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Biomechanical Foot Factors, Social Participation, and Self- Participation in Sedentary Versus Non-Sedentary Adults (Poster)

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Biomechanical Foot Factors, Social Participation, and Self-Perception in Sedentary Versus Non-Sedentary Adults

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BACKGROUND

Purpose: Compare biomechanical foot factors, activity level, satisfaction with participation in social roles, and self-related level of activity between sedentary and non-sedentary adults

Hypotheses:

1. Step count will positively correlate with: Medial longitudinal arch (MLA) recoil, intrinsic and extrinsic muscle strength, muscle CSA, neutral foot posture, satisfaction with participation in social roles, and self-efficacy

2. Step count will negatively correlate with: Plantar fascia thickness, self-reported pain interference, and BMI



Paper Pull: Used to determine participants' intrinsic muscle strength by measuring during maximum 1st MTP flexion

MLA Recoil: Used to determine recoil with walking, step ups, and hopping on one foot

Diagnostic Ultrasound: To document foot muscle cross-sectional area (CSA) and plantar fascia thickness

Foot Posture Index: Validated in large samples of participants against walking, plantar pressure and clinical data

PROMIS: Used to document the participants' level of physical function, self efficacy, pain interference, and social participation, relative to the US population

Heel rise: Used to measure extrinsic foot strength (gastroc/soleus complex)

METHODS

Recruitment Process: George Fox newsletter email, directly contacting classmates, family, and friends. Subjects were screened for inclusion/exclusion criteria over the phone.

43 Participants: 20 female, 23 male
18-83 years old
Average age 41.79, SD 20.18 years

FPI: categorizes participants into either flatfoot, neutral or supinated foot based on a 12-point scale

PROMIS: Self-reported pain interference, self efficacy, physical function, and social participation domains

IPAQ: Self-reported physical activity performed over 7 consecutive days as a part of daily life

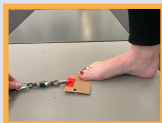
MLA Recoil (3): Participants performed fast walking, step up, and hopping, to load the plantar fascia in order to measure recoil

Heel Rise: 5 single-leg maximal heel rises

Paper Pull Test: Force transducer measured peak intrinsic foot muscle (abductor hallucis and flexor hallucis brevis) force in sitting

Ultrasound: Measuring abductor hallucis muscle CSA and thickness of the plantar fascia of the right foot, with participants in prone

Statistical analysis: We performed a Mann-Whitney test for between-groups differences comparing very active and moderately active participants, a linear correlation for each variable vs step count, and a one-way ANOVA to compare MLA recoil during tasks for the entire group.



RESULTS

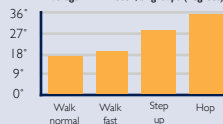
The very active group demonstrated more MLA recoil during hopping.

Discussion - The MLA has more recoil due to this group having increased plantar fascia thickness and increased intrinsic foot strength.

The very active group produced higher paper pull forces as % of bodyweight.

Discussion - Intrinsic foot strength of very active individuals increases as a result of higher imposed demands, compared to moderately active individuals.

Average MLA recoil, all groups (degrees)



The very active group scored higher on the pain interference PROMIS measure

Discussion - Pain does not prevent individuals from doing low-level activities, however may prevent more active individuals from doing physically demanding activities.

Plantar fascia thickness positively correlated with step count ($p < 0.05$)

Discussion - The plantar fascia increases in thickness as a response to higher imposed demands in the very active group.



LIMITATIONS & RECOMMENDATIONS

Limitations

Skin mounted markers may underestimate changes in foot segment motion and therefore may impact our modeling of MLA recoil.

Homogenous sample may have led to an overestimation of the magnitude of association between activity level and intrinsic/extrinsic foot factors.

Single-leg hop: Varying hop strategies and varying ability of participants to perform a single leg hop may have limited the accuracy of our data regarding MLA recoil during this task.

Further Research

Larger, heterogenous sample size: including a more sedentary population and having a longer period of recruitment will improve the validity and generalizability of results

Plantar fascia quality and activity level: investigating the correlation between plantar fascia quality (i.e., histologic findings of degeneration and plantar fascia fasciosis) and activity level in sedentary vs non-sedentary people, and determining which of these individuals are symptomatic.

Paper Pull Test: utilizing this clinical tool to help predict foot response to increasing activity levels in a sedentary population



REFERENCES

