

## **MICHAEL RAYMOND PIERRYNOWSKI**

[pierryn@mcmaster.ca](mailto:pierryn@mcmaster.ca)

**CURRENT STATUS:** McMaster University, Faculty of Health Sciences  
School of Rehabilitation Science  
Associate Professor with tenure (July 1992 - )

McMaster University, Faculty of Science  
Human Biodynamics Graduate Program  
Associate Member (September 1995 - )

### **EDUCATIONAL BACKGROUND:**

- 1982 Ph.D. Simon Fraser University (Biomechanics):  
A physiological model for the solution of individual muscle forces during normal human walking: Morrison JB, Chapman AE , Bawa PN , Calvert TW , Poiker TK and Crowninshield RD , Supervisors.
- 1978 M.Sc. University of Waterloo (Biomechanics and Work Physiology):  
Energy levels of human body segments during load carriage on a treadmill: Norman RWK, Winter DA, Sharratt MT and Myles S , Supervisors.
- 1976 B.Sc. (Hons). University of Waterloo (Kinesiology)

### **EMPLOYMENT HISTORY:**

- 1989-2002 Adjunct Professor, School of Physical and Health Education, Department of Preventative Medicine and Biostatistics, Institute of Biomedical Engineering, University of Toronto
- 1989-1991 Assistant Professor, School of Medicine, Department of Orthopaedic Surgery, University of Pennsylvania
- 1987-1989 Associate Professor with Tenure, School of Physical and Health Education, Department of Preventative Medicine and Biostatistics, Institute of Biomedical Engineering, University of Toronto
- 1985-1987 Assistant Professor, Institute of Biomedical Engineering, University of Toronto
- 1983-1987 Assistant Professor, Department of Preventative Medicine and Biostatistics, Faculty of Medicine, University of Toronto
- 1982-1987 Assistant Professor, School of Physical and Health Education, University of Toronto
- 1981-1982 Instructor, School of Physical and Health Education, University of Toronto

### **GRADUATE TRAINING APPOINTMENTS:**

- 1980-1981 Teaching Assistant, Department of Kinesiology, Simon Fraser University (Tissue Biomechanics)
- 1979 Research Assistant, Arthritis Society of British Columbia, St Paul's Hospital, (Accuracy of the CARS-UBC Electrogoniometer)
- 1978-1979 Teaching Assistant, Department of Kinesiology, Simon Fraser University (Kinesiology and Biomechanics)
- 1977-1978 Teaching Assistant, Department of Kinesiology, University of Waterloo (Biomechanics)
- 1977 Research Assistant, Department of Kinesiology, University of Waterloo (Impact Performance of Air Crew and Hockey Helmets)

1976-1977                      Research Assistant, Department of Health, University of Waterloo (Physiological Response to Emotional Stress)

## 1                      **MOST SIGNIFICANT CONTRIBUTIONS**

Michael Pierrynowski is an Associate Professor within the School of Rehabilitation Science and the Department of Kinesiology at McMaster University. For almost 30 years Michael has demonstrated expertise in the analysis of human movement with a concentration on normal and pathological motion. He has supervised numerous graduate students and has over 100 scientific publications. Michael is a long-standing consulting editor for the Journal of Biomechanics and is the biomechanics section editor for Elsevier's The Yearbook of Sports Medicine. His recent scientific work focuses on using directional statistics to model the motion of the ankle, knee, lumbar spine, and head, neck and shoulder complex.

### **Five most significant contributions**

Pierrynowski MR, Ball KA. Oppugning the Assumptions of Spatial Averaging of Segment and Joint Orientations, *Journal of Biomechanics*, 42(3): 375-378, 2009.

The use of appropriate statistical models to describe and infer patterns within biomechanical data is often rudimentary. The use of directional statistics requires a geometric understanding of biomechanical data. This paper alerts the biomechanical community of the inappropriate use of a frequently used statistic.

Pierrynowski MR, Measurement Properties of a Simple Biomechanical Measure of Walking Effort, *Computational and Mathematical Methods in Medicine*, iFirst article, 1–10, 2009.

A simple measure of overall walking effort would be valuable to patients and clinicians to select suitable treatment interventions and to monitor progress. In this paper, seven potentially useful clinical measures of walking effort are presented. Several of these walking effort outcomes are grounded within differential geometry proofs, have excellent reproducibility and responsiveness, are simple and easy to administer with relatively inexpensive equipment, and can be used in real world environments. Variants of these outcomes are being used to identify patients with knee osteoarthritis and children with developmental coordination disorders.

Pierrynowski MR, Gross A, Miles M, Galea V, McLaughlin L, McPhee C. Reliability of the long-range power-law correlations obtained from the bilateral stride intervals in asymptomatic volunteers whilst treadmill walking. *Gait & Posture*, 22(1): 46-50, 2005.

A paper which reports on the high measurement reliability of a dynamic systems (fractal) outcome. More recent work, demonstrates that this outcome is not reliable in patients with a mechanical neck disorder {MND}. This has led to the development of the Neck Walk Index {NWI}, a performance based outcome with high diagnostic sensitivity and specificity.

Pierrynowski MR, S. B. Smith and JH Mlynarczyk. Proficiency of Foot Care Specialists to Place the Rearfoot at Subtalar Neutral. *The Journal of the American Podiatric Association*, 86: 217-223, 1996.

A publication that alerted the foot care professional community to the limitations of casting a foot, to fabricate foot orthoses, at the subtalar neutral position. This paper initiated a series of research projects, and graduate student supervision, examining the influence of wearing foot orthoses.

Pierrynowski MR and Morrison JB. A Physiological Model for the Evaluation of Muscular Forces in Human Locomotion: Theoretical Aspects. *Mathematical Biosciences*, 75: 69-101, 1985.

My doctoral work which defined, constructed and tested a biologically based model to allocate forces to a redundant set of muscles during activity. This paper was one of the first publications that rejected simplified and mathematically optimized solutions in favour of those that had embedded motor control features.

## 2 ACTIVITIES AND CONTRIBUTIONS

### **Consulting/contract activities**

1998-1999	FOOTLevelers: Evaluation of a Foot Orthoses System
1997-1998	KINtech Orthopaedics Limited: Evaluation of a Knee Brace
1983-1987	MansAnalysis: Biomechanical Analysis of the Golf Swing
1982-1986	Judo Canada: Research and Testing Committee
1986	Sunbeam Corporation (Canada) Ltd.: Development of a Rowing Ergometer
1985	Power Skater, Inc.: Biomechanical Analysis of a Skating Device

### **Supervisory experience (e.g. training of students)**

#### M.Sc. or Ph.D. Senior Supervisor

Ph.D.	2	(Tupling, Ball)
M.Sc.	14	(Sutherland, Hattin, Ball, Martin, Laviolette, Shannon, End, Clouse-Jensen, Trenholm, Goodwin, Rick, Trotter, Soleyn, McPhee)

#### M.Sc. or Ph.D. Supervisory Committee Membership, Lifetime, (Listing of names starts in 2000)

Ph.D.	23	(Santaguida, Orlin, Durkin, Wrbaskic, Maltais, Holmes)
M.Sc.	38	(Radstake, Mercuri, MacKenzie, Ste Croix, Pennell)

#### M.Sc or Ph.D. External Reviewer (Lifetime)

Ph.D.	6	Peeler, Morris, Sim, Orlin, Carman, Dowling
MSc.	4	Axcell, Andrews, Hurley, Cunningham

#### Ph.D. Senior Supervisor:

1993-1998	Ball, Kevin A. Rigid and Pliant Movement Analysis: Use of invasive and external observations to determine tibial and femoral motion during gait: Graduate Department of Community Health, University of Toronto
1981-1988	Tupling, Susan J. Segmental Angular Momentum Analysis of Somersaulting and Twisting Movements: Graduate Department of Community Health, University of Toronto

#### M.Sc. Senior Supervisor:

2002-	McPhee, Colleen, The psychometric properties of physical performance test in whiplash-associated disorder populations, Clinical Health Sciences (Rehabilitation Science), McMaster University
2007-2008	Soleyn (nee Shaw), Jean, Effect of a series of low-velocity, whiplash like perturbations on proprioceptive ability, Clinical Health Sciences (Rehabilitation Science), McMaster University
2004-2007	Trotter, Leslie, Impact of Foot Orthoses on Impairment and Functional Outcomes: A randomized clinical trial, Clinical Health Sciences (Rehabilitation Science), McMaster University
2004-2005	Rick, David, A pilot study determining the influence of cervical manipulation on spinal motion during gait in previously concussed individuals. Department of Human Biodynamics, McMaster University
2002-withdrew	Goodwin, Chris, Foot orthoses for rheumatoid arthritis patients: A biomechanical measure for assessing gait economy and treatment outcome: Clinical Health Sciences (Rehabilitation Science), McMaster University
1996-1999	Trenholm, Richard, Use of Soft Foot Orthoses in Figure Skating. Are they Useful? A Pilot Study: Pierrynowski MR, J Dowling, C Riach, G Frost, Examiners, Department of Human Biodynamics, McMaster University
1988-1990	Clouse-Jensen, Susan Biomechanical Analysis of Long Duration Pilot-Aileron Interaction: Pierrynowski MR, MJ Pyley, P Rothwell, Gen. R Fassold, Examiners, Graduate Department of Community Health, University of Toronto

- 1987-1989 Eng, Janice J. The Biomechanical and Clinical Effects of Foot Orthotics in Patellofemoral Pain Syndrome: Pierrynowski MR, RJ Shephard, MJ Plyley, S Woolley, Examiners, Graduate Department of Community Health, University of Toronto
- 1987-1989 Shannon, Patrick J Biomechanical Analysis of the Front Crawl Stroke on the SwimBench: Pierrynowski MR, Plyley MJ, Shephard RJ, Dainty DA, and Campbell R, Examiners, Graduate Department of Community Health, University of Toronto
- 1985-1989 Lavolette, Jocelyn M Optimal Marker Placement for Kinematic Studies of the Human Lower Extremity: Pierrynowski MR, James D, Shephard RJ, Hearne T, Examiners, Graduate Department of Community Health, University of Toronto
- 1985-1988 Martin, Mario A. Les Effets Biomecaniques D'un Programme D'Entrainement en Force Isocinetique des Muscles Abducteurs et Adducteurs de la Hanche sur les Schemas de la Course, Department D'Education Physique, Faculte des Etudes Superieures
- 1985-1987 Ball, Kevin A. Three-Dimensional Kinematic Techniques for Human Body Segment Tracking: Pierrynowski MR, MJ Plyley, M Joy and R Wells, Examiners, Graduate Department of Community Health, University of Toronto
- 1984-1986 Hattin, Heather C. Effect of Load, Cadence, and Fatigue on Articular Knee Joint Force During a Half Squat: Pierrynowski MR, MJ Plyley, R Goode, and DHH Mackenzie, Examiners, Institute of Biomedical Engineering and the Department of Physiology, University of Toronto
- 1982-1987 Sutherland, Sandra Segmental Mechanical Power Output and Efficiency during Human Arm Crank Ergometry: Effects of Cadence and External Workrate: Pierrynowski MR, RJ Shephard, MJ Plyley and R Wells, Examiners, Graduate Department of Community Health, University of Toronto

Ph.D. External Reviewer

- 2005 Peeler, Jason. Structural and Functional Parameters of Patellofemoral Joint Pain and Deterioration, University of Manitoba, Winnipeg, Manitoba.
- 2004 Morris, Alan. Musculoskeletal Modelling and EMG Driven Simulation of the Human Lower Body, University of Toronto, Toronto, Canada.
- 2003 Sim, Darryl. Biomechanics of Dysfunction and Injury Management for the Cervical Spine, Ph.D. Thesis, Queensland University of Technology, Brisbane, Australia.
- 2003 Orlin, Margo. Effect of Calcaneal Eversion on Standing and walking in Children, Ph.D. Thesis, Drexel University, Philadelphia, USA.
- 2000 Carman, Allan. The Development of Methods for Improving Accuracy and Validity of Musculoskeletal Modelling of the Lower Limb, Ph.D. Thesis, University of Otago, Dunedin, New Zealand.
- 1987 Dowling, James J. The prediction of force in individual muscles crossing the human elbow joint, Ph.D. Thesis, University of Waterloo, Waterloo, Canada

M.Sc. External Reviewer

- 1993 Axcell, Tami. Reliability of the computerized isokinetic dynamometer. M.Sc. Thesis, University of Toronto, Toronto, Canada.
- 1992 Andrews, David M. The contribution of below knee wobbling mass to the estimation of vertical knee joint reaction forces following impact with the ground. M.Sc. Thesis, McMaster University, Hamilton, Canada.
- 1987 Hurley, Graham RB. The effect of development and function on muscle moment power during the recovery phases of running for girls ages 9 to 17 years. M.Sc. Thesis, Laurentian University, Sudbury, Canada

BHSc (OT), BHSc (PT), MCHC (PT), and MSc (PT) Senior Research Projects

- 1993 Fanti R. Computer enhancement of magnetic resonance images: Arthrokinematics. Senior Research Project, BHSc(PT) Program, McMaster University, 1993.
- 1993 Gardner SN, Roy DM. Proposal for analysis of the gait module. Senior Research Project, BHSc(PT) Program, McMaster University, 1993.
- 1993 McCall RJ. Multimedia gait module. Senior Research Project, BHSc (PT) Program, McMaster University, 1993.
- 1993 van Wyk KL. Arthrokinematics learning module. Senior Research Project, BHSc (PT) Program, McMaster University, 1993.
- 1993 Whear CD. Towards the standardization of quantitative methods for assessing relative joint angles in the human body. Senior Research Project, BHSc (PT) Program, McMaster University, 1993.
- 1994-1999 **[to be completed]**
- 2000 Duggan M, Hollick J, Valley M. Is there a relationship between the subtalar joint inclination angle and clinical signs of pronation in the general population? Senior Research Project, BHSc (PT) Program, McMaster University, 2000.
- 2000 Ciavarella A, Jones B, Komarek L. Pressure distribution under the foot in standing. Senior Research Project, BHSc (OT) Program, McMaster University, 2000.
- 2001 Finstad E, Kemecey M, Simpson J. Does the subtalar joint inclination angle affect the location of lower extremity injuries? Senior Research Project, BHSc (PT) Program, McMaster University, 2001.
- 2001 Bisset M, Kaarto, McLean L. Prescription of athletic footwear for the rheumatoid arthritic foot. Senior Research Project, BHSc (PT) Program, McMaster University, 2001 [with L Willock].
- 2001 Terraro T, Wilczek N. An interactive learning module for the anatomy and clinical tests of the knee. Senior Research Project, BHSc (PT) Program, McMaster University, 2001 [with H. Groves and D. Stacy].
- 2002 Dosen R, Rajah S. Reliability of head bobbing motion in patients with mechanical neck disorders. Senior Research Project, MCHC (PT) Program, McMaster University, 2002.
- 2002 Histon K, Kett K, Kenny F, Mahavitaine N, manorek J, Nairn S. Exploring knee joint instability. Senior Research Project, MCHC (PT) Program, McMaster University, 2002.
- 2003 Buck S, Cheung G, Lundquist L, Tang B, Zavitz K. Impairment of upper limb function in patients with a mechanical neck disorder. Senior Research Project, MSc (PT) Program, McMaster University, 2003.
- 2003 Guy S, McDowell J, Ruttan P, Stevenson B, Turner L, Vair R. Can the variability in the Neck-walk Index score discriminate between patients with mechanical neck disorders and asymptomatic individuals? Senior Research Project, MSc (PT) Program, McMaster University, 2003.
- 2004 Chunara S, Cooper D, Kappes R, Murphy P. Sensitivity of the Neck-Walk Index to detect change in patients with mechanical neck disorders. A student pilot study. Senior Research Project, MSc (PT) Program, McMaster University, 2004.
- 2005 Dube J, Roman C, Williamson H, Yoon T. Validity of an Inertial Sensor to Measure Walking Economy. Senior Research Project, MSc (PT) Program, McMaster University, 2005.
- 2005 Aboelela O, Fried T, Lorusso C, Yu L. Does the neck-walk index differentiate patients with shoulder pain from patients with a mechanical neck disorder? A student pilot study. Senior Research Project, MSc (PT) Program, McMaster University, 2005.
- 2005 Cherry S, Gorny J, Gottschalk J, Hoag B, Kazun P, St.Michael J. Relationship between head and upper limb coordination in individuals with a mechanical neck disorder. Senior Research Project, MSc (PT) Program, McMaster University, 2005 [with V. Galea].
- 2008 Jaworski K, Pye L, Taylor M. Improved estimation of the tibiotarsal and subtalar joint axes from motion data. Senior Research Project, MSc (PT) Program, McMaster University, 2008.

- 2009 Dreisinger K, Druchok S, MacKenzie R, Niven LA. Changes in impairment and functional outcomes attributed to wearing foot orthoses. Senior Research Project, MSc (PT) Program, McMaster University, 2009.

### Technology transfers (specify the nature of the activity and the target audience)

none

### Professional and Scientific Societies:

- |           |   |
|-----------|---|
| 1981-2002 | Member, International Society of Biomechanics               |
| 1977-2002 | Member, Canadian Society for Biomechanics                   |
| 1980-1989 | Member, Canadian Association of Sport Sciences              |
| 1980-1987 | Member, Canadian Medical and Biological Engineering Society |

### Presentations as Invited Keynote guest speaker (public or invited lectures)

13. Kim P, Pierrynowski MR. Statistical Estimation of Curvature and Torsion with Application to Biomechanics. Fields Institute 5<sup>th</sup> Annual Biomathematics and Biostatistics Symposium, Guelph, Ontario, 03 September 2008.
12. Pierrynowski MR, Rivest L-P, Baillargeon S. Are there fixed axes within the human rearfoot. 2nd Annual Foot and Lower Extremity Symposium London, Ontario, 25 May 2007.
11. Pierrynowski MR and Trotter L. Impact of foot orthoses on impairment and functional outcomes. 2nd Annual Foot and Lower-Extremity Symposium London, Ontario, 25 May 2007.
10. Chang T, Pierrynowski MR. Exploratory Data Analysis for Human Motion Data. Mathematics and Statistics Colloquium, York University, 17 Nov 2005.
9. Pierrynowski MR. Classifying Rearfeet using supination/pronation kinematics. Foot and Ankle Research Retreat, Annapolis, MD, 19-21 May 2000.
8. Het Bepalen Van De Juiste Mate Van Correctie. Van Klinische Metingen Naar Zoolvoorschrift [Are Clinical Measurements Useful in Prescribing Foot Orthoses?] Jubileumcongress: Nederlandse Vereniging van Podotherapeuten, Ede, The Netherlands, 12 November 1999.
7. State of the Art of Clinical Movement Analysis in Canada. Analisi del movimento in clinica: presente e futuro, Roma, Italia, 29 October 1999.
6. The Relationship Between STJN and the Gait Cycle, Ontario Society of Chiropractors, Toronto, 20 February 1997.
5. STJ Neutral and the Gait Cycle, Chiropody Symposium, Toronto, 25 January 1997.
4. Ability of Chiropractors to Place the Subtalar Joint at the Neutral Position, Ontario Society of Chiropractors, Toronto, 09 February 1996.
3. Locomotion Analyses in the Biomechanics Laboratory at the University of Toronto, Canadian Memorial Chiropractic College, Toronto, 03 February 1988.
2. Validity of Biomechanical Models Which Decompose Moment of Force into Individual Muscles. Engineering Foundation Conference on Biomechanics and Control: The Development and Roles of Models, Henniker, New Hampshire, USA, 23 July 1987.
1. Accuracy of the WATerloo Spatial Motion Analysis and Recording Technique (WATSMART) to Locate Points and Human Body Segments in 4D Space-Time, Canadian Association of Sport Sciences, Ottawa, Canada, 25 October 1986.

### Editorships

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|-------|---|
| 2006- | Board Member, Year Book of Sports Medicine, Elsevier, Inc.              |
| 1993- | Consulting Editor, Journal of Biomechanics (review ~08 papers per year) |

### Evaluation of articles for scientific, literary or artistic journals

- |       |  |
|-------|--|
| 2004- | Physiotherapy Canada (~2 papers per year)                                  |
| 2003- | Journal of the American Podiatric Medical Association (~2 papers per year) |
| 1998- | Medicine and Science in Sports and Exercise (~2 papers per year)           |

1998-	Gait & Posture (~2 papers per year)
1988-1993	Journal of Biomechanics (~6 papers per year)
1984-1989	Medicine and Science in Sports and Exercise (~2 papers per year)
1984-1987	Ergonomics (~2 papers per year)
1982-1989	Canadian Journal of Applied Sport Sciences (~4 papers per year)

**Evaluation of Grants:**

2005-	CIHR (~1 per year)
2005-	NSERC (~1 per year)
1999-	Canadian Physiotherapy Foundation (~1 grant per year)
1995-2000	The Hospital For Sick Children Foundation (~1 grant per year)
1993-1995	Ontario Ministry of Health (~2 grants per year)
1987-1993	Fitness and Amateur Sport (~3 grants per year)
1987-1992	Canadian Fitness and Lifestyle Research Institute (~1 grant per year)
1987-1989	Medical Research Council (~2 grants per year)
1982-1995	Natural Sciences and Engineering Research Council (~3 grants per year)

**Knowledge translation/Dissemination activities (since 1997)**

5	Neck Pain Symposium, 12 April 2008
4	Neck Pain Symposium, 30 September 2005
3	Ontario Cabinet Ministerial Visit, Jim Wilson, Energy, Science and Technology, 14 April 1998.
2	Mini Shad Valley, McMaster University, 18-19 July 1997.
1	Health Science Research Information and Discussion Day, McMaster University, 17 June 1997.

**3 INTERRUPTIONS AND DELAYS**

The tragic death of one of Michael's beloved daughters, Theresa, on 17 May 1997, had a profound psychological impact on his life.

**4 PATENTS AND INTELLECTUAL PROPERTY RIGHTS**

In the Spring of 1996, McMaster University formally granted the property rights to **FOOTfacts**, a foot motion assessment and processing technique which is used to prescribe customized foot orthotics, to Michael Pierrynowski and Kevin Ball. This system was used by one graduate student (R Trenholm) to successfully prescribe customized foot orthoses to elite figure skaters.

## 5 PUBLICATIONS

### Published (or in press) refereed papers (original articles published in journals with editorial review)

44. Pierrynowski MR, Ball KA. Oppugning the Assumptions of Spatial Averaging of Segment and Joint Orientations, *Journal of Biomechanics*, 42(3): 375-378, 2009.
43. Pierrynowski MR, Measurement Properties of a Simple Biomechanical Measure of Walking Effort, *Computational and Mathematical Methods in Medicine*, iFirst article, 1–10, 2009.
42. Trotter L, Pierrynowski MR, A Randomized Clinical Trial Examining the Effectiveness of Full-contact Custom-made Foot Orthoses and Prefabricated Inserts on Gait Effort, *Journal of the American Podiatric Medical Association*, 98(6): 429-435, 2008.
41. Trotter L, Pierrynowski MR, A Randomized Clinical Trial Examining the Effectiveness of Full-contact Custom-made Foot Orthoses and Prefabricated Inserts on Lower Extremity Musculoskeletal Pain, *Journal of the American Podiatric Medical Association*, 98(5): 357-363, 2008.
40. Rivest L-P, Baillargeon S, Pierrynowski MR. A directional model for the estimation of the rotation axes of the ankle joint, *Journal of the American Statistical Association*, 103(483): 1060-1069, 2008.
39. Trotter L, Pierrynowski MR, Ability of Foot Care Professionals to Cast Feet Using the Non-weight-bearing Plaster and the Gait-referenced Foam Casting Techniques, *Journal of the American Podiatric Medical Association*, 98(1): 14-18, 2008.
38. MacDermid J, Galea V, Pierrynowski MR, Goldsmith CH, Gross A, McLaughlin L and HaNSA. HaNSA – Head and Neck, Shoulder & Arm Research Group. Orthopaedic Division Review, March/April: 23-27, 2007.
37. Santaguida PL, Pierrynowski M, Goldsmith C, Fernie G. Comparison of Cumulative Low Back Loads of Caregivers when Transferring Patients Using Overhead and Floor Mechanical Lifting Devices. *Clinical Biomechanics*, 20: 906-916, 2005.
36. Pierrynowski MR, Tiidus PM, Galea V. Women with fibromyalgia walk with an altered muscle synergy. *Gait & Posture*, 22: 210-218, 2005.
35. Sajko SS, Pierrynowski MR. Influence of Treadmill Design on Rearfoot Pronation During Gait at Different Speeds. *Journal of the American Podiatric Association*, 95(5): 475-480, 2005.
34. Maltais DM, Pierrynowski MR, Galea V, Bar-Or O. Physical activity level is associated with the O2 cost of walking in cerebral palsy. *Medicine and Science in Sports and Exercise*, 37(3): 347-353, 2005.
33. Maltais DM, Pierrynowski MR, Galea V, Matsuzaka A, Bar-Or O. Habitual Physical Activity Levels are Associated with Biomechanical Walking Economy in Children with Cerebral Palsy. *American Journal of Physical Medicine and Rehabilitation*, 84(1): 36-45, 2005.
32. Pierrynowski MR, Gross A, Miles M, Galea V, McLaughlin L, McPhee C. Reliability of the long-range power-law correlations obtained from the bilateral stride intervals in asymptomatic volunteers whilst treadmill walking. *Gait & Posture*, 22(1): 46-50, 2005.
31. Maltais D, Pierrynowski MR, Galea V, deBruin H, Al-Mutawaly N, Bar-Or O. Minute by Minute Differences in Co-Activation during Treadmill Walking in Cerebral Palsy. *Electromyography and Clinical Neurophysiology* 44(8):477-87, 2004.
30. Maltais D, Bar-Or O, Pierrynowski M, Galea V. Repeated treadmill walks affect physiologic responses in children with cerebral palsy, *Medicine and Science in Sport and Exercise*, 35(10): 1653-1661, 2003.
29. Dawson, KA, PM Tiidus, M. Pierrynowski, JP Crawford and J Trotter. Evaluation of a community based exercise program for diminishing symptoms of fibromyalgia. *Physiotherapy Canada*, 55(1): 17-22, 2003.
28. Pierrynowski MR, Finstad E, Kemecey M, Simpson J. Relationship between the subtalar joint inclination angle and the location of lower extremity injuries, *Journal of the American Podiatric Association*, 93(6): 481-484, 2003.
27. Tiidus PM, Pierrynowski MR, Dawson KA. Influence of moderate training on gait and work capacity of Fibromyalgia patients: A Preliminary Field Study. *Journal of Sports Sciences and Medicine*, 1: 122-127, 2002.
26. Boucher M, Leone J, Pierrynowski MR, Bhandari M. Three-Dimensional Assessment of Tibial Malunion Following Intramedullary Nailing: A Preliminary Study, *Journal of Orthopaedic Trauma*, 16: 473-483, 2002.
25. Dickey JP, Pierrynowski MR, Bednar DA, Yang SX. Relationship between Pain and Vertebral Motion in Chronic Low-back pain Subjects, *Clinical Biomechanics*, 17: 345-352, 2002.
24. Pierrynowski MR, V Galea. Enhancing the ability of gait analyses to differentiate between groups: Scaling gait data to body size, *Gait & Posture*, 13(3): 193-201, 2001.

23. Maltais D, Bar-Or O-D, Pierrynowski MR, Galea V. Use of orthoses lowers the O<sub>2</sub> cost of walking in children with cerebral palsy, *Medicine and Science in Sport and exercise*, 33(2):320-325, 2001.
22. Pierrynowski MR Commentary on Leclaire R, Esdaile JM, Jequier JC et al. (1996) Diagnostic accuracy of technologies used in low back pain assessment: thermography, triaxial dynamometry, spinoscopy, and clinical assessment. *Spine* 21(11):1325-1330, in *Clinical Journal of Sport Medicine*, 1997.
21. Pierrynowski MR and SB Smith. Effect of Patient Position on the Consistency of Placing the Rearfoot at Subtalar Neutral. *The Journal of the American Podiatric Medical Association*, 87: 399-406, 1997.
20. Pierrynowski MR and SB Smith. Rearfoot Inversion/Eversion During Gait Relative to the Subtalar Joint Neutral Position. *Foot & Ankle International*, 17: 406-412, 1996.
19. Pierrynowski MR, S. B. Smith and JH Mlynarczyk. Proficiency of Foot Care Specialists to Place the Rearfoot at Subtalar Neutral. *The Journal of the American Podiatric Association*, 86: 217-223, 1996.
18. Ball MR and Pierrynowski MR. Classification of Errors in Locating a Rigid Body. *Journal of Biomechanics*, 29: 1213-1217, 1996.
17. Ball MR and Pierrynowski MR. Estimation of Six Degree of Freedom Rigid Body Segment Motion from Two Dimensional Image Data. *Human Movement Science*, 14: 139-154, 1995.
16. Eng J and Pierrynowski MR. The Effect of Soft Orthotics on Three-Dimensional Lower-Limb Kinematics During Walking and Running. *Physical Therapy*, 74: 836-844, 1994.
15. Eng J and Pierrynowski MR. Evaluation of Soft Foot Orthotics in the Treatment of Patellofemoral Pain Syndrome, *Physical Therapy*, 73: 62-70, 1993.
14. Hurley GRB, R McKenney, M Robinson, M Zadavec and Pierrynowski MR. The Role of the Contralateral Limb in Below-Knee Amputee Gait. *Prosthetics and Orthotics International*, 14: 33-42, 1990.
13. Hattin H., Pierrynowski MR and MR Ball. Effect of load, Cadence, and Fatigue on tibio-femoral joint force during a half-squat. *Medicine and Science in Sport and Exercise*, 21: 613-618, 1989.
12. Pierrynowski MR, MR Tiidus and MJ Pyley. Effects of Running Up or Downhill Prior to a Downhill Run. *European Journal of Applied Physiology*, 56:668-672, 1987.
11. Tupling SJ and Pierrynowski MR. On the use of Cardan Angles to Locate Rigid Bodies in Three Dimensional Space. *Computer Methods and Programs in Biomedicine*, 25: 527-532, 1987.
10. Sloman L, Pierrynowski MR, ME Berridge, SJ Tupling and J Flowers. Mood Depressive Illness and Gait Patterns. *Canadian Journal Psychiatry*, 32: 190-193, 1987.
9. Tupling SJ, GM Davis, Pierrynowski MR and RJ Shephard. Wheelchair Impulse Generation and Arm Strength in the Physically Disabled, *Ergonomics*, 29: 303-311, 1986.
8. Pierrynowski MR and Morrison JB. Estimating the Muscle Forces Generated in the Human Lower Extremity when Walking: A Physiological Solution. *Mathematical Biosciences*, 75: 43-68, 1985.
7. Pierrynowski MR and Morrison JB. A Physiological Model for the Evaluation of Muscular Forces in Human Locomotion: Theoretical Aspects. *Mathematical Biosciences*, 75: 69-101, 1985.
6. Pierrynowski MR, Winter DA and Norman RW. Metabolic Measures to Ascertain the Optimal Load to be Carried by Man. *Ergonomics* 24: 393-399, 1981.
5. Pierrynowski MR, Norman RW and Winter DA. Mechanical Energy Analyses of the Human During Load Carriage on a Treadmill. *Ergonomics* 24: 1-14, 1981.
4. Pierrynowski MR, Winter DA and Norman RW. Transfers of Mechanical Energy Within the Total Body and Mechanical Efficiency During Treadmill Walking. *Ergonomics* 23: 147- 156, 1980.
3. Norman RW, PJ Bishop and Pierrynowski MR. Puck Impact Response of Hockey Face Masks. *Canadian Journal of Applied Sport Sciences* 5: 208-214, 1980.
2. Bishop PJ, Norman RW, Pierrynowski MR and J Kozey. The Ice Hockey Helmet: How Effective Is It? *The Physician and Sports Medicine* 7: 97-106, 1979.
1. Norman RW, PJ Bishop, Pierrynowski MR and JC Pezzack. Aircrew Helmet Protection Against Potential Cerebral Concussion in Low Magnitude Impacts. *Aviation, Space and Environmental Medicine* 50: 553-561, 1979.

**Published (or in press) books and monographs (as author or editor)**

none

**Published (or in press) contributions to books (book chapters)**

5. Pierrynowski MR. Muscle Function During Human Gait in Normal and Muscle Damaged Populations, in *Skeletal Muscle Damage & Repair: Mechanisms and Interventions* (PM Tiidus, editor), Human Kinetics Publishers, Champaign, Illinois, 2008.
4. Pierrynowski MR and Stratford PW *Mathematical Modeling of Human Motion: Its implications in predicting a safe quadriceps strengthening exercise for individuals with a deficient anterior cruciate ligament*, in *Current Therapy in Sports Medicine*, 3rd Edition (JS Torg and RJ Shephard, editors), Mosby, Philadelphia, pages 490-494, 1995.
3. Pierrynowski MR *Analytic Representation of Muscle Line of Action and Geometry*, in *Three Dimensional Analyses of Human Movement* (P Allard, IAF Stokes & J-P Blanche, editors), Human Kinetics Publishers, pages 215-256, 1994.
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1. Pierrynowski MR *The Role of the Biomechanist in Sports Medicine*, in *Current Therapy in Sports Medicine* (RJ Shephard and P Welsh, editors), B.C. Decker, Inc., Toronto, Canada, pages 58-59, 1985.

**Published (or in press) contributions to books (conferences or symposiums proceedings/abstracts)**

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70. Morash J, Galea V, MacDermid J, Gross A, Pierrynowski M. Neural strategies controlling the shoulder and arm during a high reach and grasp task in patients with mechanical neck disorders (MND). Orthopedic Symposium, Calgary, Canada, 13-15 Oct 2006: p-42.
69. Bradley LB, Galea V, Mac Dermid J, Gross A, Pierrynowski M. Upper limb function in patients with mechanical neck disorder: Joint kinematics. Orthopedic Symposium, Calgary, Canada, 2006;Oct 13-15: p-43.
68. Pierrynowski M, Gross A, Galea V, MacDermid J, McLaughlin L, Graham N, Kumbhare D and Parkinson W. Sensitivity of the Neck-Walk Index to detect change in patients with mechanical neck disorders. The Changing Face of Physiotherapy, 2005 Orthopaedic Symposium, Canadian Physiotherapy Association, London, Ontario 28-30 October 2005.
67. MacDermid J, Galea V, Pierrynowski M, Gross A and McLaughlin L. The relationship between quantitative sensory tests or electrophysiology and disability in patients with mechanical neck disorders. The Changing Face of Physiotherapy, 2005 Orthopaedic Symposium, Canadian Physiotherapy Association, London, Ontario 28-30 October 2005.
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63. Maltais DB, Pierrynowski MR, Galea V, Bar-Or O. Physiologic and Biomechanical Walking Economy are Associated with Walking-Related Gross Motor Function in Children and Adolescents with Mild Spastic Cerebral Palsy. American Academy for Cerebral Palsy And Development Medicine, 59th Annual Meeting, Orlando, Florida, 14-17 September 2005.
62. Pierrynowski M, Kumbhare D, Galea V, Gross A, MacDermid J, McLaughlin L, HaNSA. The Neck-Walk Index: A new performance outcome measure that identifies patients with neck pain or stiffness. Presented at the 65th Annual Assembly of the American Academy of Physical Medicine & Rehabilitation, Phoenix, Arizona, October 2004. [Abstract in Arch Phys Med Rehabil 2004;85:E10.]

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60. McLaughlin L and HaNSA. The impact of proximal positioning on pain perception: A clinician's journey to the research lab. Presented at the Canadian Physiotherapy Association - Orthopaedic Division 16th Annual National Symposium, St. John's, Newfoundland, 12 September 2004.
59. Graham N and HaNSA. Mechanical traction for mechanical neck disorders: a systematic review. Presented at the Canadian Physiotherapy Association - Orthopaedic Division 16th Annual National Symposium, St. John's, Newfoundland, 12 September 2004.
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57. Maltais DB, Pierrynowski MR, Galea V, Bar-Or O (2004) Physical Activity Level is Associated with the Oxygen Cost of Walking in Children and Adolescents with Mild Spastic Cerebral Palsy, North American Society for Pediatric Exercise Medicine, August 11-15, New Brunswick, Canada.
56. Ball KA, Pierrynowski MR, Greiner TM, Woodward SP (2004) Functional alignment procedure for joint-specific movement analysis: *in-vitro* tibiotalar example, 8<sup>th</sup> International Symposium on the 3-D Analysis of Human Movement, 1-2 April 2004, Tampa, Florida, USA.
55. Orlin MN, Pierrynowski MR, Palisano RP, Westcott S, Gracely E. Effect of Calcaneal Eversion on Balance and Temporal Spatial Characteristics of Gait in Children, American Physical Therapy Association Combined Sections Meeting, 4-8 Feb 2004, Nashville, Tennessee, USA.
54. Guy S, McDowell J, Ruttan P, Stevenson B, Turner L, Vair R with the Head and Neck, Shoulder & Arm Special Interest Group (HaNSA Members: Galea V, Graham N, Gross A, Kumbhare D, MacDermid J, Manto L, McLaughlin L, McPhee C, Parkinson W, Pierrynowski M) The Neck-Walk Index identifies patients with mechanical neck disorders, 8th International Federation of Orthopaedic Manual Therapists Conference, 21-26 March 2004, Cape Town, South Africa
53. Buck S, Cheung G, Lundquist L, Tang B, Zavitz K with the Head and Neck, Shoulder & Arm Special Interest Group (HaNSA Members: Galea V, Graham N, Gross A, Kumbhare D, MacDermid J, Manto L, McLaughlin L, McPhee C, Parkinson W, Pierrynowski M) Upper limb function in patients with mechanical neck disorders, 8th International Federation of Orthopaedic Manual Therapists Conference, 21-26 March 2004, Cape Town, South Africa
52. Pierrynowski M, Galea V, Graham N, Gross A, Kumbhare D, MacDermid J, Manto L, McLaughlin L, McPhee C, Parkinson W. A new performance outcome measure, the Neck-Walk Index, to classify patients with neck pain or stiffness, Achieving Excellence Through Collaboration Conference, Sponsored by the Insurance Bureau of Canada and the Workplace Safety & Insurance Board, 18 Sept 2003, Toronto, Canada.
51. Dawson KA, Tiidus PM, Pierrynowski MR, Crawford JP, Trotter J. Effectiveness of a community based exercise program in diminishing symptoms of fibromyalgia. 48<sup>th</sup> Annual Meeting of the American College of Sports Medicine, Baltimore, Maryland, 30 May - 02 June 2001.
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### **Presentations as guest speaker**

43. The Influence of mild-whiplash on the Neck-Walk Index: A prospective Study, Third Annual HaNSA Symposium, Hamilton, Ontario, 02 April 2008.
42. The Neck-Walk Index, Second Annual HaNSA Symposium, Hamilton, Ontario, 28 February 2007.
41. Movement scientists working with clinicians to help patients with head, neck, shoulder and arm disability. Always challenging and always a compromise! University of Waterloo, Waterloo, Ontario, 07 Mar 2007.
40. The Neck-Walk Index: A Clinical Outcome Measure for Patients with Neck Pain. CIRRIIS: Centre for Interdisciplinary Research in Rehabilitation and Social Integration, Université Laval, Ste-Foy, Quebec, 07 Dec 2006.
39. The Neck-Walk Index: A Clinical Measure for Patients with Neck Pain. Département de mathématiques et de statistique, Université Laval, Ste-Foy, Quebec, 23 Nov 2006.
38. The Neck-Walk Index: A new outcome measure that identifies patients with neck pain or stiffness, Department of Human Anatomy and Cell Science, University of Manitoba, 11 August 2005.
37. Gait Analysis: Bridging the Gap From Laboratory to Clinic, Hamilton Health Sciences, 23 May 2004.
36. The Head and Neck, Shoulder & Arm Special Interest Group: History and Present Status, School of Rehabilitation Science, McMaster University, 26 November 2003.
35. Are Clinical Measurements Useful in Prescribing Foot Orthoses? Department of Physical Therapy, Exercise & Nutrition Sciences, State University of New York, Buffalo, NY 5 April 2002
34. Summary of My Research Leave. School of Rehabilitation Science, McMaster University, 17 May 2000.
33. Are Clinical Measurements Useful in Prescribing Foot Orthoses? Sunnybrook Hospital, Toronto, 30 November 1999.
32. Measurement Properties of Two Clinical Tools Used by Foot Care Professionals to Prescribe Foot Orthoses, Centro Di Bioingegneria, Politecnico di Milano, Milano, Italy, 26 October 1999.
31. Quality of Two Clinical Measurement Tools Used by Foot Care Professionals to Prescribe Foot Orthoses? Florence, Italy, 20 October 1999
30. Can Clinical Measurements be Used to Prescribe Foot Orthoses? New York Chiropractic College, 28 September 1999.
29. Research Activities in the Human Movement Laboratory (HML), (with V Galea). McMaster University, Department of Biomedical Sciences Annual Research Day, 6 February 1998.
28. Can Clinicians Manually Assess Rearfeet to Prescribe Foot Orthoses? Brighton University, Eastbourne, UK, 13 February 1998.
27. Physiotherapy and Biomechanical Foot Care, Pediatric Physical Therapy Graduate Program, Allegheny University of the Health Sciences, 5 April 1997.
26. Orthotics for Children: Are they Clinically Useful?, Hahnemann University, Programs in Physical Therapy, 01 April 1996.
25. Ability of Foot Care Specialists to Position the Rearfoot at Subtalar Neutral, McMaster University, Department of Kinesiology, 11 March 1996.
24. The Effects of Chemotherapy on Gait Patterns of Children with Acute Lymphoblastic Leukaemia, (with V Galea, C Mark, and JM Halton). McMaster University, Department of Biomedical Sciences Annual Research Day, 12 February 1996.
23. Selected Projects from the Human Movement Laboratory (with V Galea). McMaster University, 05 April 1995.
22. Gait Evaluation of Children During Treatment for Leukaemia, (with V Galea, and JM Halton). McMaster University, Department of Biomedical Sciences Annual Research Day, 03 March 1995.
21. A Moving Assessment of Gait, (with V Galea, J Halton, and M Wright) Pediatric Grand Rounds, McMaster University, 02 March, 1995.
20. Force-Length Properties of Human Striated Muscle, Manual Therapy Interest Group, McMaster University, 7 May 1994

19. The Human Movement Laboratory in the Faculty of Health Sciences (with V Galea), McMaster University, 22 April 1994.
18. Determining the Rotation Matrix and Translation Vector of Rigid Bodies from Initial and Final Position Data, McMaster University, 15 March 1993.
17. The Role of a Biomechanist in a School of Occupational Therapy and Physiotherapy, McMaster University, 22 October 1992.
16. Muscle Mechanics, Graduate School Program in Physical Therapy, Hahnemann University, 21 November 1991.
15. A Model for the Solution of Individual Muscle Forces, Department of Kinanthropometry, University of Ottawa, 12 November 1991.
14. Application of Gait Analysis for the Handicapped, Advances in Developmental Disabilities, Children's Seashore House Convocational Scientific Meeting, 25 September 1990.
13. Clinical Gait Analysis: the role it provides in health care delivery, Kinesiology Symposium, Simon Fraser University, 14 September 1990.
12. Three Dimensional Sacroiliac Motion During Locomotion in Asymptomatic Male and Female Subjects, Fifth Annual Canadian Memorial Chiropractic College Research Day, 8 February 1989.
11. How Deep Do Individuals Dive? Guidelines for the Canadian General Standards Board (Residential Swimming Pools), Canadian General Standards Board, 29 June 1988.
10. Sacroiliac Motion During Gait, University of Waterloo, Department of Kinesiology, Waterloo, Ontario, 26 April 1988.
9. Physiological Factors Influencing Muscle Force Output, The Toronto Hospital, Toronto Western Division, Department of Rehabilitation Medicine, Toronto, 04 November 1987.
8. Sports and Medicine and Gait Labs, The Hospital for Sick Children, Division of Biomedical Research, Toronto, 02 June 1987.
7. A Physiological Model for the Evaluation of Muscular Forces During Human Movement, Institute of Biomedical Engineering, University of Toronto, Canada, 10 October 1985.
6. Biomechanics of Hopping and Skipping, Faculty of Physical Education, Queen's University, Canada, 29 March 1985.
5. Solving for Individual Muscle Forces, Faculty of Physical Education, Queen's University, Canada, 29 March 1985.
4. Mathematically Modelling the Individual Muscle Force Redundancy Problem, Faculty of Physical Education, University of Calgary, Canada, 08 Feb 1983.
3. Models for Solving Individual Muscle Force Time Profiles, Faculty of Medicine, University of Calgary, Canada, 07 Feb 1983.
2. Musculo-Skeletal Model of the Lower Extremity, Faculty of Physical Education, University of Calgary, Canada, 07 Feb 1983.
1. Physiological Models for Solving the Muscular Forces during Human Locomotion, School of Physical Education and Recreation, University of British Columbia, Canada, 03 Dec 1980.

#### **Research or technical reports**

8. Pierrynowski MR, PJ Shannon and HD Jones. How Deep Do Individuals Dive? Guidelines for the Canadian General Standards Board (Residential Swimming Pools). The Canadian Red Cross Society, May 1988.
7. Pierrynowski MR, PL Rothwell and DT Hickey. Crewstation Assessment of Reach Revision IV: Validation of Predicted Reach Envelopes. Submitted to the Defense and Civil Institute of Environmental Medicine Contract Number 01SE.977111-4-8024, September, 1987.
6. Pierrynowski MR and DT Hickey. Crewstation Assessment of Reach Revision IV: A Critical Review of Selected Features. Submitted to the Defense and Civil Institute of Environmental Medicine Contract Number 01SE.977111-4-8024, September 1987.
5. Pierrynowski MR, RD Bryant and DT Hickey. Crewstation Assessment of Reach (CAR-PC1): Summary of Revisions Performed for Use on a Personal Computer. Submitted to the Defense and Civil Institute of Environmental Medicine Contract Number 01SE.977111-4-8024, August 1986.
4. Hickey DT, Pierrynowski MR and PL Rothwell. Crewstation assessment of reach: summary of CAR-IV revisions and reassessment of the model for use in the CF aircrew-cockpit compatibility evaluation (ACCE). Submitted to the Defense and Civil Institute of Environmental Medicine Contract Number 01SE.977111-4-8024, February 1986.

3. Hickey DT, Pierrynowski MR and PL Rothwell. Man modelling CAD programmes for workspace evaluations. Submitted to the Defense and Civil Institute of Environmental Medicine Contract Number 01SE.977111-4-8024, November 1985.
2. Norman RW, D.A. Winter and [Pierrynowski MR]. Mechanical Energy Analyses of Human Body Segments During Load Carriage. Waterloo Research Institute Project Number 702-15. Submitted to the Defense and Civil Institute of Environmental Medicine, 1979.
1. Norman RW, PJ Bishop, D Hayes and [Pierrynowski MR]. Impact Performance of Air Crew Helmets with Respect to Potential Head Injury. Waterloo Research Institute Project Number 801-13. Submitted to the Defense and Civil Institute of Environmental Medicine, 1979.

#### **Articles in professional or cultural journals without review**

4. Pierrynowski MR Introducing a new clinical outcome for patients with neck pain: the Neck Walk Index. Omega Oracle, Issue 42, Nov 2008.
3. Snyder RD, Pierrynowski MR, M Orlin and WW Robertson. An Approach to the Gait Analysis of Children with Juvenile Rheumatoid Arthritis. The University of Pennsylvania Orthopaedic Journal, 7:22-25, 1991.
2. Pierrynowski MR The Children's Seashore House Gait Laboratory: A facility for gait and foot pressure analyses. The University of Pennsylvania Orthopaedic Journal, 6:110-112, 1990.
1. Pierrynowski MR and SJ Tupling. What Do We Have in Common With the Hopping Kangaroo? Current 4:6-8, 1983.

#### **Manuscripts In Review**

McKenzie K, Wessel J, Galea V, Pierrynowski MR, Lower extremity kinematics of females with patellofemoral pain syndrome while stair climbing. Archives of Physical Medicine and Rehabilitation.

Galea V, Morash J, Bradley L, Pierrynowski M, MacDermid J, Gross A, Shoulder and upper arm muscle activation strategies are altered in patients with mechanical neck disorders compared to asymptomatic volunteers. Clinical Neurophysiology.

#### **Manuscripts in Preparation**

Pierrynowski MR, Rivest L-P, Baillargeon S, Reliable non-invasive estimation of human rearfoot geometry

Soleyn J, Pierrynowski MR, Gross A, Galea V. Visual feedback protocol requires six repetitions to achieve excellent reliability in a common neck proprioception test. Archives of Physical Medicine and Rehabilitation.

Haddou M, Rivest L-P, Pierrynowski MR. Some non-linear mixed models for directional data with application to the estimation of the ankle's rotation axes. Journal of the American Statistical Association.

Galea V, Woody EZ, Szechtman H, Pierrynowski MR. Detection of "motion" in a hypnotically stiffened arm.

## 6 EDUCATIONAL CONTRIBUTIONS

### Graduate Courses, School of Rehabilitation Science, McMaster University

01/02/03	MSc (RS 701) Analysis and Rehabilitation of Functional Movement (with J Wessel)
04/06/07	MSc (RS 701) Analysis and Rehabilitation of Functional Movement
04/05/07/08	MSc (PT) Unit I Physiotherapy (Tutor)
01/02/03/04/05/06	MSc (PT) Unit II Physiotherapy (Tutor)
01/02/03/04	MSc (PT) Unit II Physiotherapy (Professional Issues Coordinator)
08	MSc (PT) Unit III Physiotherapy (Professional Issues Coordinator)
02/03	MSc (OT) Term V Occupational Therapy (Research Course Tutor)
04/07/08	MSc (OT) Term IV Occupational Therapy (Research Course Tutor)
02/03/04	MSc (PT) Unit VI Physiotherapy (Research Coordinator)

### Undergraduate/Graduate Courses, School of Rehabilitation Science, McMaster University

92	BHSc (PT) Unit I Physiotherapy (Tutorial Tutor-in-Training)
98/99/00/01	BHSc (PT) Unit II Physiotherapy (Tutor)
93/94/95/96/97/98/00	BHSc (PT) Unit II Physiotherapy (Anatomy Tutor)
97/98/00	BHSc (PT) Unit II Physiotherapy Inquiry Seminar Coordinator
93/94/95/96/97	BHSc (PT & OT) Unit VI Research Internship (Coordinator)
98/00/01	BHSc (PT) Unit VI Research Internship Coordinator (coordinator and lecturer)
95/96	BHSc (PT) Unit VI Physiotherapy (Tutorial Tutor)
00/01	BHSc (PT) Unit VI Physiotherapy (Tutorial Mentor)

### Certificate Courses, Mohawk College

02/03/04/05/06/07/08	HTH03, Statistics, Databases and the Internet, Clinical Research Associate Program
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### Graduate Course: Department of Orthopaedic Surgery, University of Pennsylvania

89/91	Biomechanics for Orthopaedic Residents
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### Undergraduate Courses, School of Physical and Health Education, University of Toronto, (UG year in braces)

88	Applied Muscle Mechanics	(2)
88	Introduction to the Biophysical Sciences	(1)
82/83/84/85/86/87	Qualitative Biomechanics	(2)
82/83/84/85/86/87	Laboratory Techniques in Biomechanics	(4)
82	Computing Project in Biomechanics	(4)
82	Anatomical Correlates in Biomechanics	(4)
81/82/83/84/85/86/87	Quantitative Biomechanics	(2)

### Graduate Courses, Department of Community Health, Exercise Sciences Program, University of Toronto

84/86	Biomechanics of Muscle Activity
83/85/87	Advanced Biomechanics Techniques

## 7 **LIFETIME RESEARCH FUNDING: (Applied, Currently Holding, or Held)**

### **Applied**

2009-2011 NIH (NCCAM)/CIHR Biological Basis for Manual Therapies call for Exploratory and/or Developmental Grants (R21), 01 Jul 2009 – 30 June 2011, \$274,848, Characterizing the Magnitude and Time Course of Biological Responses in Mild to Moderate Whiplash Associated Disorders as a basis for Differentiating Biological Outcomes and Predictors. MacDermid JC, Pierrynowski MR, Dickey JP, Woodhouse LJ, Goldsmith CH, Galea V, Kumbhare DA, Gross AR, Parkinson W, McLaughlin LM

### **Currently Holding**

2009 NICDS (National Institute for Complex Data Structures) Inaugural Workshop Support, 01 May 2009 – 31 Dec 2009, \$34,000, The analysis of directional data with applications to biomechanics and biomedical imaging. Rivest L-P, Massam H, Kim P, Chung M, Dickey J, Pierrynowski MR

2008-2009 Sole Support Incorporated, 01 July 2008 – 30 June 2009, \$55,400, Influence of Foot Orthoses on Foot Mechanics, Pierrynowski MR, Trotter, L. (includes product donations)

2006-2009 Neuro Group Inc, 01 Aug 2006 - 31 Dec 2009, \$423,000, Proposal to Evaluate the Efficacy of the IntereX5000 in the Treatment of Chronic Neck and Shoulder Pain. Triano J, Woodhouse L, Galea V, Injeyan HS, MacDermid J, McGregor M, Pierrynowski MR, Ruegg R, Teodoroczyk JA.

### **Held**

2005 Leon Paul, Inc., 01 Sep 2005 - 31 Dec 2005, \$4,200, Does performance improve when fencers wear custom footwear? Pierrynowski MR, Sonnadara R.

2005-2006 Sole Supports Incorporated, 01 Jan 2005 - 30 Apr 2006, \$42,150, Impact of Foot Orthoses on Impairment and Functional Outcomes: A randomized clinical trial, Pierrynowski MR, Trotter L. (includes product donations)

2003 Hamilton Health Sciences Corporation, 01 Jan 2004 - 31 July 2005, \$9,674, Upper limb function following mechanical neck disorder, Manto L, Lee A, Galea V, Pierrynowski MR and HaNSA.

2003 Physiotherapy Foundation of Canada, 01 July 2003 - 30 June 2004, \$4,000, The role of quantitative sensory testing in diagnosis and evaluation of mechanical neck disorders., MacDermid J, Galea V, Gross A, Graham N, McPhee C, McLaughlin L, Pierrynowski M

2003 Hamilton Hospital Assessment Centre, 01 June 2003 - 30 May 2004, \$11,089, A pilot study to examine the test-retest reliability of a novel performance outcome measure, the neck-walk index, for patients with neck pain or stiffness., Pierrynowski M, Gross A, MacDermid J, Galea V, McLaughlin L, McPhee C, Graham N

2003 Canadian Physiotherapy Association, 01 May 2003 - 30 April 2004, \$1,000, Promoting effective manual therapy for patients with mechanical neck disorders, McPhee C, Galea V, Graham N, Gross A, MacDermid J, McLaughlin L, Pierrynowski M

2001 Bloorview Children's Hospital Foundation: An Innovative, Multi-disciplinary Assessment of the Effects of an Exercise Program on the Energy Cost of Locomotion and Walking Proficiency in Children with Cerebral Palsy. [1 year \$54,000, Bar-Or, Pierrynowski, Galea]

1999-2000 The Trillium Foundation: Training interventions for primary fibromyalgia patients [1 year \$23,000, Tiidus, Ducharme, Pierrynowski, Crawford, Trotter, Trotter]

1998 Canadian Orthopaedic Association (Hip Hip Hooray): Malalignment following Plate Fixation and Intramedullary Nailing of Tibial Shaft Fractures: Magnitude and Clinical Implications: A Matched Prospective Cohort Study [6 months \$1780, Bhandari, Pierrynowski, Lachowski, Kwok, Dunlop]

1997-98 Hospital for Sick Children Foundation, Multi disciplinary approach to measuring the effect of ankle foot orthoses on walking economy of children with cerebral palsy [1 year \$40,000, Bar-Or, Pierrynowski, Galea, Maltais]

1997-98 Canadian Figure Skating Association: Use of soft foot orthotics by figure skaters: Are they of any benefit? [1 year \$2,500, Trenholm, Pierrynowski, Smith]

1996 Canadian Orthopaedic Association (Hip Hip Hooray): Lateral heel wedge and its effect on subtalar motion at the ankle joint. [6 months \$1,000, McCann, Pierrynowski]

- 1996-98 North American Spine Society: Relationship between 3D segmental spinal motion *in vivo* and pain in instrumented patients with low back pain. [30 months \$11,748, Bednar, Dickey, Pierrynowski, Galea]
- 1995 Program for Faculty Development, Leadership Development Program: Networking the Chiroprodists of Ontario. [6 months \$1,111, Pierrynowski]
- 1994-95 Edith Herman Research Fund: Effect of various teaching methods on the reliability of placing the ankle joint in the subtalar neutral position. [8 months \$5,843, Mlynarczyk, Pierrynowski, Smith]
- 1993-94 J.P. Bickell Foundation: Assessing translation and shear in anterior cruciate deficient knees. [18 months \$18,068, Pierrynowski, Stratford, Galea]
- 1993 Natural Sciences and Engineering Research Council, Equipment Grant: Three-dimensional coordinate system. [1 year \$73,331, Elliott, Dowling, Lee, Pierrynowski, Riach, Starks, Tipper, Weeks]
- 1992-93 Ministry of Colleges and Universities: Transition Academic Fund, Development of a Human Movement Teaching Resource Laboratory. [1 year \$143,400, Pierrynowski, Stratford, Saarinen]
- 1992-94 McMaster University Faculty of Health Sciences: Start-up Research Funds [2 years \$50,000, Pierrynowski]

University of Toronto, School of Physical and Health Education

- 1988 Fitness and Amateur Sport: Biomechanical Analysis of the Front Crawl Stroke on the SwimBench [1 year \$4,000, Pierrynowski, Pyley]
- 1988 The Canadian Red Cross Society: Pool Safety Study. [3 months \$2,000, Pierrynowski]
- 1988 Canadian Memorial Chiropractic College: Quantification of sacroiliac motion during gait. [5 months \$2,500, Pierrynowski]
- 1986-1989 Natural Sciences and Engineering Research Council: Examining the assumptions inherent within a hierarchical physiological muscle force predictor model. [3 years \$48,800, Pierrynowski]
- 1985-1988 Defense and Civil Institute of Environmental Medicine: Assessment of Aircraft Cockpit Compatibility Using the CAR Computer Man Model. [3 years \$67,748, Pierrynowski]
- 1985 University of Toronto: Equipment grant to update the strength laboratories for the undergraduate curriculum. [1 year \$26,300, Pierrynowski]
- 1984 Wintario: Biomechanics in the Undergraduate Curriculum: Is Computer-Aided Instruction Desirable? [1 year \$24,000, Pierrynowski]
- 1983-1986 Natural Sciences and Engineering Research Council: Validation of a Physiological Muscle Force Predictor Model. [3 years \$42,900, Pierrynowski]
- 1982-1985 Health and Welfare Canada: On-line Clinical Assessment of Muscular Activity in Lower Limb Disability. [3 years \$60,300, Morrison, Pierrynowski]
- 1982 Ontario Hydro and Bell Northern Research: Pole Safety Study. [6 months \$3,000, Pierrynowski]
- 1982 Sport Canada: Temporal, Kinematic and Electromyographic Observations of Elite sprinters on an Indoor Running Surface and a New High Velocity Treadmill. [1 year \$4,500, Pierrynowski]
- 1981 Wintario: Implementation of a Dynamic Model of the Human Musculo-Skeletal System for Locomotor Activity. [1 year \$10,000, Pierrynowski]

**RESEARCH FUNDING: (Not Funded, List Starts in 2003)**

- 2008 MITACS, 01 July 2009 – 30 June 2012, \$220,000, Quantifying Biomechanical Motion. Kim PT, Pierrynowski MR, Dickey JP, Thomason JJ
- 2007 NIH, 01 Jul 2008 – 30 June 2010, \$273,879.20, Characterizing the magnitude and time course of biological responses in mild and moderate whiplash associated disorders as a basis for differentiating biological outcomes and predictors. MacDermid J, Pierrynowski M, Gross A, Dickey J, Goldsmith C, Galea V, McLaughlin L, Woodhouse L.
- 2007 NSERC, Research Tools and Instruments Grant, 01 July 2008 – 30 June 2009, \$135,799, Geometry of human movement. Kim P, Pierrynowski M, Dickey J.
- 2007 Canadian Institutes of Health Research, 01 Oct 2007 - 30 Sep 2008, \$100,000, Dose-Dependency of Joint Loading and Risk of Knee Osteoarthritis in Middle-Aged Male Runners: Influence of Running Speed and Mileage, Periarticular Muscle Strength and Prior Injury to the Knee. Blimkie, CJR, Adachi R, Webber C, Pierrynowski M, Gordon C, Beattie K, Young B, Thabane L, Inglis D

- 2006 Anonymous, 30 Sep 2006 - 31 July 2007, \$48,000, A randomized clinical trial to determine if [blinded] foot orthoses improve impairment and functional outcomes. Pierrynowski MR.
- 2006 Canadian Institutes of Health Research, Invention - Tools, Techniques & Devices for Research and Health Care, 01 Oct 2006 - 30 Sep 2009, \$100,000, The Neck-Walk Index, a novel performance outcome measure for patients with chronic neck pain: Moving a laboratory tool to the clinical environment. Pierrynowski MR, McDermid J, Gross A, Galea V, McLaughlin L.
- 2006 Canadian Institutes of Health Research, 01 Oct 2006 - 30 Sep 2009, \$100,000, Dose-Dependency of Joint Loading and Risk of Knee Osteoarthritis in Middle-Aged Male Runners: Influence of Running Speed and Mileage, Periarticular Muscle Strength and Prior Injury to the Knee. Blimkie, CJR, Adachi R, Webber C, Pierrynowski M, Gordon C, Beattie K, Young B, Thabane L, Inglis D, Wessel J.
- 2006 United States Department of Defense (DOD), Peer Reviewed Medical Research Program (PRMRP), 01 Sep 2006 - 31 Dec 2008, \$575,000, Subject-Specific Assessment of Tibia Stress Fracture Risk, Webber CE, Adachi JD, Blimkie CJR, Gordon CL, Inglis D, Pierrynowski MR, Pietruszczak S.
- 2006 Canadian Institutes of Health Research, 01 April 2006 - 31 March 2009, \$234,057, Biomechanical and neurophysiological foundations underlying complex musculoskeletal disorders affecting the neck and arm, Pierrynowski MR, Galea V, MacDermid J, Gross, A.
- 2005 United States Department of Defense (DOD), Peer Reviewed Medical Research Program (PRMRP), 01 Sep 2005 - 31 Dec 2008, \$615,370, The development of a subject-specific technique for the assessment of individual fracture risk, Webber CE, Adachi JD, Blimkie CJR, Gordon CL, Inglis D, Pierrynowski MR, Pietruszczak S.
- 2004 Workplace Safety & Insurance Board, 01 May 2004 - 31 December 2005, \$163,899, Neurophysiological and biomechanical foundations underlying complex musculoskeletal disorders affecting the neck/arm, Pierrynowski MR, MacDermid J, Galea J, Gross A, McLaughlin L, Kumbhare D, Parkinson W, and HaNSA
- 2004 Department of Public Health and Human Services, 01 April 2004 - 01 April 2009, \$1,875,000, Biomechanical modeling of the acquisition and refinement of gait in children, Ball KA, Bhandari M, Greiner TM, Pierrynowski MR, Smith D, Snyder R, van Loon MB, Wright M, Woodward SP.
- 2004 The Physicians' Services Incorporated Foundation, 01 Jan 2004 - 31 Dec 2005, \$134,339, Development of a measurement battery for neurological impairment in patients with neck pain, Kumbhare, D, & HaNSA.
- 2003 Hamilton Hospitals Assessment Centre, 01 May 2003 - 30 April 2004, \$11,089, A pilot study to examine the test-retest reliability of a novel performance outcome measure, the neck-walk index, for patients with neck pain or stiffness., Pierrynowski M, Gross A, MacDermid J, Galea V, McLaughlin L, McPhee C, Graham N
- 2003 Workplace Safety & Insurance Board, 01 May 2003 - 31 December 2004, \$19,715, The role of quantitative sensory testing in diagnosis and evaluation of mechanical neck disorders., Galea V, MacDermid J, Gross A, Pierrynowski M, McLaughlin L, McPhee C, Graham N

### **PERSONNEL FUNDING:**

#### **McMaster University, School of Rehabilitation Science**

- 1997 Ontario Work Study Program: Funding a Human Movement Laboratory student assistant. [4 months \$1,750, M. Pierrynowski]
- 1995-96 Ontario Work Study Program: Funding for a biomechanics student technician. [8 months \$2,000, Pierrynowski]
- 1994-95 Ontario Work Study Program: Funding a Human Movement Laboratory student assistant. [8 months \$1,750, M. Pierrynowski]
- 1993-94 Ontario Work Study Program: Funding for two Human Movement Laboratory student assistants. [8 months \$3,500, M. Pierrynowski]

#### **University of Toronto, School of Physical and Health Education**

- 1987-88 Ontario Work Study Program: Funding for a biomechanics student technician. [8 months \$3,000, Pierrynowski]
- 1986-87 Ontario Work Study Program: Funding for a biomechanics student technician. [8 months \$3,000, Pierrynowski]
- 1985-86 Ontario Work Study Program: Funding for a biomechanics student technician. [8 months \$2,000, Pierrynowski]
- 1984-85 Ontario Work Study Program: Funding for a biomechanics student technician. [8 months \$2,000, Pierrynowski]
- 1983-84 Ontario Work Study Program: Funding for a biomechanics student technician. [8 months \$1,000, Pierrynowski]

## **8 ADMINISTRATIVE RESPONSIBILITIES**

### **McMaster University**

#### *University*

- 2003-2006 Member, University Library Committee (appointed)  
 1993-1998 Chair, Human Movement Teaching Resource Laboratory Committee (elected)

#### *Faculty of Health Sciences*

- 2008-2010 Designate, Learning Technologies Access Committee (appointed)  
 2007-2008 Designate, Student Research Ethics Board (appointed)  
 2007- 2008 Member, Scholarships Selection Committee (appointed)  
 2005-2008 Member, Graduate Admissions and Study Committee (elected)  
 2002- 2005 Member, Health Sciences Library Users' Committee (elected)  
 2000- 2006 Member, Scholarships Selection Committee (appointed)  
 1998-2004 Designate, Student Research Ethics Board (appointed)  
 1997-1998 Member, Research Advisory Group (Ethics Board) (appointed)  
 1996-1998 Member, Faculty of Health Sciences Finance Committee (elected)  
 1995-1999 Member, Faculty of Health Sciences Executive Committee (elected)  
 1994-1999 Member, Council of the Faculty of Health Sciences (elected)

#### *School of Rehabilitation Science*

- 2007- Designate, e-Learning committee  
 2007- Member, RS curriculum  
 1992- Member, PT board  
 1992- Member, PT faculty  
 2000-2000 Member, Physiotherapy Program Striking Committee (volunteered)  
 1994-1996 Member, Executive Committee (elected)  
 1993-1995 Member, Edith Herman Fund Research Committee (elected)  
 1995-1997 Member, Work Function Unit Operations Committee (appointed)

#### *Department of Kinesiology*

- 2005-2006 Member, Biomechanics Faculty Search Committee (elected)

### **University of Pennsylvania**

#### *University*

- 1989-1991 Member, Academic Advisory Committee (elected)

### **University of Toronto**

#### *University*

- 1984-1985 Member, Director's Task Force on Complement and Planning Committee (appointed)  
 1984-1985 Member, Directorship Search Committee (appointed)  
 1981-1986 Member, University Computer User's Committee (elected)

#### *School of Physical and Health Education*

- 1987-1988 Chair, SPHE School Council (elected)  
 1984-1985 Chair, Examination Committee (elected)  
 1982-1987 Chair, Labs, Equipment, Technical Support and Space Allocations Committee (elected)  
 1982-1983 Chair, CAHPER Convention Exhibits Committee (appointed)  
 1981-1984 Chair, Sport Studies Emphasis Executive Committee (appointed)  
 1986-1988 Chair, Curriculum Committee (elected)  
 1983-1984 Member, Department Internal Review Committee (appointed)

- 1981-1989 Member, Physical and Health Education School Council (appointed)  
1981-1989 Member, Laboratories, Equipment and Space Allocation Committee (appointed)  
1981-1984 Member, Curriculum Committee (appointed)

*Graduate Department of Community Health*

- 1985-1988 Member, Curriculum Committee (appointed)  
1985-1988 Member, Examinations Committee (appointed)

*Institute of Biomedical Engineering*

- 1986-1988 Chair, Biomedical Engineering Summer Student Program Committee (elected)

*Department of Athletics and Recreation*

- 1985-1988 Member, Fitness Committee (appointed)

**ADMINISTRATIVE APPOINTMENTS**

- 2007 Acting Director, Rehabilitation Sciences Graduate Program, McMaster University  
1989-1991 Director, Children's Seashore House Gait Laboratory, Philadelphia, Pennsylvania  
1986-1988 Director, Exercise Sciences Graduate Program, Department of Community Health, University of Toronto  
1985-1986 Acting Director, Exercise Sciences Graduate Program, Department of Community Health, University of Toronto