Effects of Slippers on Sit-to-Stand Transition in Older Women

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Presentation outline

1. Introduction
2. Methods
3. Results
4. Conclusions
5. References
6. Q&A
1. Introduction
Introduction

Common problems for many older people

Loss of sensation

Weakness of Somatosensory

Risk of falling

Improper footwear
Introduction

• **Slips and trips** can be prevented by **shoe features**, including midsole material hardness, height of the heel collar and outer sole slip resistance. *(Hornbrook et al., 1991)*

• **Risk of falls** in old people is increased inside home when walking **barefoot** or in **socks**. *(Koepsell et al., 2004; Menz et al., 2006)*


Introduction

• Slips and trips can be prevented by shoe features, including midsole material hardness, height of the heel collar and outer sole slip resistance. (Hornbrook et al., 1991)

• Risk of falls in older people is increased inside homes when walking barefoot or in socks. (Koepsell et al., 2004; Menz et al., 2006)

Biomechanical studies on indoor footwear are scarce.


Introduction

Sit-to-stand
(fundamental and frequent motion)

- Postural transition and coordination of muscle activity to achieve postural stability.
  *(Millington, et al., 1992; Ganea. Et al., 2011)*

- Important indicator of daily-life functional independence and mobility. *(Schenkman et al., 1991)*

Introduction

Sit-to-stand
(fundamental and frequent motion)

• Postural transition and coordination of muscle activity to achieve postural stability.
  (Millington, et al., 1992; Ganea, et al., 2011)

• Important indicator of daily-life functional independence and mobility.
  (Schenkman, et al., 1991)

Visual observation to assess sit-stand transition balance

Introduction

Objective:
To quantify the subject’s postural stability in sit-to-stand transition in response to barefoot and indoor slipper conditions.
2. Methods

2.1 Participants
2.2 Footwear
2.3 Experimental protocol
2.4 Measure outcomes
2.1 Participants

• 10 healthy older females
• 60-67 years old
• BMI: 20.4-28.6
• Foot size: EU 35-38
• Without using walking aid
• Healthy feet
2.2 Footwear

1. Barefoot

2. Slipper
   - Common indoor slipper style of local older woman
   - Open-toe design
   - A strap across the dorsal forefoot
2.3 Experimental protocol

1. Positioned in an **armless** standard chair
2. **Adjustable** seat height to position knee at 90° of flexion
3. Sat with their feet **shoulder width** apart
4. **Arms by the side** without touching their body

1. Stand up, at the command “stand”
2. **Stand still** for five seconds
3. **5 minutes** practice trial
4. **3 valid trials** of data
2.4 Measure outcomes

- Center of pressure (COP)
  By Novel Pedar®

1. COP excursion (mm)
   - Antero-posterior (AP) range
   - Medio-lateral (ML) range

2. COP sway length (mm) & mean COP velocity (mm/s)
3. Results and discussion

3.1 COP AP excursion
3.2 COP ML excursion
3.3 Sway length
3.4 Mean velocity
3.1 COP AP excursion

**Left foot**
- Participants: Barefoot, Slippers
- Anterior - Posterior direction (mm)
- Graph for participants 1 to 10

**Right foot**
- Participants: Barefoot, Slippers
- Anterior - Posterior direction (mm)
- Graph for participants 1 to 10
3.1 COP AP excursion

Left foot

- Slippers
- BMI

Left side with slipper
Higher BMI, greater AP displacement

$p<0.05$
3.2 COP ML excursion

Greater ML displacement with Slippers on right foot
3.3 Sway length

**Left foot**

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<th>Participants</th>
<th>Barefoot</th>
<th>Slippers</th>
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**Right foot**

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3.3 Sway length

**Left foot**
- Higher BMI, longer sway length
- $p<0.05$

**Right foot**
- Larger foot size, longer sway length
- $p<0.05$

**Left side with slipper**

**Right side with slipper**
3.4 Mean velocity

**Left foot**

Mean velocity (mm/s)

Participants

- **Barefoot**
- **Slippers**

**Right foot**

Mean velocity (mm/s)

Participants

- **Barefoot**
- **Slippers**

*Less stable* in Slippers
3.5 Mean velocity

Left foot
- Left side with slipper
- Higher BMI, higher velocity

Right foot
- Right side with slipper
- Larger foot size, higher velocity

*p < 0.05*
4. Conclusion
4. Conclusion and suggestion

• Slippers VS BF: No significant difference found in AP and ML direction, sway path and sway velocity.
• Left foot with slipper positively correlated with BMI in AP, sway length and velocity.
• Right foot with slipper positively correlated with foot size, sway length and velocity.
• Slippers without fixation on hindfoot may not able to improve postural stability during sit-stand movement.
• Indoor slippers interventions/ design associated with improved postural stability in older adults should be developed and investigated.
Acknowledgment

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References


END

Thank you for your kind attention
## TA muscle activation

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<th>Ready to stand</th>
<th>Standing still</th>
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