

SUMMARY OF SCIENTIFIC/TECHNICAL PAPERS IN THIS ISSUE

Head Extension and Age-Dependent Posturographic Instability in Normal Subjects.

Richard T. Jackson, PhD and
William R. De l'Aune, PhD (*p. 1*)

Purpose of the Work. A relatively new test called dynamic posturography is being used to help determine the cause of "dizzy" or vertigo symptoms in patients. We are investigating what effect tilting the head back 55° has on the performance and test scores. It has been suggested that this maneuver makes one of the balance organs less effective. **Subjects/Procedures.** We applied the posturography tests to 144 subjects ages 22 to 85, the majority older than 60 years. None of the subjects had symptoms of balance disorders. They were tested with head erect and then extended 55°. **Results.** None of our "normal" subjects younger than 59 lost their balance when tested with head erect. However, a third of the older subjects did. When the head was tilted, about half of the elderly subjects lost their balance. Although head tilting appears to be useful to uncover balance problems in the young and middle-aged, it is not useful in the elderly because "normal" elderly lose their balance too often. **Relevance to the Veteran Population.** Elderly subjects often have balance problems. It would seem wise for the elderly to secure a support or to brace the legs before tilting the head back.
Richard T. Jackson, PhD

Effects of Age and Disability on Tracking Tasks with a Computer Mouse: Accuracy and Linearity.

Cameron N. Riviere, PhD and
Nitish V. Thakor, PhD (*p. 6*)

Purpose of the Work. This work studies how advanced age and movement disorders make it more difficult to control computers and other tools in order to suggest ways to give the elderly and persons with disabilities better control. **Subjects/Procedures.** Eight subjects aged 19 to 29 (Mean=23, Standard Deviation=3), four

subjects aged 70 to 73 (M=72, SD=1), and five motor-disabled subjects aged 37 to 74 (M=65, SD=16) participated. Using a computer mouse, the subjects tracked sinusoidal and circular motions at various frequencies. Accuracy and linearity were measured. **Results.** The maximum bandwidth was 2 Hz, which decreased due to advanced age or disability. All tests showed significant nonlinearity, which increased with target frequency, age, and disability. **Relevance to the Veteran Population.** With both advanced age and disability, control becomes increasingly inaccurate and nonlinear, suggesting that nonlinear filtering may improve personal control for the elderly and persons with disabilities.

Cameron N. Riviere, PhD

Use of Bivalved Ankle-Foot Orthosis in Neuropathic Foot and Ankle Lesions.

Michael L. Boninger, MD and
James A Leonard, Jr., MD (*p. 16*)

Purpose of the Work. The neuropathic foot is a common complication of diabetes mellitus and is associated with development of chronic ulcers and Charcot joints that can result in amputation. This study describes the long-term experience of patients with neuropathic changes who were treated using a rigid, removable Total Contact, laminated, bivalved, rocker-bottom soled, Ankle-Foot Orthosis (TCAFO). **Subjects/Procedures.** Sixteen patients were treated: six with Charcot changes only, ten treated for ulcers. All patients were fitted with a TCAFO. Each TCAFO was constructed by taking a cast of the extremity and making a positive mold from the cast. This mold was then modified to provide pressure relief over the areas of ulceration and callus and bony prominences. **Results.** The TCAFO was effective at healing neuropathic ulcers and Charot joints. However, healing time was longer than reported for total contact casting. The TCAFOs offered the patient and caregiver the advantage of improved tolerance, function, and reusability. Ulcerations were easily monitored; therefore, the patients could become ambulatory prior to eradication of infection. **Relevance to the Veteran Population.** This study showed TCAFO to be a safe, functional, and cost-

effective therapy for the above-mentioned complications.

Michael L. Boninger, MD

Development of Instrumentation and Protocol to Measure the Dynamic Environment of a Modified Van.

Maureen Linden, MS and Stephen Sprigle, PhD (*p. 23*)

Purpose of the Work. The accelerations of a van modified to accommodate a person driving from a wheelchair were measured to determine the effects of seated position within the van on vehicle dynamics and seat type on subject response. **Subjects/Procedures.** Accelerations were measured on the vehicle floor and subject's torso in three positions within the van and upon two different seats. Three separate van maneuvers at different speeds were compared. **Results.** The rear of the vehicle presented a more dynamic environment than the front of the vehicle, while the wheelchair transmitted more acceleration to the subject than the vehicle seat. **Relevance to the Veteran Population.** The results confirm previous clinical belief that driving from the vehicle seat has advantages over driving from a wheelchair. The vehicle seat better dampens acceleration and provides a more stable seat.

Maureen Linden, MS

Stability of Walking Frames.

Richard D. Pardo, MSc; A. Barry Deathe, MD, FRCPC; David A. Winter, PhD; Keith C. Hayes, PhD; Jennifer Russel-Smyth, BScCP (*p. 30*)

Purpose of the Work. This study looks at the support that walking frames offer and how this support may be altered by walker height. **Subjects/Procedures.** In addition to having a leg amputation each person who volunteered was walker-dependent and had been using a walker for a least one month. Volunteers used a standard walker, fitted with load measuring devices, to move along a level corridor. Walker height was adjusted between tests. **Results.** Walker stability was not affected by changing walker height. The high walker

setting showed lower walker loads and the low walker setting showed higher walker loads. **Relevance to the Veteran Population.** The people in this study were able to adapt to small changes in walker height without sacrificing stability. Our results suggest that walker users who also experience arm pain may get relief by setting walker height higher than normal. A walker set lower than normal may take pressure off a tender, inflamed, or ulcerated residual limb.

Richard D. Pardo, MSc (Biomechanics)

Test-Retest Reliability of the Chattecx Balance System in the Patient with Hemiplegia.

David Levine, PhD, PT; Michael W. Whittle, MD, PhD; Jeannette A. Beach, PT; Pamela G. Ollard, PT (*p. 36*)

Purpose of the Work. The purpose of this study was to determine the test-retest reliability of several measures of balance in the hemiplegic population, using the Chattecx Balance System (CBS). **Subjects/Procedures.** Twenty patients with hemiplegia (14 male, 6 female; 14 right hemiplegia, 6 left; mean age 69.5, range 32–86 years) were tested on the CBS at the same time on 3 consecutive days under 3 conditions: 1) static platform, 2) anterior-posterior linear translation, and 3) rotational angular motion about a mediolateral axis. Variables examined were center of pressure in the mediolateral direction (COBX), the center of pressure in the anteroposterior direction (COBY), and a dispersion index, which is a measure of variability about the mean position. **Results.** ICCs ranged from 0.58–0.92 for the static platform, 0.46–0.83 for the linear translations, and 0.62–0.89 for the angular rotations. COBX was highly reliable for the static and moderately reliable for linear and angular testing protocols. COBY was not reliable for any test condition. Dispersion was moderately reliable only for the static and angular testing protocols. **Relevance to the Veteran Population.** Measures that were found to be highly or moderately reliable may be useful for demonstrating the progress in the rehabilitation of patients with hemiplegia.

David Levine, PhD, PT