

PATHOKINESIOLOGY LABORATORY
RANCHO LOS AMIGOS NATIONAL REHABILITATION CENTER

ABSTRACTS FROM CONFERENCE PRESENTATIONS (2003 – 2005)

DIABETES / AMPUTEE

The influence of walking speed and footwear on plantar pressure values in older adults. Cummings CD, Burnfield JM, Mohamed O, Perry J. Combined Sections Meeting of the American Physical Therapy Association: February, 2003, Tampa, FL

PURPOSE: Elevated plantar pressure has been associated with foot pain and pathology in older adults. Pressure, defined as the ratio between force and area, should change if walking conditions alter either vertical ground reaction force or available plantar surface area. The purpose of this investigation was to evaluate the influence of walking speed and footwear condition on plantar pressure variables in older adults. It was hypothesized that during walking, higher plantar pressure values would be recorded 1) at faster velocities due to expected increases in peak force (Nilsson and Thorstensson, 1989); and 2) barefoot compared to shod due to reduced contact area between the plantar and support surface, particularly in the medial arch.

SUBJECTS: Twenty adults 55 – 85 years old (10 male, 10 female) without known neurologic or lower extremity orthopedic pathology participated.

METHODS: Plantar pressure variables (PEDAR, Novel Electronics) and walking velocity (Stride Analyzer, B&L Engineering) were recorded as subjects (self-selected shoes; barefoot) walked across a 10m walkway at pre-determined slow (57 m/min), medium (80 m/min), and fast (97 m/min) velocities.

ANALYSES: Separate 3x2 analyses of variance with repeated measures were used to identify significant differences in mean peak pressure (MPP), peak force, and contact area in eight anatomically-defined foot regions across walking speeds and between footwear conditions. Bonferroni adjustments were applied to account for multiple comparisons within each variable. An alpha level of .00625 (.05/8) was used to test for significance.

RESULTS: *Speed Effect:* Faster walking resulted in significantly higher MPPs (7-40%) under the heel (16 N/cm²), 1st (11 N/cm²) and middle (15 N/cm²) metatarsal heads (MH), great (12 N/cm²) and little (9 N/cm²) toes, but 7% lower MPPs under the lateral arch (6 N/cm²). With faster walking, peak forces were significantly higher (13-46%) under the same regions except for the middle MHs. Peak force was significantly lower

(17%) under the lateral arch. Contact area was significantly smaller under the lateral arch (-6%), but larger under the little toes (8%) with faster walking. *Footwear Effect (barefoot vs. shod)*: Barefoot MPPs were significantly higher (19-24%) under the heel (14 N/cm²) and 2-4th MHs (16 N/cm²), but 25% lower under the great toe (9 N/cm²). Barefoot, peak forces were significantly higher under the 2-4th MHs (27%), but lower under the heel (-7%) and little toes (-46%). While barefoot, significant reductions in contact area were recorded under the heel (-17%), medial arch (-41%), and little toes (-39%).

CONCLUSIONS: During fast walking, higher MPPs in 5 of 8 regions resulted primarily from increases in peak force as contact area varied minimally compared to the slow condition. Higher MPPs during barefoot walking resulted primarily from reduced contact area compared to the shod condition.

RELEVANCE: In the presence of plantar pain and/or pathology, avoiding fast walking and/or use of supportive, well-fit footwear may reduce pressures. These strategies may also be useful for decreasing pressures in persons with peripheral neuropathy.

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