Effects of Shoe Fit on Gait and Posture

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SUMMATIVE STATEMENT

The effects of shoe fit on gait and posture were clarified. The vertical motions of the trunk, the propulsive power that supports walking, and the proportion of physical motions which contribute to forward motion were lower when wearing shoes with loosened laces than when "wearing properly."

KEYWORDS:

Gait, **Posture**, **Shoe lacing**, **Occupational fall**, **Signal processing**

BACKGROUND & AIM

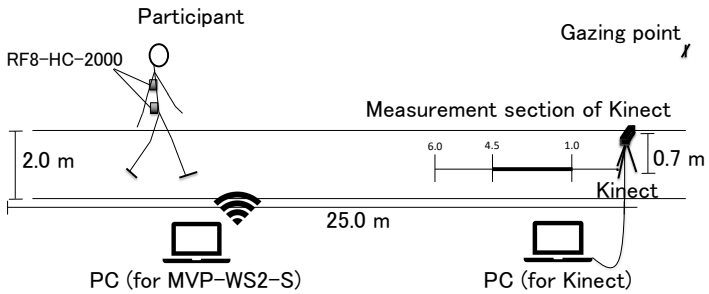
Wearing shoes with loosened laces, is considered to be one of the causes of fall accidents. However, the perspectives on proper wearing of shoes for safety have been overlooked.

The present study aimed to clarify the effects of "shoe-wearing style" on gait and posture.

METHODLOGY

- ✓ The 21 recruited healthy adult participants were asked to put on their shoes as usual.
- ✓ 25-m walking tests were conducted under 6 different conditions.
- ✓ The participants walked at 2 paces (normal & fast), under the 3 shoe-wearing conditions (usual, tight & loose).
- ✓ Walking velocity and step length were measured with the walking posture measurement system.
- ✓ Two motion sensors were placed on the thoracic vertebrae and sacrum of each participant.
- ✓ A two-way ANOVA was conducted for each index.

Shoe lacing conditions in the experiment



Experimental setting

Analysis indices

walking velocity, step length, gait cycle time, impact on landing (left and right), mean displacement (lateral, vertical, and longitudinal), mean trajectory length (horizontal plane, frontal plane, and sagittal plane), the maximum power spectral density (PSD) obtained by frequency analysis value (PSD_{1st}), the next largest PSD value (PSD_{2nd}), and the $CRP_{S.D.}$

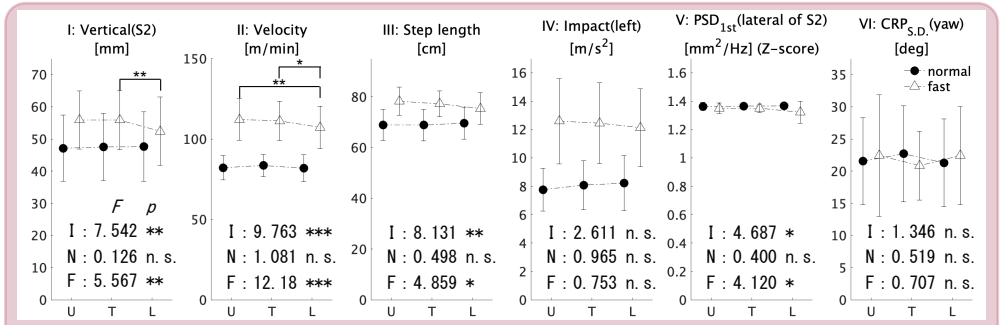
RESULTS & DISCUSSION

(1) The vertical motion of the trunk was shorter; The loose laces restricted the vertical motions of the trunk to prevent the shoe from coming off.

(2) The propulsive power to walk was lower; The walking velocity and stride length were reduced by the loosened condition, which spoils the propulsive force from the ground.

(3) The proportion of physical motions that contribute to forward motion was smaller. The proportion of physical motions was larger except in the forward direction.

(4) There was no significant difference in $CRP_{S.D.}$, the coordination of the trunk was maintained constant even under the loosened condition.



Interaction effects in walking paces and shoe-lacing condition, simple main effects of the normal and the fast pace (U: usual, T: tightened, L: loosened, I: interactions, N: normal, F: fast), $*p < .05$, $**p < .01$, $***p < .001$

CONCLUSIONS

The effects of "inappropriate wearing of shoes" on gait and posture were clarified. The shoes problems may be caused by the over familiarity to shoes in everyday life in everywhere for everybody. Therefore, it has been overlooked that the perspective of properly wearing shoes ensure the safety. The results of this study can be applied as a guide for the proper wearing of shoes.