

TABLE OF CONTENTS

GEOFFREY DYSON MEMORIAL LECTURE

- The Challenge of Communicating Concept To Coaches By Computer3
D. I. Miller
University of Western Ontario, London, Ontario, Canada

KEYNOTE ADDRESSES

- Optimal Frictional Properties For Sports Shoes 15
E. C. Frederick
Exeter Research, Exeter, New Hampshire, USA
- Biomechanics of Pitching23
K. R. Campbell
Bennet Institute for Sports Medicine, Baltimore, Maryland, USA

SYMPOSIUM

- The Biomechanist As An Expert Witness35
G. T. Moran
University of San Francisco, San Francisco, California, USA
D. Howland
Attorney-at-Law
Amherst, MA, USA
L. J. Stoner
University of Minnesota, Minneapolis, Minnesota, USA

JUMPING AND LANDING

- Simulation of human jumping - task alteration 41
W. S. Selbie, G. E. Caldwell
National Institutes of Health, Bethesda, MD, USA
University of Maryland, College Park, Maryland, USA
- High jump direct dynamic simulation47
F. Casolo, A. Vallatta, B. Zappa
Politecnico di Milano, Milano, Italy
- Monitoring of sprinters' motor coordination through vertical jump exercises52
R. Rodano, R. Squadrone
Politecnico di Milano, Milano, Italy
- On the force moment of stretching or flexing the knee and the height of
vertical jumping56
W. Zefang
Beijing, P. R. China

The effect of height and post-landing movement task on landing performance 60
B. L. Caster
University of Oregon, Eugene, Oregon, USA

A biomechanical analysis of the compulsory Hecht vault 65
A. S. Arnold, S. L. Smith
United States Olympic Committee, Colorado Springs, Colorado, USA

A biomechanical comparison of developmental stages of the standing long jump 69
D. J. Wison, E. W. Brown
University of Missouri-Columbia, Columbia, Missouri, USA
Michigan State University, East Lansing, Michigan, USA

GAIT

Relationship between mechanical and physiological energy costs and efficiency of treadmill walking in active and inactive females 75
K. D. Browder, J. D. Wilkerson
Bowling Green State University, Bowling Green, Ohio, USA
Texas Women's University, Denton, Texas, USA

A biomechanical and physiological analysis of efficiency at different running paces 80
K. M. Price, J. D. Wilkerson
Angelo State University, San Angelo, Texas, USA
Texas Women's University, Denton, Texas, USA

Characteristic gait patterns in aged populations compared to a young adult population 83
D. H. Sussman
Bemidji State University, Bemidji, Minnesota, USA

Work-energy analysis of triathletes running under bike/run and run only conditions ... 86
G. W. Marino, J. Goegan
University of Windsor, Windsor, Ontario, Canada

Effects of water and non-water soluble pre-tape adhesive sprays on subtalar joint pronation 90
D. H. Sussman, W. Crews
Bemidji State University, Bemidji, Minnesota, USA

Effects of upper vamp design and midsole material and thickness on ground reaction forces in running 94
R. Ferrandis, A. C. Garcia, J. V. Durt, J. Ramiro, P. Vera
Institute of Biomechanics of Valencia, Valencia, Spain

Kinematic and kinetic comparison of lean and obese individuals during walking 98
A. Abdulrahman, C. Zebas
University of Kansas, Lawrence, Kansas, USA

Dynamic measurement of force within the shoe during conditions
of perceived exertion 102

M. D. Tremaine, J. L. Albrigo, G. C. Blanche III, S. M. Haddock, K. C. Teed
Anderson Orthopaedic Research Institute, Alexandria, Virginia, USA

A comparison of five mechanical work algorithms for different footstrike
patterns and speeds during distance running 106

M. M. Slavin, R. A. Hintermeister, J. Hamill
University of Massachusetts, Amherst, Massachusetts, USA

A model to measure supination and pronation of the foot over different levels of
physiological stress using an in-shoe monitoring system 110

S. M. Haddock, M. D. Tremaine, J. L. Albrigo, G. C. Blanche III, K. C. Teed
Anderson Orthopaedic Research Institute, Alexandria, Virginia, USA

CYCLING

Optimization of the seating position in a human powered vehicle 115

Y. Lei, M. B. Trabia, D. Too
University of Nevada-Las Vegas, Las Vegas, Nevada, USA

Effect of inertial loading on muscle activity in cycling 120

L. Li, G. E. Caldwell
University of Maryland, College Park, Maryland, USA

The effect of hip position/configuration on EMG patterns in cycling 126

D. Too
University of Nevada-Las Vegas, Las Vegas, Nevada, USA

An analysis of the ergometer and recumbent cycles in two different seat positions 132

G. Bindner, A. Hegwood, C. L. Tant
Iowa State University, Ames, Iowa

WINTER SPORTS

A biomechanical comparison of single, double, and triple axels 138

D. King, A. Arnold, S. Smith
United States Olympic Committee, Colorado Springs, Colorado, USA

A comparison of hip and knee joint kinematics between two
Alpine ski ergometers 142

M. K. Miller, J. Porcari, D. Audet, C. Csontos
University of Wisconsin-LaCrosse, LaCrosse, Wisconsin, USA

Performance success in ski-jumping related to vertical take-off speed 145

B. Jost
University of Ljubljana, Ljubljana, Slovenia

A case study of muscle activity in giant slalom skiing 149
R. A. Hintermeister, C. L. Suplizio, C. J. Dillman, R. J. Steadman
Steadman-Hawkins Sports Medicine Foundation, Vail, Colorado, USA

Kinematic considerations of elite Alpine slalom racers 154
D. A. Goodwin
Western Michigan University, Kalamazoo, Michigan, USA

Analysis of selected mechanics of the backward C-cut skating stride 159
G. W. Marino, J. Grasse
University of Windsor, Windsor, Ontario, Canada

INJURY AND REHABILITATION

What is leg dominance? 165
S. Spry, C. Zebas, M. Visser
University of Kansas, Lawrence, Kansas, USA

Utilization of the metrecom with respect to Wielki's data in the study
of the angles of the curvatures in the spine 169
K. Wright-Smith, T. Wrigley, W. Morrison
Victoria University of Technology, Melbourne, Australia

Thoracic injury effects of linear and angular karate impact 173
P. K. Smith, D. C. Viano, D. P. Faust, L. Faust
West Chester University, West Chester, Pennsylvania, USA
Institute of Preventive Sports Medicine, Ann Arbor, Michigan, USA

A three-dimensional kinetic comparison of the effects of prophylactic
ankle devices 177
P. D. Rast, D. M. Drewlinger, J. D. Wilkerson
Texas Women's University, Denton, Texas, USA

The effect of preventative drills on stability of the knee in female
basketball players 181
G. C. L. Allen, M. N. Satem, G. Chen
Kansas State University, Manhattan, Kansas, USA

Modifications of joint mobility range induced by eccentric contraction 186
R. Saggini, L. Dragini, M. A. Giamberardino
University of Chieti, Chieti, Italy

EVALUATION OF SPORTS EQUIPMENT

The effect of tennis racquet flexibility on rebound velocity 193
J. C. Kern, W. J. Zimmerman
Texas Women's University, Denton, Texas, USA

On the coefficient of restitution of tennis racquets	196
<i>A. Vallatta, F. Casolo, M. Caffi</i>	
Politecnico di Milano, Milano, Italy	
The effect of oar design on scull boat dynamics	201
<i>T. W. Pelham, L. E. Holt, D. G. Burke, A. G. W. Carter, J. P. Peach</i>	
Dalhousie University, Halifax, Nova Scotia, Canada	
Aerodynamics of soccer balls and volleyballs	205
<i>P. Luhtanen, J. Vilkki, R. Kauppinen</i>	
Research Institute for Olympic Sports, Jyväskylä, Finland	
Sports Institute of Eerikkilä, Tammela, Finland	
Effects of knob end loading and barrel length on selected mechanical characteristics of aluminum softball bats	210
<i>L. Noble, H. Walker</i>	
Kansas State University, Manhattan, Kansas, USA	
The effect of shoe type on a golfer's stability	214
<i>G. Lange, T. R. Derrick, J. Hamill</i>	
University of Massachusetts-Amherst, Amherst, Massachusetts, USA	
Evaluation of football shoulder pads.	217
<i>L. Noble, H. Walker, R. Dorgan, D. Deppen</i>	
Kansas State University, Manhattan, Kansas, USA	
Naples Community Hospital Wellness Center, Naples, Florida, USA	
An analysis of two stairstepping machines at two speeds	221
<i>R. Hylland, M. E. Thomason, C. L. Tant, M. Herrington</i>	
Iowa State University, Ames, Iowa, USA	

TRAINING AND EXERCISE

Effects of an upper body harness tethering system on EMG activity of the lower back during walking.	227
<i>A. E. Finch, A. Briggs</i>	
Indiana State University, Terre Haute, Indiana, USA	
The effect of a seven week lifting program on electromechanical delay in female track athletes	232
<i>S. Ingram</i>	
Texas Sports Science Institute, Sugar Land, Texas, USA	
Three dimensional analysis of the clean and jerk techniques for female elite Chinese weightlifters	235
<i>L. Deming, A. Kangwei, W. Yunde</i>	
National Research Institute of Sports Science, Beijing, P. R. China	

The effects of the kinematic link principle on performance	239
<i>B. K. Lee</i>	
Texas A & M University, College Station, Texas, USA	
Electrical stimulation of the triceps surae for muscular strength improvement in volleyball players	243
<i>L. Divieti, C. Borniquez, M. Crivellini, M. Galli, M. Mancarella</i>	
Politecnico di Milano, Milano, Italy	
The effect of step-height on the knee and in-shoe pressure distribution during step aerobics	248
<i>J. Foti, J. Hamill, T. Foti, T. R. Derrick</i>	
University of Massachusetts Amherst, Amherst, Massachusetts, USA	
Step aerobics: a kinematic and kinetic analysis	252
<i>S. A. Bezner, S. A. Chinworth, D. M. Drewlinger, J. C. Kern, P. D. Rast,</i>	
<i>R. E. Robinson, J. D. Wilkerson</i>	
Texas Women's University, Denton, Texas, USA	
 INSTRUMENTATION	
Synchronization of video kinematic and analog biomechanical data using the Motion Analysis System	257
<i>L. Abraham, D. Kalakanis</i>	
The University of Texas at Austin, Austin, Texas, USA	
3-D imaging applied to foot structures in walking first phase - bone structures	262
<i>R. Therrien, D. Farrar, J.-P. Cuerrier</i>	
University of Sherbrooke, Sherbrooke, Quebec, Canada	
A method for kinetic power measurement in jumping using video analysis techniques	266
<i>T. C. Bauer, C. Zerpa</i>	
Lakehead University, Thunder Bay, Ontario, Canada	
Accelerometry for paddling and rowing	270
<i>T. W. Pelham, L. E. Holt, D. G. Burke, A. G. W. Carter</i>	
Dalhousie University, Halifax, Nova Scotia, Canada	
Application of individual spheromatograms in sports activities	274
<i>C. Wielki, C. Noens</i>	
Faculty Medicine UCL, Heverlee, Belgium	
Evaluation of the gravitational constant using conventional instrumentation	278
<i>P. Luhtanen, H. Mononen, A. Salo, M. Salonen, J. Viitasalo</i>	
Research Institute for Olympic Sports, Jyväskylä, Finland	

MODELING

- A mathematical model of human dynamic locomotion: theoretical
basis of the model285
M. M. Vieten, C. Larkins
University of Konstanz, Konstanz, Germany
University of Michigan, Ann Arbor, Michigan, USA

- A mathematical model of human dynamic locomotion: development
and application of the model289
C. Larkins, M. M. Vieten
University of Michigan, Ann Arbor, Michigan, USA
University of Konstanz, Konstanz, Germany

- Developing a theoretical model of human movement293
L. J. Stoner, D. J. Wu
University of Minnesota, Minneapolis, Minnesota, USA

- Development of an anthropomorphic thigh for impact assessment298
C. Hrysmallis, W. Morrison
Victoria University of Technology, Melbourne, Australia

THROWING, KICKING AND STRIKING

- Intra-individual variability for basketball free throws305
R. E. Vaughn, B. Kozar
Boise State University, Boise, Idaho, USA

- A comparison of the basketball set shot and jump shot at two different distances309
D. Diehl, C. L. Tant, S. Emmons, R. Osborn
Iowa State University, Ames, Iowa

- Kinematic parameters of basketball jump shots projected from varying distances313
M. N. Satern
Kansas State University, Manhattan, Kansas, USA

- The backspin backhand drive in tennis to balls of varying height318
B. Elliott, M. Christmass
University of Western Australia, Nedlands, Australia

- Biomechanical similarities and differences of A. Agassi's first
and second serves323
A. Vorobiev, G. Ariel, D. Dent
International Center for Biomechanical Research, La Hoya, California, USA

- An analysis of the kinetics and kinematics of the golf swing328
G. Koenig, M. Tamres, R. W. Mann
Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

Three dimensional kinematics of the direct free kick in soccer when
opposed by a defensive wall334
E. W. Brown, D. J. Wilson, B. R. Mason, J. Baker
Michigan State University, East Lansing, Michigan, USA
Australian Institute of Sport, Belconnen, Australia

Angular characteristics of the upper trunk and hips in skilled baseball pitching339
D. Hong, E. M. Roberts
Rush Medical College, Chicago, Illinois, USA
University of Wisconsin, Madison, Wisconsin, USA

A comparison of the volleyball jump serve and the volleyball spike344
C. L. Tant, B. Greene, M. Bernhardt
Iowa State University, Ames, Iowa, USA

SELECTED SPORTS ACTIVITIES

In-shoe pressure distribution during ergometer rowing in novice
and experienced rowers349
E. H. Elliott, J. Hamill, T. R. Derrick
University of Massachusetts Amherst, Amherst, Massachusetts, USA

The investigation of the "free rifle 60 shots" event353
A. Barabas, P. Barany
Hungarian University of Physical Education, Budapest, Hungary

Biomechanical investigation of the swimming start356
P. Barany, A. Barabas, J. Moravec
Hungarian University of Physical Education, Budapest, Hungary

Biomechanics: past, present, and future perspectives359
D. M. Drewlinger
Texas Women's University, Denton, Texas, USA

Analysis of novice and elite disc golfers performing drives363
S. L. Jackson, E. A. Tanner
University of North Carolina, Charlotte, North Carolina USA

Analysis of elite and novice disc golfers performing 10 m putts.368
S. L. Jackson, E. A. Tanner
University of North Carolina, Charlotte, North Carolina USA

Analysis of children putting and driving in disc golf371
S. L. Jackson, E. A. Tanner
University of North Carolina, Charlotte, North Carolina USA