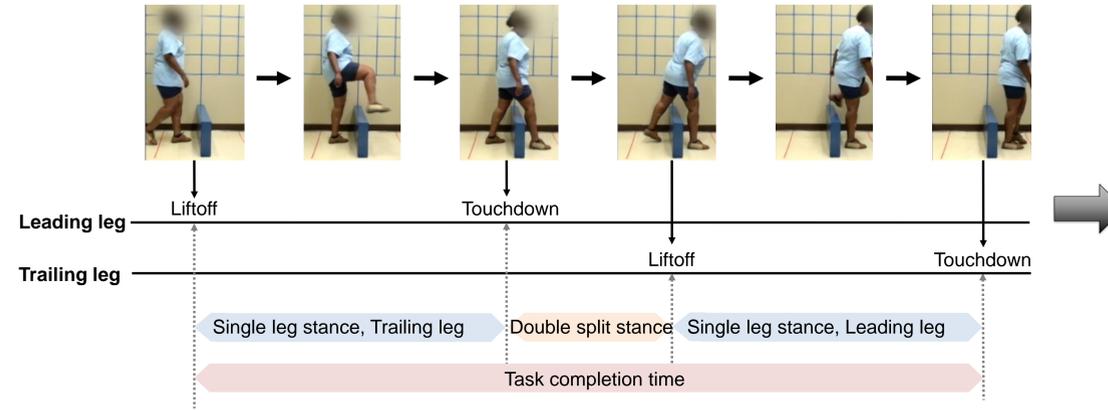
Video-based Task Analysis

Identify the start & end time of stepping and compensatory movements using the software program ELAN v5.1 (The Language Archive)

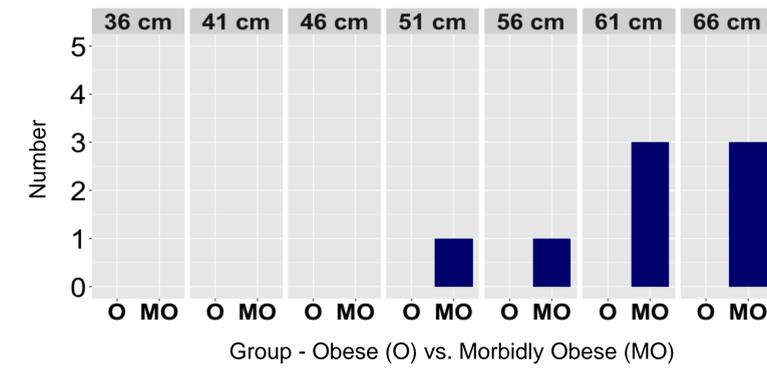
1. Stepping movement

2. Compensatory movements

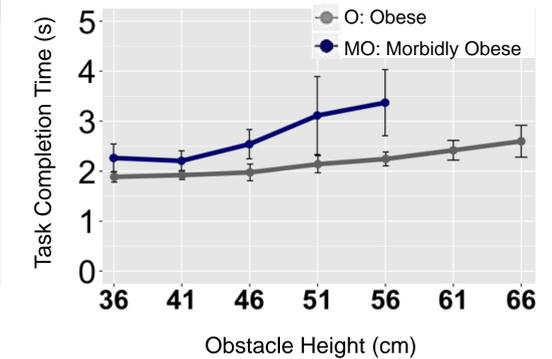
1. Stepping Movements



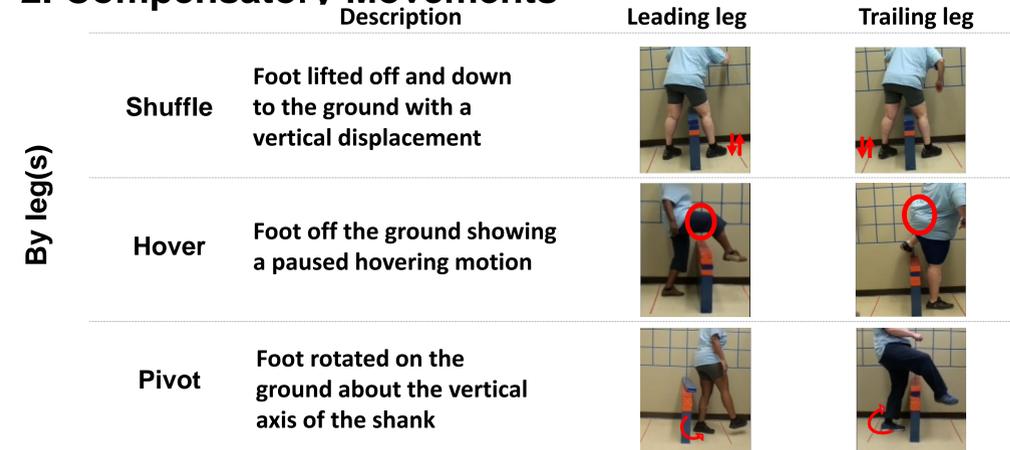
Number of unsuccessful trials increased with Obstacle Height among Morbidly Obese



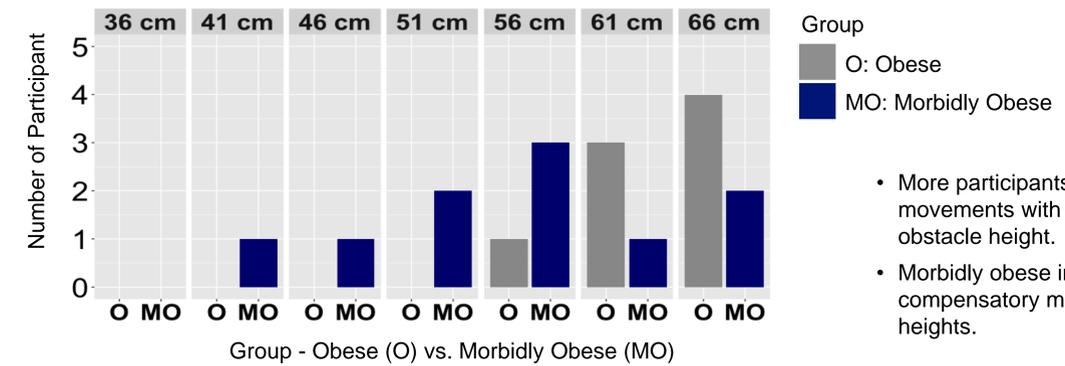
Task Completion Time Increases with Obstacle Heights, and more among the Morbidly Obese



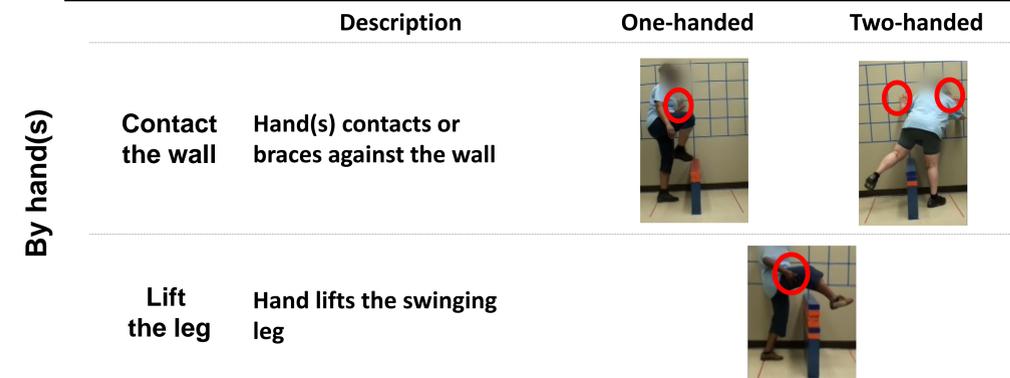
2. Compensatory Movements



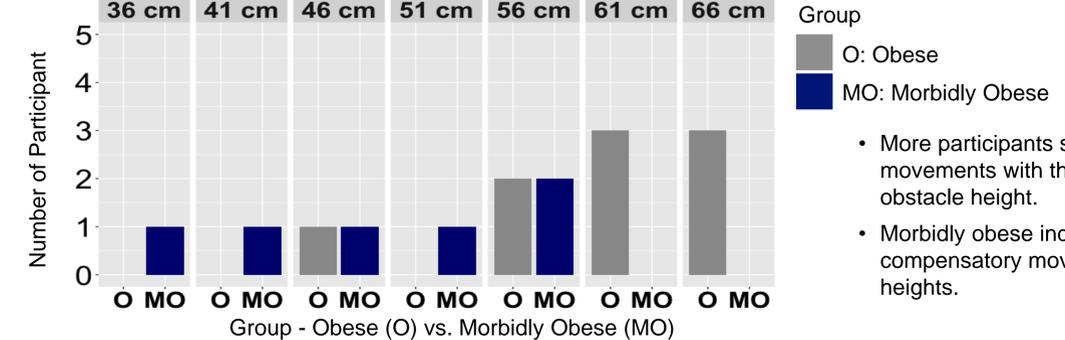
Number of Participant Using Compensatory Movements with their Leg(s)



- More participants showed compensatory movements with their leg(s) with increasing obstacle height.
- Morbidly obese individuals performed compensatory movements at lower obstacle heights.



Number of Participant Using Compensatory Movements with their Hand(s)



- More participants showed compensatory movements with their hand(s) with increasing obstacle height.
- Morbidly obese individuals performed compensatory movements at lower obstacle heights.

Conclusion

- Longer task completion time and increased number of participants using compensatory movements were observed with the increasing obstacle heights. This effect was greater in the morbidly obese vs. obese group.
- Stepping movements and compensatory movements were identified as potential measures of postural control in dynamic task with prolonged single leg stance.
- **Ongoing analysis** involves the use of wearable inertial sensors to quantify subtle compensatory strategies performed with the torso and hips that cannot be easily detected in the video-based analysis.

Reference

- [1] Drought, A. B., Murray, M. P., & Kory, R. C. (1964). Walking patterns of normal men. The journal of bone and joint surgery.
- [2] Nadeau, S., McFadyen, B. J., & Malouin, F. (2003). Frontal and sagittal plane analyses of the stair climbing task in healthy adults aged over 40 years: what are the challenges compared to level walking? Clin Biomech (Bristol, Avon), 18 (10), 950-959.
- [3] Hue O, Simoneau M, Marcotte J, Berrigan F, Doré J, Marceau P, Marceau S, Tremblay A, Teasdale N. Body weight is a strong predictor of postural stability. Gait Posture. 2007 Jun;26(1):32-8.

Acknowledgments: This study was supported by the MCubed2.0 program of the University of Michigan