

INVESTIGATING MUSCULOSKELETAL HEALTH AND LIMB BIOMECHANICS IN RURAL MADAGASCAR



Mandena, Madagascar

TAYLOR P. TRENTADUE^{1,2}, MELISSA MANUS²,
CHARLES L. NUNN^{1,2}, and DANIEL SCHMITT¹

¹ Department of Evolutionary Anthropology, Duke University

² Duke Global Health Institute, Duke University



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OBJECTIVES

- Investigate how the gender, age, and occupation of participants influence musculoskeletal health.
- Examine musculoskeletal health in a rural Malagasy population through qualitative survey data and quantitative analysis of vertical ground reaction force curves.
- Understand the biomechanical factors that contribute to pathological gait and disability at the hip, knee, and ankle.

Musculoskeletal health and joint functioning are vital for successful participation in occupational tasks and daily activities and is thus an important area of study both clinically and in global health. To measure mechanical changes as a function of pain, vertical forces exerted on the ground by the lower extremity are analyzed in a novel way to describe biomechanical functioning. This research gives insight into impacts of rheumatic disease and advances understanding of joint pathology globally.

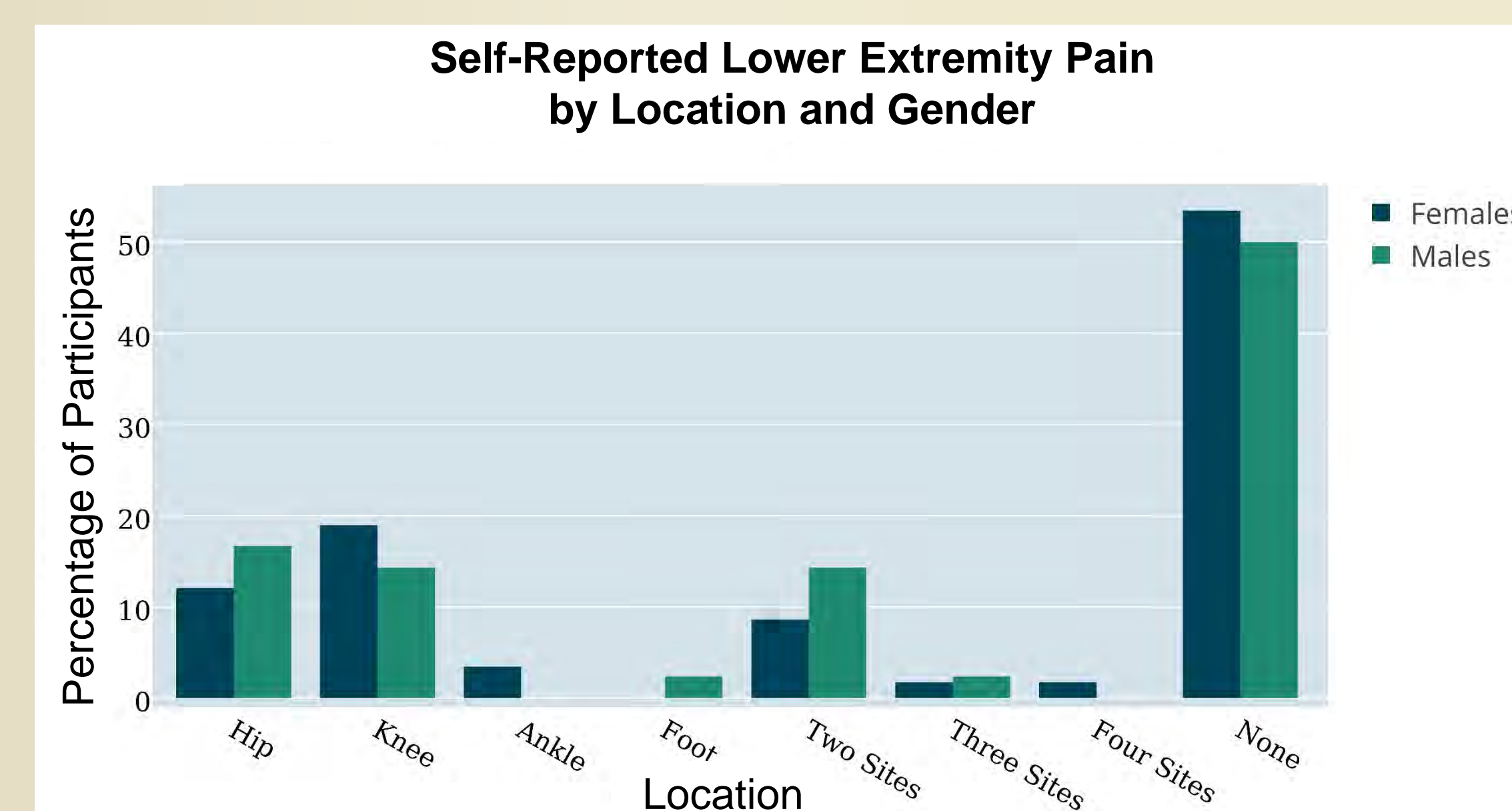


Figure 1: Location of self-reported lower extremity joint pain by gender. The most common site of pain in females was the knee (18.97%) and the hip in males (16.67%).

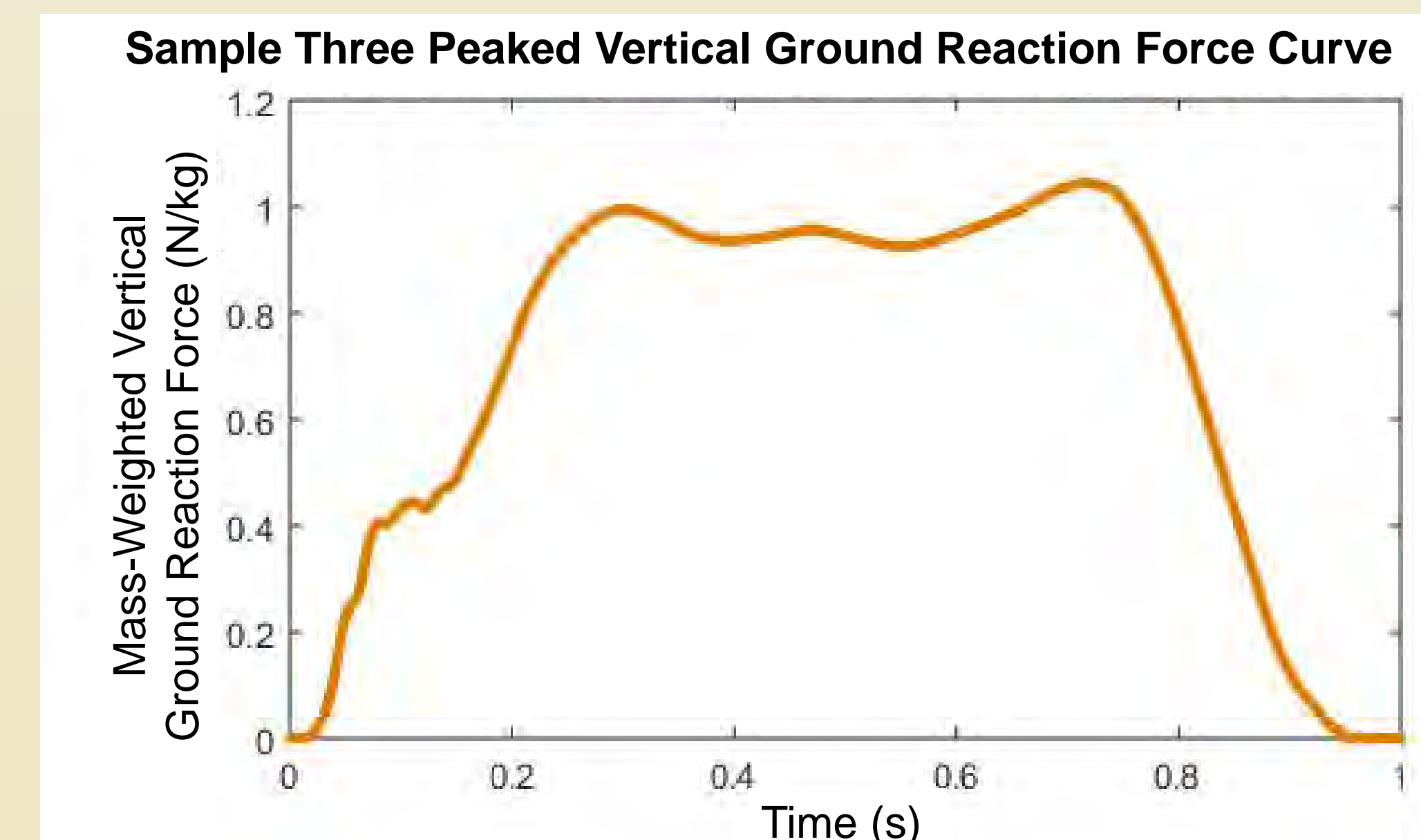


Figure 2: An example of a mass-weighted vertical ground reaction force curve showing a third peak. Data were filtered in MATLAB using a fourth-order Butterworth filter with a cutoff frequency of 10 Hz.

METHODOLOGY

- We provided a musculoskeletal health survey, which was then reviewed with participants orally by local Malagasy translators. We used modified forms of the Arthritis Impact Measurement Scales [AIMS], Western and McMaster Universities Arthritis Osteoarthritis Index [WOMAC], and Nordic Musculoskeletal Questionnaire.
- Participants walked across a two-axis force platform embedded and leveled in the ground such that five steps on the right foot and five steps on the left foot were recorded using PASCO Capstone software.
- We observed men and women transplanting rice crops in rice fields to understand musculoskeletal activity associated with agriculture.
- *As a novel approach to assessing musculoskeletal health, we are using Fourier analysis to interpret the vertical ground reaction force waveforms collected from force platform data.*

CONCLUSIONS

- 46.55% of women (n=55) and 50% of men (n=40) self-reported lower extremity pain.
- We found no statistically significant correlation between age and pain as measured by the musculoskeletal health surveys.
- Biomechanical data showed a third peak in the vertical ground reaction force curves for some people. A third peak has been reported previously in literature in paraplegics and bilateral amputees with prosthetics.
- Analysis on biomechanical factors contributing to the third peak are currently being analyzed.



**EMBEDDING THE FORCE PLATFORM
IN THE GROUND**



**BIOMECHANICAL DATA COLLECTION
USING THE FORCE PLATFORM**

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