

# ABSTRACTS OF RECENT LITERATURE

by

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Abstracts are drawn primarily from the orthotics, prosthetics, and sensory aids literature. Selections of articles were made from these journals:

*American Journal of Occupational Therapy*

*American Journal of Physical Medicine and  
Rehabilitation*

*American Journal of Sports Medicine*

*ASHA (American Speech and Hearing Association)*

*Bulletin of the Tokyo Metropolitan Rehabilitation  
Center for the Physically and Mentally  
Handicapped*

*Clinical Prosthetics and Orthotics*

*IEEE Transactions of Biomedical Engineering*

*Journal of Biomechanics*

*Journal of Medical Engineering and Technology*

*Journal of Speech and Hearing Research*

*Journal of Testing Evaluation*

*Journal of Visual Impairment and Blindness*

*Medicine and Science in Sports and Exercise*

*Orthopedics*

*Paraplegia*

*Physical Therapy*

*Rehabilitation Psychology*

*Research Quarterly of Exercise and Sport*

**Behbehani K, Kondraske GV, Richmond JR** (Biomedical Engineering Program, University of Texas, Arlington, TX 76019). Investigation of Upper Extremity Visuomotor Control Performance Measures. Reprinted from *IEEE Trans Biomed Eng* 35:518-525, 1988.

The need to characterize upper extremity performance is prompted by significant clinical as well as

industrial applications. This paper describes a performance measurement strategy based on engineering principles. Measures of movement speed, reaction speed, and coordination are obtained with a computer-based tracking task protocol to complement strength and range of motion measures. Proposed measures were evaluated in distinct studies. The first study, aimed at evaluating the stability and discrimination power of seven initial measures, involved 165 normal and 32 Parkinson patients and was carried out over a period of five years. Based on a need for further performance characterization, five additional measures were developed. A second study, involving 15 normal subjects, was conducted to investigate reliability for an expanded set of measures. Results of these studies demonstrate effective quantification of performance in both normal subjects and Parkinson patients and document reliability and discriminatory power of the measures. Measurands are discussed with regard to their interpretation in general human-task interface situations. [JEE]

**Branch T, Hunter R, Reynolds P** (Sports Medicine Institute, University of Minnesota, Minneapolis, MN 55455). Controlling Anterior Tibial Displacement Under Static Load: A Comparison of Two Braces. Reprinted from *Orthopedics* 11:1249-1252, 1988.

This article presents data comparing the restraining effect of the Lenox Hill® and the CTi brace to static loading using the KT-1000 Knee Ligament

Arthrometer. Testing was performed at 25 degree and 90 degrees in 15 patients with documented single ligament injuries involving the anterior cruciate. The opposite knee was determined to be normal by subjective and objective testing and was used as the control.

Results showed that the anterior drawer was more sensitive at 25 degrees than at 90 degrees, in differentiating the ACL-deficient knee from the control leg. At 25 degrees, using passive and active drawer tests, both the Lenox Hill and the CTi brace improved the ACL-deficient knee significantly. With 15 pounds of passive loading, both the Lenox Hill and the CTi brace improved the drawer to within normal limits. However, only the CTi brace was able to return the drawer to within the normal range at the 20 pound force level. Neither brace improved the drawer to normal when subjected to the higher loads created by an active drawer test. At 90 degrees, 15 pounds of passive loading could not discriminate between the braced and the unbraced knee or between the normal and ACL-deficient knee. [JEE]

**Burdett RG, Borello-France D, Blatchly C, Potter C** (University of Pittsburgh, Pittsburgh, PA 15261). Gait Comparison of Subjects with Hemiplegia Walking Unbraced, with Ankle-Foot Orthosis, and with Air-Stirrup® Brace. Reprinted from *Phys Ther* 68:1197-1203, 1988.

The effects of the Air-Stirrup® (AS) standard ankle brace on the gait of 19 subjects with hemiplegia resulting from a cerebrovascular accident who exhibited excessive subtalar joint motion were studied. Videotaped trials and footprint analyses were used to measure subjects' hip, knee, and ankle sagittal plane angles; inversion and eversion of the calcaneus; and time-distance gait characteristics. A one-way analysis of variance for repeated measures was used to compare the gait of 19 subjects with the AS brace and unbraced and 11 subjects with the AS brace, unbraced, and with an ankle-foot orthosis. The AS brace was associated with more calcaneal stability during standing than the unbraced condition. The ankle-foot orthosis was associated with less plantar flexion at foot-strike than either the AS brace or unbraced condition. Both the AS brace and the ankle-foot orthosis were associated with less mid-swing plantar flexion and increased step length

on the paretic side compared with no brace. These results support the effectiveness of the AS brace in controlling inversion and eversion instability in patients with hemiplegia. [JEE]

**Hamill J, Freedson PS, Boda W, Reichsman F** (Biomechanics and Exercise Physiology Laboratories, Department of Exercise Science, University of Massachusetts, Amherst, MA 01003). Effects of Shoe Type of Cardiorespiratory Responses and Rearfoot Motion During Treadmill Running. Reprinted from *Med Sci Sports Exerc* 20:515-521, 1988.

Running kinematics and physiological responses to high intensity submaximal treadmill running in training shoes and racing flats were evaluated. Eight women (mean age=21.9 years) completed a peak  $\text{VO}_2$  test on the treadmill (mean peak  $\text{VO}_2 = 49.2 \text{ ml kg}^{-1} \text{ min}^{-1}$ ). In two subsequent testing sessions, subjects completed 15-minute runs at a speed corresponding to 90 percent of peak  $\text{VO}_2$  (range=9.9–13.4  $\text{km hr}^{-1}$ ) while wearing training shoes and racing flats (balanced order assignment). No significant time effect or time by shoe condition interaction was observed for the rearfoot motion variables. Maximum rearfoot angle and total rearfoot motion averaged 42 percent and 13.9 percent higher, respectively, for the racing flat ( $P < 0.05$ ). There were significant increases over time for  $\text{VO}_2$ ,  $V_E$ , HR and RPE, indicating an increase in cardiorespiratory response and the perception of effort over the course of the 15-min run. Thus, metabolic and perceptual indications of fatigue at the end of the run emerged but were not accompanied by rearfoot motion changes in either running shoe. These results indicate that rearfoot motion is a function of shoe design and did not change during 15 minutes of high intensity running. [JEE]

**Heck SA** (Harborview Medical Center, Seattle, VA 98116). The Effect of Purposeful Activity on Pain Tolerance. *Am J Occup Ther* 42:577-580, 1988.

Thirty healthy college students participated in a study in which they duplicated a pattern on graph paper for 2 minutes while electrical stimulation was applied at a very unpleasant level. The volunteers also engaged in nonpurposeful activity, using a blunt stylus to trace an "X" repeatedly in one

square of graph paper. Stimulation varied from 1 to 333 microsecond pulse width, administered at two pulses per second. Physiologic responses were monitored continuously with a sensor attached to the contralateral hand. Heart rate and peripheral skin temperature were recorded.

The mean number of seconds of painful stimulation endured while performing purposeful activity was significantly greater than when individuals did nonpurposeful tracing. Heart rate and peripheral skin temperature, however, did not differ according to type of activity.

Purposeful activity can be used to manage pain by distracting one from noxious experiences. Work-hardening programs should replicate job requirements and be intrinsically purposeful. Without purposeful activity, subjects created their own distractions rather than interact with the external stimuli. [JEE]

**Isacson J, Brostrom L** (Department of Orthopedic Surgery, Karolinska Hospital, Stockholm, Sweden). Gait in Rheumatoid Arthritis: An Electrogoniometric Investigation. *J Biomech* 21:451-457, 1988.

Seventeen women with rheumatoid arthritis were examined. All were under 50 years of age and had mobile hips, ankles, and stable knees. None used a walking aid or had bone surgery. Eleven healthy women were also examined walking at voluntary speed, six healthy women walked at the same average speed as the arthritic patients. Gait was recorded by a three-dimensional goniometer monitoring hips, knees, and ankles while subjects walked on a treadmill. Subjects wore rubber shoes with heel and toe switches.

Clinical signs of arthritis were found in the knees and feet of 13 subjects. Twelve had painful knees, 17 had swollen knees, and one had genu valgum. Twelve ankles were painful and 10 had subtalar pain. Eight had metatarsal subluxation, and 14 had pain at the foot pad. One had pes valgus. None walked with a significant limp, yet the voluntary speed was half that of healthy women. Arthritic stride length and duration were reduced. Arthritic ankles had less plantarflexion at toe-off than normal ankles. Arthritic hips display more rotation, but less frontal motion than healthy subjects. Ankles and

feet show reduced internal rotation, adduction, and plantarflexion among arthritic subjects.

The primary abnormality appears to be the inability of the foot and ankle to act as support and stable lever for the leg at push-off. Increased hip rotation may be an attempt to avoid pressure on painful metatarsal heads by rotating the limb instead of pushing off energetically. A slight tendency to valgus angulation confirms clinical observation and may or may not result from abnormal foot motion. [JEE]

**Khalili D, Zomlefer M** (Robotics Laboratory, Department of Electrical Engineering and Computer Science, Santa Clara University, Santa Clara, CA 95053). An Intelligent Robotic System for Rehabilitation of Joints and Estimation of Body Segment Parameters. Reprinted from *IEEE Trans Biomed Eng* 35:138-146, 1988.

As an application of robotics in rehabilitation, a robotic system consisting of two planar robot arms, each with two degrees of freedom, is considered. This robotic system, when coupled across a human joint, provides a vehicle for rehabilitation of the joint following surgery or trauma. A novel approach for estimation of body segment parameters is formulated, which uses state and output information from the robot system to improve these estimates. In addition, redundant sensors are used to improve the accuracy of the estimates. First, the rationale for continuous passive motion (CPM) is described and a short history of body segment parameter estimation is provided. Next discussed is an interconnected robotic system which can provide continuous passive motion for a human limb and also estimate the limb segmental parameters. A procedure for body segment parameter estimation (BSP) is formulated and the incorporation of multiple/redundant sensors is presented. The dynamic equations for a single robot arm are provided and the system is simulated. Therapeutic applications of the robotic system are discussed and the sensitivity of the measured forces with respect to the robot arm joint angles is studied in order to find an optimum orientation of the system for the best possible estimation. The application of this system to both rehabilitation and sports medicine is also discussed. A description of this work has been presented in preliminary form elsewhere. [JEE]

**Koike K, Yamada S** (Tokyo Metropolitan Rehabilitation Center for the Physically and Mentally Handicapped, Tokyo 162, Japan). The TC Double Socket Prosthesis Series. *Bull Tokyo Metropolitan Rehabilitation Center for the Physically and Mentally Handicapped* 33-53, 1988.

A new above-knee prosthesis was devised with a thermoplastic double socket composed of an external socket attached to the lower parts and with a detachable internal socket. The original version, TC-1 had a metal valve. It was replaced by TC-2 which had a new rubber sheet valve. The TC-3 was developed for individuals with very short amputation limbs, and allowed a rolling motion between the two sockets. The TC-4 is the below-knee version. The TC-5 is an above-knee socket with the lateral quarter of the external socket removed to promote heat radiation. The TC-6 has an adjustable suction prosthesis for those with immature limbs.

The TC-1 overcame several disadvantages of the conventional rigid suction socket including weight, difficulties when obtaining favorable alignment within the socket, avoiding perspiration, and modifying the socket according to changes in amputation limb. It was also difficult to wear while seated, and therefore being comfortable was problematic. The TC-1 was developed in November 1978; the inner socket is made of low density polyethylene; the external socket is molded from low density polypropylene. Other plastics may also be used. More than 2,000 amputees wear the TC-1 and TX-2; breakage occurred in only one case. A telephone survey of 115 wearers revealed that nearly all approved of its light weight, comfort, and ease of handling in the sitting position. Substantial numbers also noted the cleanliness of the socket and reduction in perspiration problems. Pressure distribution studies involving a strain gauge revealed that pressure peaked at the beginning of stance and decayed more gradually at midstance than with rigid sockets. Pressure curves obtained with three sockets made over the same model for the same wearer revealed that the TC socket had lower and more uniform pressure than did the ISNY or conventional total-contact socket.

The TC-3 for the very short amputation limb consists of an external socket made of two portions; the endoskeletal modules are attached onto the lower half shell. The lower shell is attached by two

rolling joints at the medial and lateral walls of the external socket to the upper shell. This design has been fitted to over 40 persons since 1981, almost all of whom can increase step length, ascend low stairs leading with the prosthesis, and sit on the floor.

The TC-4 below-knee prosthesis has a flexible, transparent ionomer inner socket with a rubber sheet valve. Twenty individuals have worn the socket since 1981. The TC-5 developed for above-knee amputees since 1984 also has a rubber sheet valve. The TC-6 has been fitted to three young amputees since December 1987. [JEE]

**McFadyen BJ, Winter DA** (Department of Kinesiology, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada). An Integrated Biomechanical Analysis of Normal Stair Ascent and Descent. *J Biomech* 21:733-744, 1988.

Three healthy men each performed eight trials of stair ascent and descent. Data was collected beginning with right foot contact on the second step and ending with the next right foot contact on the fourth step. The staircase had four box modules and one rectangular module as the top platform. Risers were 22 cm and treads, 28 cm; total slope of the stairs was 37 degrees. Handrails were not available. Force plates were installed in the steps. Surface electromyograms were recorded simultaneously with frontal and sagittal cinematography. Rectus femoris, semitendinosus, tibialis anterior, medial gastrocnemius, and soleus were telemetered while vastus lateralis, gluteus maximus, and gluteus medius were connected to the processor. Foot switches were placed at the heel, first metatarsal, and toe. Data was normalized to a stance to swing ratio of 64 to 36. Analysis of intrasubject variability was performed for one subject who was compared with a statistical group of normals. Variation was higher for hip moments during stair walking as compared with level walking. Hip power was greater on the stairs, but ankle and knee joints had similar values for stairs and floors. Rectus femoris, medial gastrocnemius, and soleus were both above and below the activity in level walking. Tibialis anterior showed higher variation for descent but no difference between stair ascent and level walking. Gluteus medius and maximus, and vastus lateralis had lower variability during ascent and descent as compared with level walking.

Intersubject variability indicated all joint angles and knee kinetics were highly correlated with modes of stair walking. Knee and ankle extensors contributed strongly to stair gait. Hip joint moments deviated the most among subjects, especially during ascent. There was never substantial vertical motion without forward translation. Walking up stairs involved the concentric contraction of quadriceps and triceps generating internal energy. Descent was achieved by gravity controlled by eccentric contractions of the same muscles. Stance phase was divided into weight acceptance, pull-up, and forward continuance. Swing was divided between foot clearance and foot placement. [JEE]

**Messier SP, Pittala KA** (J.B. Snow Biomechanics Laboratory, Department of Health and Sport Science, Wake Forest University, Winston-Salem, NC 27109). Etiologic Factors Associated with Selected Running Injuries. Reprinted from *Med Sci Sports Exerc* 20:501-505, 1988.

The purpose of this study was to determine whether a relationship exists between selected biomechanical, anthropometric, and training variables and runners afflicted with one of the following injuries: iliotibial (IT) band friction syndrome, shin splints, and plantar fasciitis. Competitive and recreational runners were divided into a noninjured control group (N=19), an IT band friction syndrome injury group (N=13), a shin splint injury group (N=17), and a plantar fasciitis injury group (N=15). Discriminant function analysis of the biomechanical data revealed two significant ( $P < 0.05$ ) discriminators between the control and shin splint groups; maximum pronation velocity and maximum pronation. Analysis of the anthropometric and training data revealed that plantar flexion range of motion was a significant ( $P < 0.05$ ) discriminator between the control and plantar fasciitis groups. In addition, analysis of the descriptive statistics (mean  $\pm$  SE) identified some nonsignificant ( $P > 0.05$ ) trends between the injury and control groups: maximum pronation, total rearfoot movement, and maximum velocity of pronation were greater in the injury groups; the injury groups showed a trend toward a higher arch; dorsiflexion range of motion was less in the shin splint group; a greater percentage of injured runners had a leg length difference ( $> 0.64$  cm); 20 percent more

runners in the injury groups ran hills; and 20 percent more of the runners in the IT band friction syndrome group ran on crowned roads. [JEE]

**Michael J** (Duke University Medical Center, Durham, NC 27710). Component Selection Criteria: Lower Limb Disarticulations. *Clin Prosthet Orthot* 12:99-108, 1988.

Hip disarticulation and hemipelvectomy prostheses use endoskeletal components that are lightweight and cosmetic. The hip allows free motion, with stride length controlled by a spring or elastic flexion-limiting apparatus. Manual locking hip joints are rarely required. The hip joint may be a reversed polycentric knee disarticulation joint offering increased ground clearance and enhanced stance stability. An alternate hip system includes a spring which encircles the pylon; the spring is compressed during early stance and releases kinetic energy in late stance. The single axis/constant friction knee unit is the most common because of its lightness, economy, and durability. The friction brake stance control knee is the second most common unit. Polycentric knees offer maximum stance stability. Fluid, controlled units provide a smoother gait. The solid ankle cushion heel foot is most popular, although the single-axis foot is used when more stability is needed. Multiaxial designs are also used, as are the newer flexible keel designs which offer a more rapid cadence. The more responsive the foot mechanism, the more important knee resistance becomes. Torque-absorbing units reduce shear force. Transverse rotation units installed above the knee facilitate automobile entry.

For the knee disarticulation prosthesis, single pivot external knee hinges are traditional, although they lack swing phase friction and wear rapidly. A yoke attachment permits use of a fluid-controlled cylinder. Alternatively, a polycentric hinge provides a more acceptable mediolateral silhouette, and can accommodate a fluid-controlled unit. Polycentric units create relative shortening of the shank when the user sits, and may lift the foot off the floor. If the polycentric unit proves fragile for a vigorous patient, then an above-knee set-up may be installed, although it causes the knee to protrude by at least two inches. All foot-ankle units can be used, although the flexible keel designs, with or without a torque-absorbing unit, are preferred.

The ankle disarticulation and Syme's prostheses cannot use an articulated ankle mechanism because of space limitations. Current choices are special versions of the solid ankle cushion heel, stationary ankle flexible endoskeleton, or Carbon Copy II. [JEE]

**Murray DD, Hartvikson WJ, Anton H, et al.** (Shaughnessy Hospital, Vancouver, British Columbia V6H 3M1, Canada). With a Spring in One's Step. *Clin Prosthet Orthot* 12:128-135, 1988.

Thirty-one adults responded to a questionnaire comparing their reactions to the SEATTLE Foot and the foot previously worn. They ranged in age from 24 to 72 years; most received a prosthesis within one year after amputation. The most common original foot was the SACH Foot, with the single-axis next most frequently worn. Length of time for use of the SEATTLE Foot averaged 8.5 months. Subjects included 29 below-knee and two above-knee amputees. Four-fifths of the entire group found the heel stiffness in the SEATTLE Foot acceptable and felt they had good ankle motion with the newer foot. Slightly more than half felt the SEATTLE Foot decreased shock stress. Seven-eighths reported that their gait was better with the SEATTLE Foot, particularly the toe-off action. Half of the respondents said the Foot made a difference in their recreational pursuits, including walking, stair climbing, hiking, dancing, and jogging. Balance, endurance, and smoothness of gait were improved. Three-quarters of the group stated that uneven terrain was easier to negotiate with the SEATTLE Foot, even though it did not provide as much forefoot flexibility in the frontal plane as does an articulated foot. Nearly all appreciated the anatomical detail of the Foot. Two-fifths felt that residual limb pain was decreased, and more than half had fewer skin problems with the new foot.

One subject participated in an electrogoniometric evaluation, comparing the SACH Foot and SEATTLE Foot with the intact side. Hip motions were the same for both feet and the intact side. The SEATTLE Foot produced more consistent internal/external knee rotation and varus/valgus than did the SACH Foot. The SEATTLE Foot also produced more repeatable foot patterns, including forefoot abduction/adduction, plantarflexion/dorsiflexion,

and inversion/eversion. The pattern of plantarflexion/dorsiflexion with the SEATTLE Foot more closely resembled that of the intact side. The same individual participated in force plate studies. The initial peak response is greater for SACH than for the SEATTLE Foot, suggesting more effective shock absorption with the latter. The second peak is greater for the SEATTLE Foot than for the SACH Foot. The midstance trough approaches that of the intact limb. [JEE]

**Nigg BM, Herzog W, Read LJ** (Biomechanics Laboratory, University of Calgary, Calgary, Alberta T2N 1N4, Canada). Effect of Viscoelastic Shoe Insoles on Vertical Impact Forces in Heel-Toe Running. *Am J Sports Med* 16:70-75, 1988.

Sixteen healthy male heel-strike runners tested two pairs of running shoes, one pair had a horseshoe-shaped rearfoot stabilizer. Five different insoles were used: EVA, two commercial viscoelastic insoles, and two experimental viscoelastic types. Hardness was quantified by SHORE value. Thickness was measured at the heel. Markers were placed on the posterior leg and shoe to quantify rearfoot movement. Lateral markers were also used on the leg and shoes. Subjects ran over a force platform and were filmed in two planes. Mean values for vertical impact force and time of impact force did not change for different insoles. Loading rate for the EVA insole was significantly lower than for commercial viscoelastic insoles. Time of maximal loading rate for the regular insole was significantly later than for two test insoles. The regular insole shoe had significantly lower change in rearfoot angle than the commercial viscoelastic insole. There were no significant differences among insoles for any variables describing Achilles tendon angle.

The results of this study showed no significant difference in maximum vertical impact forces and time of force occurrence among insoles. The regular insole with heel stabilizer showed lower maximal vertical loading rate. These results differed from those of previous studies, possible because this study considered running rather than walking, or that different insoles were examined, or that different methodologies were used. This study showed that the regular insole had less initial and total pronation than other insoles; this may be due to the lower heel position in the regular shoe, with a consequently

lower axis of subtalar rotation and decreased moment of ground reaction force through the subtalar joint. The heel stabilizer affected the variables of interest more than the insoles. [JEE]

**Parry H, Delargy M, Burt A** (Yorkshire Regional Spinal Injuries Centre, Pinderfields General Hospital, Wakefield, West Yorkshire, England). Early Mobilization of Patients with Cervical Cord Injury Using the Halo Brace Device. *Paraplegia* 26:226-232, 1988.

The halo was fitted to patients with cervical bony injury as soon as possible after transfer to the Spinal Injuries Unit. Any skull calipers were removed. Pins were screwed in at four points on the skull with a torque of 6 inch pounds. Pin sites were cleaned daily and Cicatrin Powder dusted at the base. Traction up to 55 pounds was applied. If unsuccessful, operative reduction and fixation was performed. After reduction, a sheepskin-lined thoracic brace was connected to the halo. After a satisfactory seated x-ray, a full rehabilitation program ensued. Relatives were taught how to give subcutaneous heparin at home. Patients had day or weekend leave. The halo and jacket remained for 10 to 12 weeks, after which no further orthosis was used.

During the past two years, 23 patients have been referred. Three were unsuitable for halo bracing because of clavicular fracture, abdominal trauma, or rising neuropathy. The halo reduced the dislocation in 18 patients, eight of whom had complete cord injuries from odontoid to C7. Three patients with later deterioration in fracture alignment had operative fixation without removal of the halo ring. Most patients were mobilized within two weeks of the accident. Two individuals who developed scapular abrasions 8 weeks post-injury had the halo replaced with a SOMI orthosis. Gymnasium rehabilitation began on an average of 3 three weeks post-injury, and patients had home leave on an average of 7 weeks post-injury. The only delay in discharging patients was unsuitable accommodation. Patients and relatives have not complained of coping with the halo; most patients feel safer with it than when on bed rest with regular turning.

Of 20 patients treated with skull calipers and bed rest, two had slippage and four developed pin site infections. Mobilization started at 8 weeks, and home leave commenced on the average of 8 weeks

for those with incomplete lesions, and 14 weeks for patients with complete transection. [JEE]

**Peter RE, Bachelin P, Fritschy D** (Clinic of Orthopaedic Surgery, University Hospital, 1211 Geneve, Switzerland). Skiers' Lower Leg Shaft Fracture: Outcome in 91 Cases Treated Conservatively with Sarmiento's Brace. *Am J Sports Med* 16:486-490, 1988.

Ninety skiers, one with bilateral fractures, were treated with functional bracing. The average age was 34 years. Ninety fractures were closed; 84 were spiral fractures; 79 were associated with fibular fracture. The treatment protocol required that all simple diaphyseal closed tibial fractures be treated conservatively; operative fixation was limited to unstable fractures or those associated with polytrauma. Undisplaced and transverse fractures were immediately immobilized in a long leg cast at 30 degrees of knee flexion. Those with displacement or shortening had a transcaneal pin traction of 3.5 kg for an average of 14 days, and radiographs at 2, 4, 7, and 14 days to monitor axes and leg length. The pin was incorporated in the cast and extracted through the cast when stability was sufficient, usually 15 days after casting. The cast was removed at approximately 6 weeks after injury, when an Orthoplast fracture brace was formed on the leg. An adapted plastic foot insert allowed for ankle motion. Weight bearing began with sole contact and two crutches; one crutch was eliminated after 2 weeks, and both at 4 to 5 weeks. The brace was removed upon radiographic and clinical evidence of healing.

Average hospitalization was 19 days. Average healing time for those whose fractures healed completely at removal of the brace was 90 days. No one had knee or heel contracture of more than 20 degrees; thigh and calf atrophy was minimal, and gait and function were excellent. One patient had nonunion with the brace, and four complained of skin irritation and itching, one woman had foot edema, and two had transient hypoesthesia over the dorsal foot. One patient had shortening more than 10 mm. Frontal plane angulation was minimal, with 97 percent having less than 4 degrees varus. Ninety-five percent had less than 2 degrees of sagittal angulation. Nearly all had no rotational deformity. Average time from work was 103 days, although 14 returned to work before brace removal. Average

time to return to sport was 7.9 months, and approximately half of the patients skied the next season. Ten patients reported occasional pain the followup questionnaire, averaging 5 years post-injury. [JEE]

**Robbins SE, Hanna A, Jones LA** (Human Performance Group, Concordia University, Montreal, Quebec, Canada). Sensory Attenuation Induced by Modern Athletic Footwear. Reprinted from *J Test Eval* 16:412-416, 1988.

Disorders that impair sensory perception can cause serious injury. It has been proposed that many running-related injuries may result from wearing athletic footwear which induces changes in the perception of loads encountered during running. To test this hypothesis a psychophysical investigation was performed in which subjects were required to give numerical estimates of the perceived magnitude of a load experienced on the plantar surface. The loads were applied to the flexed knee, and the foot was supported on one of three different weight-bearing surfaces.

The results indicated that there was a linear relation between the size of applied load and the perceived magnitude of this load on all three surfaces tested. Subjects consistently underestimated the magnitude of the loads applied, with the greatest underestimation occurring when the foot was either on a rigid plastic surface or wearing athletic footwear. The exponents of power functions fitted to these data were all close to one which is similar to the values obtained in studies of the perception of skin indentation on the palmar surface.

The results from this study support the hypothesis that athletic footwear can attenuate the perceived magnitude of loads experienced on the plantar surface. This change in the perception of load may be a factor in running-related injuries for which the term *pseudo-neuropathic* is proposed, since there are no preexisting neurological deficits.

This experiment alerts one to the need for product safety standards, particularly for athletic footwear, so that the public can be protected from the dangers that may be inherent in their design, since these devices are promoted for use in high-impact environments. [JEE]

**Robinett CS, Vondran MA** (St. Mary of the Plains Hospital, Lubbock, TX 79410). Functional

Ambulation Velocity and Distance Requirements in Rural and Urban Communities: A Clinical Report. Reprinted from *Phys Ther* 68:1371-1373, 1988.

The purposes of this clinical report are: 1) to document the distances and velocities that individuals must ambulate to function independently in their community; and, 2) to demonstrate the differences in travel distances and velocities among communities of various sizes. In seven communities of different sizes, we measured distances from a designated parking space to commonly frequented sites (e.g., stores, post offices, banks, and medical buildings). We also measured street widths and the time allowed by crossing signals to cross streets safely. From these data, we calculated the velocities needed to safely cross streets in each community. The study results showed that ambulation distances and velocities vary depending on the size of the community and that for individuals to function independently within their community, they must ambulate at velocities and distances much greater than the ambulation objectives that may be set at most rehabilitation settings. Based on the results of this study, we suggest that rehabilitation centers take distance measurements of communities from which they receive the majority of their patients to more accurately prepare patients for functional independence after rehabilitation discharge. [JEE]

**Rossi WA** (William A. Rossi Associates, Marshfield, MA 02050). The Futile Search for the Perfect Shoe Fit. Reprinted from *J Test Eval* 16:393-403, 1988.

The common assumption that perfect or correct shoe fit can be expected if the shoe and fitting are proper is untenable for a variety of reasons. For instance, no two feet of a pair are exactly alike, inevitably resulting in some degree of shoe misfit. Also, the foot assumes four different sizes and shapes under different conditions: at rest, on weight-bearing, in gait, and under thermal variations, yet all must comply to a shoe of only one size and shape.

The complexities of shoe fit are further exacerbated by other obstacles. These include the prevailing design of shoe lasts, the absence of uniformity of shoe sizes, the limited training and skills of most shoe salespeople and fitters, the subjective determi-

nation of shoe fit by customer and fitter alike, and the role of footwear fashions.

Hence shoe fit at best must be a compromise with the ideal. Nevertheless, improvements are possible, as suggested in this paper. [JEE]

**Scott RN, Parker PA** (Bio-Engineering Institute, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada). Myoelectric Prostheses: State of the Art. *J Med Eng Technol* 12:143-151, 1988.

The discussion concentrates on arm prostheses which have existed for decades. A person with one normal arm can function independently without a prosthesis. However, those with acquired bilateral arm amputation or congenital defects in the arms and legs must have prostheses for independence. Many who could be independent without prostheses are candidates for powered ones that provide more function and improved appearance. Below-elbow amputation is the most common condition for powered prostheses. For those with unilateral amputation, the prosthesis is an assistive device. Bilateral amputations results in lost sensory input and a need for performance beyond simple grasping. Above the elbow, complexity of function and power increases rapidly. Technical feasibility, rather than clinical priority, explains why most powered prostheses are used by those with unilateral below-elbow amputation.

All clinical powered prostheses use rechargeable batteries. Control may be achieved by an electromechanical switch operated by body movement or by cables. Such a system is difficult to keep adjusted, and cables are unsightly and inconvenient. Myoelectric prostheses require minimal physical effort and rarely need adjustment. They are usually self-suspending and self-contained. The electrical activity of a contracting muscle is the control signal. More than a thousand feasible commercial alternative configurations for a below-elbow prosthesis exist. In contrast, appropriate powered components for higher level amputation are not available. Control systems may have built-in controls, or stand-alone controls to be used with different battery options. Clinical acceptance of myoelectric fitting has been achieved, particularly the trend toward early fitting despite lack of data showing this to be cost effective. The myoelectric hands have

good appearance, but offer only simple grasp and speed slower than a normal hand. No sensory feedback is provided and the outer glove is not durable. Problems with wrist rotation units and powered elbows for those with elbow disarticulation remain. The most widely used control system is a two-site two-state control requiring the person with amputation to learn how to produce isolated contractions of two muscles.

The article includes discussion of multifunction prostheses and future developments in the field. [JEE]

**Staros A, Schwartz RS** (Rehabilitation Management and Technology, Inc., New York, NY 10016). Custom Footwear: The Role of Computer-Aided Engineering. Reprinted from *J Test Eval* 16:417-420, 1988.

We propose that research be performed to specify the computer-aided engineering required in custom footwear production. Presently, custom shoes for orthopedic conditions and for very active athletes must be derived from casts representing foot topography or wood lasts which must be modified by hand to represent the essential biomechanical features. Three-dimensional (3-D) imaging technology should be accessed for application to this problem. In replacing the cast and last skill-based techniques, the proposed system would record surface and underlying bony topographies for display and operator modifications made interactively on the computer screen. Software, like the operator intervention, would introduce biomechanical requirements of pathology or of special service demands, as in sports. Pressure mapping can also be introduced to display how shape modifications affect the critical force (shear) patterns on the foot. Stages are proposed in the development of a complete system for the provision of custom footwear, making such footwear accessible to an increased proportion of the nation's population. [JEE]

**Stern PH** (Burke Rehabilitation Center, White Plains, NY 10605). Occlusive Vascular Disease of Lower Limbs: Diagnosis, Amputation Surgery and Rehabilitation. Reprinted from *Am J Phys Med Rehabil* 67:145-154, 1988.

This review is concerned with the epidemiology of lower limb amputations, frequency and results of

limbsaving procedures, and the contemporary management of dysvascular amputees. National data showed no decline in the number and rates of amputations from 1981-1985, but the frequency of bypass surgery increased indicating that the problem of peripheral arterial occlusive disease is far from being resolved. Femoral/popliteal bypasses are performed twice as often as aorto/ileac procedures but failure rates are high. Based on observations of 238 amputees we noted that femoral/popliteal bypasses had the highest failure rate, particularly when performed as a last limbsaving effort. A laudable trend of preserving the knee was noted but poor stump conditions were the most important factors influencing the length of hospital stay (average 51 days). The amputee rehabilitation process is discussed along with a description of contemporary prosthetic technology. The cost effectiveness of state of the art devices for the older dysvascular amputee is questioned. The cost of amputation and rehabilitation is enormous, especially when preceded by unsuccessful arterial reconstruction. The loss of a leg is, of course, a major disaster for every individual and therefore limbsaving efforts and amputation techniques must be refined and the rehabilitation effort optimized. [JEE]

**Stuberg WA, Colerick VL, Blanke DJ, Bruce W** (University of Nebraska Medical Center, Omaha, NE 68131). Comparison of a Clinical Gait Analysis Method Using Videography and Temporal-Distance Measures with 16-mm Cinematography. Reprinted from *Phys Ther* 68:1221-1225, 1988.

The purpose of this study was to compare a clinical gait analysis method using videography and temporal-distance measures with 16-mm cinematography in a gait analysis laboratory. Ten children with a diagnosis of cerebral palsy ( $\bar{X}$  age = 8.8 ppm 2.7 years) and 9 healthy children ( $\bar{X}$  age = 8.9  $\pm$  2.4 years) participated in the study. Stride length, walking velocity, and goniometric measurements of the hip, knee, and ankle were recorded using the two gait analysis methods. A multivariate analysis of variance was used to determine significant differences between the data collected using the two methods. Pearson product-moment correlation coefficients were determined to examine the relationship between the measurements recorded by the two methods. The consistency of performance of the

subjects during walking was examined by intraclass correlation coefficients. No significant differences were found between the methods for the variables studied. Pearson product-moment correlation coefficients ranged from 0.79 to 0.95, and intraclass coefficients ranged from 0.89 to 0.97. The clinical gait analysis method was found to be a valid tool in comparison with 16-mm cinematography for the variables that were studied. [JEE]

**Triolo RJ, Nash DH, Moskowitz GD** (Shriners Hospital for Crippled Children, Philadelphia, PA 19152). The Identification of Time Series Models of Lower Extremity EMG for the Control of Prostheses Using Box-Jenkins Criteria. Reprinted from *IEEE Trans Biomed Eng* 35:584-594, 1988.

Orders and structures of time series models of the EMG used for prosthetic control purposes are often chosen arbitrarily and assumed to be static and time invariant. In this study, the Box-Jenkins method of model identification and diagnostic checking was used on the EMG of the postero-lateral thigh while contraction level, electrode position, and limb function were varied. Models remained exclusively autoregressive (AR) of order typically less than five for isometric contractions ranging from 25 to 50 percent of the maximum voluntary knee flexions and extensions, and for recording sites located within 30-mm of the original electrode position. Diagnostics performed on the residuals from AR (4) models indicate that a fourth order model may be adequate for myoelectric control applications under many circumstances. [JEE]

**Van der Woude LHV, Veeger HEJ, Rozendal RH, et al.** (Department of Functional Anatomy, Free University, Amsterdam, Netherlands). Wheelchair Racing: Effects of Rim Diameter and Speed on Physiology and Technique. Reprinted from *Med Sci Sports Exerc* 20:492-500, 1988.

Effects of different hand rim diameters in wheelchair racing were studied with respect to physiological and technique parameters at five speed levels ( $N = 8$  wheelchair sportsmen). In each of five subsequent 15-min exercise tests on a treadmill, a different sized hand rim was mounted to the rear wheels (0.3, 0.35, 0.38, 0.47, 0.56 m). In each test, speed increased with 0.83 m/s<sup>-1</sup> every 3 min, starting at

0.83 m/s<sup>-1</sup> and ranging up to 4.17 m/s<sup>-1</sup> (slope: 0.5 degrees). Cardiorespiratory responses (ventilation, oxygen cost, heart rate, respiratory exchange ratio, mechanical efficiency) and timing data (cycle time, push time, recovery time, push angle, and work per cycle) were obtained every third min, together with the movement pattern of trunk and arm segments. Clear effects of rim diameter and speed were seen for the physiological parameters ( $P < 0.05$ ). In physiological terms, D5 appeared the least beneficial, followed by D4. Moreover, increasing rim diameter had a significant effect on movement pattern of the upper arm in the sagittal as well as the frontal plane of motion. However, no timing effects were seen with changing rim diameter. On the other hand, timing parameters varied markedly with speed, whereas the segmental excursions of the upper limb did not show a "speed-effect." In general, small hand rims show lower cardiorespiratory responses. This may be related to the decreased segmental excursions of the upper limb and the lower linear hand velocity. Together with a low-rolling and air drag, heart rate, and oxygen cost, these are important prerequisites in racing events. Regulation of propelling speed primarily appears to be a matter of the timing parameters studied and the amount of work per cycle. [JEE]

**Williams R, Taffs L, Minuk T** (Henderson General Hospital, Hamilton, Ontario L8V 1C3, Canada). Evaluation of Two Support Methods for the Subluxated Shoulder of Hemiplegic Patients. Reprinted from *Phys Ther* 68:1209-1214, 1988.

One of the most troublesome complications in the rehabilitation of hemiplegic patients is inferior subluxation of the glenohumeral joint. The purpose of this study was to determine which of two shoulder supports, the Bobath shoulder roll or the Henderson shoulder ring, would be more effective in the management of hemiplegic patients with a subluxated glenohumeral joint. To determine the degree of subluxation and the amount of reduction after application of a shoulder support, radiographs were taken of 26 hemiplegic patients with subluxated shoulders. Radiographs of the unsupported affected shoulder were compared with radiographs of the same shoulder with each support applied. Radiographs of the unaffected shoulder were used as a comparison in determining the amount of subluxation.

An analysis of variance revealed no significant difference in the reduction of inferior subluxation between the two types of shoulder support. A significant difference in subluxation, however, existed between measurements of the unsupported affected shoulder and the unaffected shoulder ( $p < .001$ ) and between measurements of the unsupported affected shoulder and the supported affected shoulder ( $p < .001$ ). The results of this study demonstrate the benefits of the Bobath shoulder roll and the Henderson shoulder ring in the management of hemiplegic patients with subluxated shoulders. [JEE]

**Winter DA, Sienko SE** (Department of Kinesiology, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada). Biomechanics of Below-Knee Amputee Gait. *J Biomech* 21:361-367, 1988.

Five individuals with below-knee amputation were assessed with a synchronized cine and force plate data collection system while walking along a 10-meter walkway at natural cadence. All had SACH feet; however, two were also evaluated wearing a single-axis foot and one wore a Greissinger foot. Three had a complete electromyographic profile of gluteus maximus, biceps femoris, semitendinosus, rectus femoris, and vastus lateralis recorded with surface electrodes.

All trials were compared with normalized profiles of individual with no amputations, drawn from studies of 19 subjects. For the subjects with amputation, the average stride length was 1.27 m, average velocity was 0.97 ms<sup>-1</sup>, and average cadence was 92 steps per minute as compared to 105 steps per minute for those with no amputations. The subjects with amputations exhibited a dorsiflexor moment for the first 18 percent of stride, compared with 6 percent for normal subjects who lowered the foot rapidly under dorsiflexor control. Amputee subjects with rigid ankles generated an internal dorsiflexor moment from heel contact until foot flat, which took longer. The subjects with amputations developed between 60 to 70 percent of the power generated by the normal subjects during midstance, who caused active and rapid plantarflexion of the foot. Energy was absorbed by the prosthetic foot during midstance, either dissipated by the SACH viscous material or stored in the spring mechanism of the single axis or Greissinger foot. Some energy

was returned during push off by single axis and Greissinger feet, which returned 20 and 30 percent respectively. The knee moment of force was very low during early stance, but within normal range during late stance. Subjects with amputations never had significant extensor moment. Hip moments for them were highly variable, but the average was a strong burst during early stance to compensate for lack of energy generation by plantarflexors. Hamstrings acted as hip extensors but also produced an above normal knee flexor moment cancelled by quadriceps action. [JEE]

**ASHA Committee on Audiologic Evaluation.** Telephone Hearing Screening. *ASHA* 30(11):53, 1988.

The committee concludes that screening by telephone has "numerous limitations that restrict its potential usefulness. As a consequence, telephone hearing screening should be viewed with caution until its validity and efficacy are demonstrated." [JDS]

**Beck JG, Scott SK, Teague RB, Perez FI, Brown GA** (University of Houston, TX). Correlates of Daily Impairment in COPD. *Rehabil Psychol* 33:77-84, 1988.

Self-assessments of difficulty performing 10 tasks of daily living and of emotional state (SCL-90-R) were made by 10 female and 6 male patients suffering from chronic obstructive pulmonary disease. Degree of pulmonary function was determined by spirometry. Moderate correlations (0.40+) were obtained between severity of pulmonary involvement and eating, walking uphill, and stair climbing. No significant correlations emerged between SCL-90-R scores and the spirometry measure, but partial correlations between emotional scales and activities of daily living with spirometry as the independent variable were significant, and of moderate size for somatization subscales and 8 of 10 daily-living activities. "Based on the correlation patterns observed, it would appear that interventions designed to help patients cope more effectively with the physical [rather than affective] manifestations of their disease would be useful." [JDS]

**Boothroyd A, Springer N, Smith L, Schulman J** (City University of New York, NY). Amplitude

Compression and Profound Hearing Loss. *J Speech Hear Res* 31:362-376, 1988.

Researchers administered a 3-interval, forced-choice test of speech pattern contrast perception under two conditions of amplification to 9 prelingually deaf students. Using a master hearing aid, test stimuli were first adjusted to the students' most comfortable listening levels for low and high frequencies. Testing was continued with compression of a 30 dB input range within the students' dynamic range of hearing. Performance of a single student improved with compression, but declined significantly, though slightly, for the other eight. Authors interpret the findings as meaning that amplitude compression added to otherwise optimal signals is useless or detrimental for most profoundly deaf persons "but could be beneficial for some." [JDS]

**Buckelew SP, Burk JP, Brownlee-Duffeck M, Frank RG, DeGood D** (University of Missouri School of Medicine, Columbia, MO). Cognitive and Somatic Aspects of Depression Among a Rehabilitation Sample: Reliability and Validity of SCL-90-R Research Subscales. *Rehabil Psychol* 33:67-75, 1988.

Seventy-eight patients with chronic pain, 52 with spinal cord injuries, and 145 college students took the SCL-90-R. Coefficient alphas were 0.69 for the Somatic Depression subscale and 0.91 for Cognitive Depression. Correlation between Somatic Depression and SCL-90-R Somatization was 0.66, between Cognitive Depression and Obsessive Compulsion 0.78. However, the two depression scales were also moderately correlated with all other subscales of the SCL-90-R, leaving divergent validity doubtful. While diagnostic groups did not differ in overall depression, those with spinal-cord injuries had lower cognitive symptoms than either the pain or control groups. Authors question psychiatric diagnoses of depression in medical patients whose depressive symptoms are largely somatic. [JDS]

**Carney AE** (University of Illinois, Champaign, IL). Vibrotactile Perception of Segmental Features of Speech: A Comparison of Single-Channel and Multichannel Instruments. *J Speech Hear Res* 31:438-448, 1988.

Artificially deafened by masking noise, 11 women and 1 man who were naive to tactile stimulation and lipreading instruction were assigned to either a single or a multichannel tactile vibrotactile aid. Following training, subjects were tested for consonant and vowel recognition with visual only, tactile only, or tactile and visual stimulation. The two tactile devices were not associated with any significant differences after short-term training. [JDS]

**Chertoff ME, Goldstein R, Mease MR** (University of Wisconsin, Madison, WI). Early Event-Related Potentials with Passive Subject Participation. *J Speech Hear Res* 31:460-465, 1988.

Nine women and 1 man, ranging in age from 21 to 32 years, naive to the procedure and audiologically normal, lay on a cot in a soundproof booth—while EEG activity was recorded as 250 signals were presented the first day 225 at 75 dB nHL and 25 at 60 dB nHL—and the second day, 250 all at 60 dB nHL. Action-evoked potentials for the frequent signal subtracted from the infrequent signal peaked at 175 ms, with a smaller negative difference at about 75 ms. The data for the steady condition were virtually a straight line. [JDS]

**Clark-Carter DD, Heyes AD, Howard CI** (University of Nottingham, England). Secondary Task as a Measure of Mental Effort: A Reappraisal. *J Vis Imp Blind* 82:286-287, 1988.

A normally sighted individual skilled in the use of the long cane traversed routes blindfolded while responding to an impulse directed to either wrist by depressing a button corresponding to that wrist on a keypad held in one hand. As route difficulty increased, secondary-task performance and walking speed declined. But once these data were corrected for obstacle encounters, the secondary-task data remain almost constant. The authors conclude that walking speed is a preferable measure of mental effort required by blind pedestrians during independent travel. [JDS]

**Crystal TH, House AS** (Institute for Defense Analyses, Princeton, NJ). A Note on the Variability of Timing Control. *J Speech Hear Res* 31:497-502, 1988.

Connected-speech signals collected from 3 fast and 3 slow talkers were analyzed. Duration data for several sound categories showed strong relationships. Authors conclude that the findings support the general rule that “slow speakers are more variable in timing control than fast speakers.” However, other questions remain: What kind of model will fit the relevant acoustic-phonetic parameters? Can research on speech-sound durations identify dispersion measures for assessing developmental maturity? [JDS]

**Doherty ET, Shipp T** (VA Medical Center, San Francisco, CA). Tape Recorder Effects on Jitter and Shimmer Extraction. *J Speech Hear Res* 31:485-490, 1988.

Using five sinusoids as test signals to detect acoustic contamination, the author tested four tape recorders represented by Ampex ATR-102, Honeywell 7600 FM tape recorder, Technics RS-M95 audio cassette recorder, and a Sony PCM-501ES digital audio processor. Direct sampling or a video cassette recorder with pulse code provides the best estimation of jitter and shimmer; audio cassette recorders are poorest. [JDS]

**Fukawa T, Yoshioka H, Ozawa E, Yoshida S** (University of Tsukuba, Japan). Difference of Susceptibility to Delayed Auditory Feedback between Stutters and Nonstutterers. *J Speech Hear Res* 31:475-479, 1988.

Under amplified delayed auditory feedback (DAF), 40 stutterers proved significantly more susceptible to disruption of their reading performances than 40 nonstutterers. Sex differences within and between stuttering groups were not significant; however, females proved less affected by DAF. Authors believe that stutters depend on auditory feedback more than nonstutterers. [JDS]

**Kamen G, Morris HH** (Indiana University, Bloomington, IN). Differences in Sensorimotor Processing of Visual and Proprioceptive Stimuli. *Res Quart Exerc Sport* 59:29-34, 1988.

Can individuals be taught to overcome the dominance of a visual stimulus in favor of a more efficient proprioceptive stimulus when both are

present? Twenty-seven young adults were trained for four days to respond to visual, proprioceptive, or both stimuli presented simultaneously. On the last three days various reaction times were determined using each of the three stimuli successively. The visual dominance effect was not found. Order of testing was significant, with the group receiving proprioceptive, visual-proprioceptive, visual stimuli being fastest, and the group receiving visual, proprioceptive, visual-proprioceptive stimuli being slowest. Results support the notion that visual dominance is not due to inherent latencies in the nervous system but is learned. Among other findings of interest, researchers demonstrated that the interval between initial motor unit firing and initiation of movement can be influenced by changes in sensory conditions. [JDS]

**Karnell MP, Linville RN, Edwards BA** (University of Chicago, Chicago, IL). Variations in Velar Position Over Time: A Nasal Videoendoscopic Study. *J Speech Hear Res* 31:417-424, 1988.

An adult female with no craniofacial anomalies and an adult male with a repaired bilateral cleft lip but no presently significant speech disorder produced strings of CV repetitions at various rates while measurements were taken with a flexible endoscopic camera, pressure transducer, and strain gauge. Changes in velar position were coordinated with syllable production: peak velar displacement occurred during maximum oral closure for oral consonants and was followed by lowering of velar position during vowel production. Neither changes in speaking rate nor jaw fixation affected velar movement. These and related findings have special significance for patients with marginal velopharyngeal incompetence. [JDS]

**Karnell MP, Seaver EJ, Dalston RM** (University of Chicago, IL). A Comparison of Photodetector and Endoscopic Evaluations of Velopharyngeal Function. *J Speech Hear Res* 31:503-510, 1988.

A male and a female adult, both without speech disorders, were simultaneously assessed by videoendoscope and photodetector while speaking a selected sentence. Both procedures appeared to have good reliability, though the endoscope test-retest reliability was poorer when velopharyngeal port was

maximally open. Authors suggest using them together. [JDS]

**Laine T, Warren DW, Dalston RM, Hairfield WM, Morr KE** (University of North Carolina, Chapel Hill, NC). Intraoral Pressure, Nasal Pressure and Airflow Rate in Cleft Palate Speech. *J Speech Hear Res* 31:432-437, 1988.

Ninety women and 121 men, ranging in age from 4 to 66 years, with cleft palates or inadequacies of the velopharyngeal mechanism said the word /hamper/ repeatedly while various pressure measures were taken. For analysis, they were divided into four groups on the basis of velopharyngeal orifice size: adequate closure (N=137), adequate/borderline (N=22), borderline/inadequate closure (N=21), and inadequate closure (N=31). As the degree of inadequacy increased, airflow rate decreased. Intraoral pressure fell as inadequacy increased, but by increasing airflow rate subjects could maintain pressure above 3 cm H<sub>2</sub>O. Increase in nasal pressure was inversely related to intraoral pressure; however, combined nasal-oral pressure was constant across groups. Authors conclude that the speech mechanism is constrained to meet aerodynamic requirements. [JDS]

**Leventhal J, Schreier EM, De Witt JC, Myers A** (American Foundation for the Blind, New York, NY). A Guide to Paperless Braille Devices. *J Vis Imp Blind* 82:290-296, 1988.

A review of electronic braille input-output devices based on tests of the devices and on the evaluation of set-up ease, documentation, and, as appropriate, speech and/or braille display. The products: Braille 'n Speak, Note-a-Braille II, APH PocketBraille, PortaBraille, Eureka A4, and VersaBraille II+. Includes manufacturer's comments when given. [JDS]

**Lowe GR** (Hearing Rehabilitation Laboratory, Fort Wayne, IN). Are Audiologists Guilty of Malpractice if They Do Not Recommend Binaural Amplification? *ASHA* 30(11):39-40, 1988.

Presents a case in which malpractice is charged due to failure to recommend binaural hearing aids for a patient with a congenital sensorineural hearing

The California Consonant Test was administered to 20 hearing-impaired patients at 65 dB SPL and 10 hearing-impaired patients at 95 dB SPL in four recorded formats that made use of five different algorithms. Significant improvements in intelligibility were obtained at the lower level of amplification with tapes processed to increase consonant amplitude. Increasing consonant duration added little of practical significance. The value of digital-speech enhancement should justify continued exploration to find more complex and effective algorithms. [JDS]

**Peters HFM, Boves L** (University of Nijmegen, The Netherlands). Coordination of Aerodynamic and Phonatory Processes in Fluent Speech Utterances of Stutterers. *J Speech Hear Res* 31:352-361, 1988.

Fluent utterances of 10 adult male stutterers and 7 adult male controls, all native speakers of Dutch with normal hearing, were made with a catheter inserted to measure subglottal pressure (Psg) in the posterior commissure. Psg build-up patterns of stutterers differed significantly from those of controls; stutterers also exhibited abrupt voice onsets more often than normals. The two groups did not differ as to jitter or shimmer. Authors caution against "generalizing conclusions from one specific set of measurements, unless this is done in the framework of a comprehensive model of the speech production mechanism." [JDS]

**Ross M, Madell JR** (New York League for the Hard of Hearing, New York, NY). Premature Demise of Body Worn Hearing Aids. *ASHA*30(11):29-30, 1988.

Argues that "The quest for cosmetic acceptability bears a major responsibility for many of both the limitations and advances in hearing aid technology." To give way to patient vanity, however, "symbolizes our failure in this wider responsibility;" i.e., to improve the client's hearing. [JDS]

**Rothenberg M, Mahshie JJ** (Syracuse University, Syracuse, NY). Monitoring Vocal Fold Abduction Through Vocal Fold Contact Area. *J Speech Hear Res* 31:338-351, 1988.

Various devices for measuring transverse electrical conductance of the thyroid cartilage during voice

production (electroglottographs, EGG) are critically evaluated. Authors conclude that a measure of abduction derived from the duty cycle of the linear-phase, high-pass filtered EGG waveform is preferable when there is a reasonably strong signal during voiced speech and a criterion level is used to define the duty cycle. [JDS]

**Samar VJ, Metz DE** (National Technical Institute for the Deaf, Rochester, NY). Criterion Validity of Speech Intelligibility Rating-Scale Procedures for the Hearing-Impaired Population. *J Speech Hear Res* 31:307-316, 1988.

Fifty male and 50 female students entering NTID with better-ear average hearing levels for speech between 75 and 118 dB (mean = 100.2 dB) responded to various test materials—CID Everyday Sentence Lists, Rainbow Passage, and Cafeteria Pictorial Sequence—some of which were recorded. Four 3-judge panels of trained judges scored some speech samples on rating scales and wrote down what was said for others. Inter- and intra-rater reliabilities were high for the various procedures, ranging from 0.94 to 0.98. Though overall validities appeared good for all procedures, results indicate that, especially in the mid-ranges of speech intelligibility, the write-down procedure is preferable to rating scales for assessing speech intelligibility. [JDS]

**Schein JD**. Acquired Monocular Disability. *J Vis Imp Blind* 82:279-281, 1988.

As a field, Rehabilitation tends to overlook the handicapping effects of monocular impairments. Economic data show that monocularly impaired persons suffer a substantial loss of income post-rehabilitation. Social and psychological consequences are also severe, as case studies support. [JDS]

**Stelmachowicz PG, Lewis DE** (Boys Town National Institute for Communication Disorders in Children, Omaha, NE). Some Theoretical Considerations Concerning the Relation Between Functional Gain and Insertion Gain. *J Speech Hear Res* 31:491-496, 1988.

Two hypothetical examples—high-gain aid with low SSPL90 and nonlinear hearing aid—and 1 from

impairment. Patients should be alerted to the advantages of binaural amplification, when appropriate, though the decision to adopt it will, of course, ultimately be theirs. [JDS]

**Lubinski R, Weinstein B** (State University of New York, Buffalo, NY). Status of Communication Services in Nursing Homes in New State. *ASHA* 30(9):69-72, 1988.

Two hundred and fourteen of 475 nursing homes with 75 or more beds were surveyed. Of the nonprofit homes, 73 percent employed one or more speech-language pathologists and 27 percent, an audiologist; of for-profit homes, 70 percent employed one or more speech-language pathologists and 29 percent, an audiologist. Speech-language pathologists averaged 12 hours per week and audiologists 4 hours per week in nonprofit facilities, while speech-language pathologists averaged 5 hours per week and audiologists 1 hour per week in proprietary homes. The data show a relatively low level of communication services—significantly lower in proprietary than nonprofit settings—for those most likely to need them. [JDS]

**McMillan MO, Willette SJ** (East Tennessee State University, Johnson City, TN). Aseptic Technique: A Procedure for Preventing Disease Transmission in the Practice Environment. *ASHA* 30(11):35-37, 1988.

Offers suggestion for control of infections in clinical practice. Adopting hygienic practices is a moral and legal responsibility. [JDS]

**Maslach C, Florian V** (University of California, Berkeley, CA). Burnout, Job Setting, and Self-Evaluation Among Rehabilitation Counselors. *Rehabil Psychol* 33:85-93, 1988.

Thirty-eight of about 60 rehabilitation counselors in the San Francisco area volunteered to answer a demographic questionnaire, the Maslach Burnout Inventory, and questions about their agency setting and its policies. Compared to national norms for social-service workers, the counselors manifested significantly less burnout, though their depersonalization and emotional-exhaustion scores were about average. The latter scores were moderately

correlated with self-assessed control of work, size of caseload, difficulty in implementing agency policies, and amount of discretionary time. It was also significantly correlated with length of time on current job and in the field. It was inversely related to job satisfaction and satisfaction with administration. Other findings suggest that this exploratory study with a nonrepresentative sample addresses a potentially fruitful topic for research. [JDS]

**Matthies ML, Carney AE** (University of Illinois, Champaign, IL). A Modified Speech Tracking Procedure as a Communicative Performance Measure. *J Speech Hear Res* 31:394-404, 1988.

Using two sets of tracking materials, controlled and uncontrolled connected-discourse materials, each author worked individually with 3 different naive college students in two experiments: auditory plus noise and visual only. Controlled materials elicited higher tracking rates. Use of specific prompting reduced variability in both testing conditions. Comprehension and tracking did not appear to be perfectly related. [JDS]

**Miller G, Rossi P** (American Foundation for the Blind, New York, NY). Placement of Visually Impaired Persons: A Survey of Current Practices. *J Vis Imp Blind* 82:318-327, 1988.

A questionnaire designed to determine the number and qualifications of personnel involved in job placement and some agency practices was sent to 55 government and 71 private agencies. Forty-eight of the former and 55 of the latter responded. Twenty-three of 48 state agencies reported no special placement personnel. The remaining agencies average 14 rehabilitation counselors to 1 placement specialist. Data suggest that closures are greater in agencies having placement specialists. These and other results lead authors to propose a model placement program. Two replies to the article are published, one by J. Elton Moore and the other by Chuck Sansevere. [JDS]

**Montgomery AA, Edge RA** (Walter Reed Army Medical Center, Washington, DC). Evaluation of Two Speech Enhancement Techniques to Improve Intelligibility for Hearing-Impaired Adults. *J Speech Hear Res* 31:386-393, 1988.

a 4-year-old girl with profound, fragmentary, sensorineural hearing loss illustrate disagreements between insertion and functional gain measures. Authors present another procedure for determining real-ear hearing-aid responses. [JDS]

**Warzak WJ, Majors CT, Hansell AG, Allan TM** (University of Nebraska Medical Center, Omaha, NE). An Analysis of Televised Presentations of Disability. *Rehabil Psychol* 33:105-112, 1988.

Time samples of 374 30-minute television segments from the three major networks yielded 17,505 program and 4,182 commercial intervals. Content related to disability occurred in less than 1 percent of the segments and disabled individuals appeared in 0.2 percent. Disability was irrelevant to the plot in most instances. Because of its low incidence in the sample, disability was not found to be related to any associated variables. [JDS]

**Watson JE** (Texas Christian University, Fort Worth, TX). A Comparison of Stutterers' and Nonstutterers' Affective, Cognitive, and Behavioral Self-Reports. *J Speech Hear Res* 31:377-385, 1988.

Seventy-six stutterers and 81 nonstutterers, ranging in age from 18 to 74 years, took the Inventory of

Communication Attitudes. Results showed greater heterogeneity of stutterers' attitudes as compared to the attitudes of nonstutterers. Of 13 hypothetical situations, only 3 were encountered significantly less by stutterers, and 2 of the 3 were rated more negatively by stutterers. Other results tend to be complex, differentiating between the two groups on some dimensions but not on some others. Although data on self-assessments of stuttering and length of time in therapy were available, these were not analyzed. In view of the heterogeneity of stutterer's responses, such further analyses should prove enlightening. [JDS]

**Westbury JR** (Waisman Center, University of Wisconsin, Madison, WI). Mandible and Hyoid Bone Movements During Speech. *J Speech Hear Res* 31:405-416, 1988.

Cineradiographs of an adult, male English speaker producing 27 disyllables indicate that rotational and translational components of mandible and hyoid bone movements are independent enough to warrant kinematic descriptions that treat these two structures as rigid bodies moving in a plane. This finding represents an important step in eventually describing optimal muscle actions needed to move the bones from one position to another, with trajectory and time specified. [JDS]