

LISA M. STIRLING, PH.D.

FACULTY OF KINESIOLOGY, HUMAN PERFORMANCE LABORATORY
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PERSONAL INFORMATION

Date of birth: October 11, 1979
Place of birth: Halifax, Nova Scotia, Canada
Maiden name: Guevremont (married – February, 2008)

EDUCATION

2002 – 2007 **PhD in Medical Sciences, Biomedical Engineering**
University of Alberta
Emphasis: Rehabilitation engineering and neuroscience
Dissertation: *Physiologically-based control strategies and functional electrical stimulation paradigms for restoring standing and stepping after spinal cord injury*

1998 – 2002 **Bachelor of Applied Science in Electrical Engineering** (with Honours)
University of Toronto

RESEARCH INTERESTS

Application of engineering approaches in the fields of rehabilitation and movement science

- Development of analysis techniques for quantifying movement and muscle activity
- Biomechanics relating to the progression of osteoarthritis after ACL injury – classification of muscle activation patterns corresponding to a deterioration of articular cartilage
- Development of rehabilitation tools:
 - neural feedback-based training programs
 - functional electrical stimulation

RESEARCH EXPERIENCE

2009 – present **Adjunct Assistant Professor, Kinesiology**
University of Calgary, Human Performance Laboratory
Research: The role of muscle control strategies on the development of osteoarthritis after anterior cruciate ligament injury

2007 – 2009 **Postdoctoral Fellow, Kinesiology**
University of Calgary, Human Performance Laboratory
Supervisor: Dr. Benno Nigg
Research: Indicators of fatigue during prolonged running: biomechanical, physiological and psychological aspects

- 2002 – 2007 **Graduate Student – PhD Candidate**
 University of Alberta, Faculty of Medicine and Dentistry
 Supervisor: Dr. Vivian Mushahwar
 Committee: Dr. Keir Pearson, Dr. Arthur Prochazka, Dr. Richard Stein, Dr. Jaynie Yang
 Research: • Investigated intraspinal microstimulation for restoring mobility after spinal cord injury
 • Implemented control algorithms for generating locomotion in an animal model
- 1999, 2002 **Summer Student – Research Assistant**
 (summers) Carleton University, Department of Mechanical and Aerospace Engineering
 Research: • Assisted Dr. Donald Russell with prosthetic elbow research and design
 • Designed and implemented a preliminary EMG based control system for the limb
- 2001 – 2002 **Undergraduate Student – Research Assistant** (Fourth Year Design Project)
 Princess Margaret Hospital
 Research: • Collaborated with Dr. Lothar Lilge on the development of an optical sensor for
 medical applications
- 2001 **Summer Student – Research Affiliate**
 (summer) Communications Research Centre, Satellite Systems Group
 Research: • Implemented an algorithm (in a digital signal processor) to correct signal errors before
 transmission via a satellite system

ACADEMIC AWARDS AND GRANTS

2009	Performance Research Award, ISB, IX Footwear Biomechanics Symposium	\$1000(USD)
2007	Postdoctoral Fellowship Award, Alberta Heritage Foundation for Medical Research (3 years)	\$35,000
	Medical Sciences Graduate Research Assistantship Award, University of Alberta	\$6,500
2006	Medical Sciences Graduate Research Assistantship Award, University of Alberta	\$6,500
2005	National Institutes of Health (NIH) Travel Assistance Award	\$500(USD)
	Medical Sciences Graduate Research Assistantship Award, University of Alberta	\$6,500
2004	75th Anniversary Award, Faculty of Medicine and Dentistry, University of Alberta	\$14,000
	Medical Sciences Graduate Research Assistantship Award, University of Alberta	declined
	National Institutes of Health (NIH) Travel Assistance Award	\$500(USD)
	Matthew Spence Prize, Most Outstanding Oral Presentation: Alberta BME Conference	\$250
2003	Medical Sciences Graduate Research Assistantship Award, University of Alberta	\$6,500

TEACHING AND SUPERVISORY EXPERIENCE

Lectures and Seminars:

- Fall 2009 **Lecturer** – KNES 661.39: Advanced Data Analysis Methods
Introduced a new graduate level course in the Kinesiology, Biomechanics stream
- 09/07 – 12/08 **Chair – HPL Musculoskeletal Seminar Series**
- Fall 2008 **Guest Lecturer** – KNES 363: Biomechanics of Biological Materials
Fatigue: Mechanisms to Manifestations

- Fall 2008 **Speaker** – Musculoskeletal Seminar Series: Human Performance Laboratory, U of C
Indicators of the Progression of Fatigue during Long Distance Running
- Fall 2007 **Guest Lecturer** – KNES 363: Biomechanics of Biological Materials
Research Topic: Restoring Standing and Stepping after Spinal Cord Injury
- Fall 2007 **Speaker** – Musculoskeletal Seminar Series: Human Performance Laboratory, U of C
Physiologically-based Control Strategies and Functional Electrical Stimulation Paradigms for Restoring Standing and Stepping after Spinal Cord Injury

Co-supervision/mentorship of students/interns:

- | | | |
|---------------|----------------------|--|
| 01/09 – 08/10 | Nathalie Alexander | intern – Sports Equipment Technology,
University of Applied Science Vienna |
| 08/09 – 10/09 | Saskia Paul | intern – Medical Engineering,
University of Applied Science, Fachhochschule Koblenz |
| 05/09 – 08/09 | Silvio Luethi | summer student – Software Engineering, Portland State University |
| 05/09 – 08/09 | Alanna Friesen | student volunteer – Kinesiology, University of Alberta |
| 01/09 – 08/09 | Bernd Friesenbichler | intern (Bachelor’s theses I & II) – Sports Equipment Technology,
University of Applied Science Vienna |
| 09/08 – 04/09 | Clint Hansen | intern – Sports Science,
Christian-Albrechts University, Kiel |
| 2005 – 2007 | Bernice Lau | honors project – Electrical Engineering, University of Alberta |

EXTRACURRICULAR ACTIVITIES

- 2009 – present **Soccer** – Cochrane Lady Rangers, Div 4, indoors
- 2009 **Road Cyclist** – team Bicisport
- 2002 – 2008 **Triathlete**
- Ironman Coeur d’Alene, 2008 – 6th of 69 women age 25-29 (11hr 16min)
 - National Long Distance Triathlon Age Group Team, 2007. World Championships, France, July 2007
 - Ironman Canada, 2005 – 13th of 93 women age 25-29 (11hr 43min)
- 1998 – 2001 **Varsity Athlete**
University of Toronto Varsity Blues Women’s Soccer Team
- Bronze T and T-Holder’s Award for Academic Achievements as a varsity athlete

PROFESSIONAL ASSOCIATIONS

Professional affiliations:

- Member of IEEE (2008-present)
Student member of IEEE (2006-2007)

Societies (past and current):

- International Society for Biomechanics (2009-present)
- Footwear Biomechanics Group (2009-present)
- American Society for Biomechanics (2008-present)
Canadian Society for Biomechanics (2008-present)
Society for Neuroscience (2006)
International Functional Electrical Stimulation Society (2006)

Local Involvement

Trainee Leaders Committee – AHFMR team grant: OA Alberta
Database Management Committee – AHFMR team grant: OA Alberta

International Involvement

Invited Symposium Chair – Fatigue and Human Performance, 6th World Congress on Biomechanics, Singapore, 2010

Reviews provided for scientific manuscripts submitted to:

IEEE Transactions on Neural Systems and Rehabilitation Engineering (2)
Journal of Biomechanics (1)
American Journal of Sports Medicine (2)
Clinical Journal of Sports Medicine (1)
International Society of Biomechanics, Footwear Biomechanics Group

- 9th Biennial Footwear Biomechanics Symposium (2009 - 9 abstracts)

PEER REVIEWED JOURNAL ARTICLES

Vogelstein J.R., Francesco Tenore F., **Guevremont L.**, Vivian K. Mushahwar V.K., Etienne-Cummings R., A Silicon Central Pattern Generator Controls Locomotion in vivo, IEEE Transactions on Biomedical Circuits and Systems, 2008 Sept;2(3): 212 - 222

†Lau B., †**Guevremont L.**, Mushahwar V.K., Strategies for Generating Prolonged Functional Standing Using Intramuscular Stimulation or Intraspinal Microstimulation, IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2007 Jun;15(2):273-85 (Impact 2.489 – 2007)

Guevremont L., Norton J., Mushahwar V.K., A Physiologically-based Controller for Generating Overground Locomotion using Functional Electrical Stimulation, Journal of Neurophysiology, 2007 Mar; 97(3): 2499-510 (Impact 3.684 – 2007)

Guevremont L., Renzi C.G., Norton J.A., Kowalczewski J., Saigal R., Mushahwar V.K., Locomotor-Related Networks in the Lumbosacral Enlargement of the Adult Spinal Cat: Activation through Intraspinal Microstimulation, IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2006, Sept;14(3): 266-272 (Impact 2.489 – 2007)

Gaunt R.A., Prochazka A., Mushahwar V.K., **Guevremont L.**, Ellaway P.H., Intraspinal microstimulation elicits multisegmental sensory afferents at lower stimulus levels than local α -motoneuron responses, Journal of Neurophysiology. 2006, Dec; 96(6): 2995-3005 (Impact 3.684 – 2007)

Mushahwar V.K., **Guevremont L.**, Saigal R., Could Cortical Signals Control Intraspinal Stimulators? IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2006, June; 14(2): 198-201 (Impact 2.489 – 2007)

† *co-first authors*

PEER REVIEWED ABSTRACTS (* poster presentation, ** platform presentation)

** **Stirling L.M.**, Nigg B.M., von Tscherner V., (2009) Quantification of fatigue during treadmill running, IX Footwear Biomechanics Symposium, Stellenbosch, South Africa

- ** Stirling L.M.**, Kugler P., von Tscharner V., (2009) Support vector machine classification of muscle intensity patterns during prolonged running, XXII Congress of the International Society of Biomechanics, Cape Town, South Africa
- * **Stirling L.M.**, Nigg B.M., von Tscharner V., (2009) Index to quantify the development of fatigue during prolonged running, XXII Congress of the International Society of Biomechanics, Cape Town, South Africa
- Davis, E., Nigg B.M., Federolf P., **Stirling L.M.**, (2009) Variability in motion analysis due to experimenter experience and protocol, XXII Congress of the International Society of Biomechanics, Cape Town, South Africa
- * **Stirling L.M.**, von Tscharner V., Kim S.H., Nigg B.M., (2008) Biomechanical changes during prolonged running, North American Congress on Biomechanics, Ann Arbor, Michigan
- ** Guevremont L.**, Norton J.A., Mushahwar V.K., (2006) Open- and closed-loop control strategies for restoring overground locomotion using FES, International FES Society Meeting, Japan
- * Lau B., **Guevremont L.**, Mushahwar V.K., (2006) Control strategies for restoring stance using intramuscular and intraspinal stimulation, International FES Society Meeting, Japan
- Vogelstein J.R., **Guevremont L.**, Francesco Tenore F., Vivian K. Mushahwar V.K., Etienne-Cummings R., (2006) A Silicon Central Pattern Generator Controls Locomotion in vivo, NIH NINDS Neural Interfaces Workshop, Bethesda Maryland
- * **Guevremont L.**, Norton J., Lau, B., Mushahwar V.K., (2005) An Open- and Closed-Loop Control System for Generating Overground Locomotion Using Functional Electrical Stimulation, NIH NINDS Neural Interfaces Workshop, Bethesda Maryland
- ** Guevremont L.**, Norton J.A., Lau B., Mushahwar V.K., (2005) Generating Overground Locomotion Using a Simple Closed-Loop Controller, 6th Annual Alberta Biomedical Engineering Conference, Banff
- ** Guevremont L.**, Norton J.A., Mushahwar V.K., (2004) Development of a Control System for Generating Overground Locomotion using Intraspinal Microstimulation, 5th Annual Alberta Biomedical Engineering Conference, Banff
- ** Guevremont L.**, Norton J.A., Mushahwar V.K., (2004) Intraspinal Microstimulation Electrodes remain Stable and can generate Functional Locomotor Patterns in Chronically Implanted and Spinalised Cats, Canadian Physiological Society Meeting, Vernon
- * **Guevremont L.**, Norton J., Saigal R., Mushahwar V.K., (2003) A Chronic Study of Intraspinal Microstimulation in Spinalised Cats, 34th Neural Prosthesis Workshop, Washington DC
- Mushahwar V.K., Prochazka A., Ellaway P.H., **Guevremont L.**, Gaunt, R.A., (2003) Microstimulation in CNS excites axons well before neuronal cell bodies. Society for Neuroscience Abstracts, 33: 276.6
- Guevremont L.**, Renzi C.G., Kowalczewski J., Mushahwar V.K., (2003) Tonic Intraspinal Microstimulation Induces Functional Walking Patterns in Cats. Society for Neuroscience Abstracts, 33: 276.5
- * **Guevremont L.**, Renzi C.G., Kowalczewski J., Mushahwar V.K., (2003) Tonic Intraspinal Microstimulation of the Lumbosacral Enlargement Can Generate Rhythmic Walking Patterns in Cats. IBRO Congress, Prague, 2003.
- Mushahwar V.K., **Guevremont L.**, Renzi C.G., Kowalczewski J., (2002) Distribution of locomotor networks in the lumbar enlargement of the adult spinal cat. Neural Control of Movement Society Conference, Santa Barbara

OTHER CONTRIBUTIONS

Conferences

** **Guevremont L.**, Norton J.A., Lau B., Mushahwar V.K., (2005) One Small Step for a Cat, Alberta Motor Control Meeting, Kananaskis

** **Guevremont L.**, Gupta N., Norton J.A., Mushahwar V.K., (2004) Intraspinal Microstimulation: A Novel Technique for Restoring Standing and Stepping After Spinal Cord Injury. Glenrose Hospital Research Days Conference

** **Guevremont L.**, Mushahwar V.K., (2004) Is there Hope for Superman? The Faculty of Graduate Studies and Research and the Graduate Students' Association Open House Forum: Vision without Borders

Industry Reports

Adidas, progress report, Muscle activity during prolonged running, February 2010

Adidas, progress report, Biomechanical indicators of fatigue during prolonged running, July 2008

Adidas, progress report, Index to quantify fatigue during prolonged running, August 2009

Books and Book Chapters

Guevremont L., and Mushahwar V.K., Tapping into the Spinal Cord for Restoring Function after Spinal Cord Injury, Neuroengineering, DiLorenzo, DJ and JD Bronzino (editors), CRC Press / Taylor and Francis, November 2007 (ISBN: 978-0-8493-8174-4)

Stirling L.M., Restoring standing and stepping after spinal cord injury: physiologically-based control strategies and functional electrical stimulation paradigms, VDM Publishing House Ltd., VDM Verlag, July 2009 (ISBN: 978-3-639-15644-7)

MANUSCRIPTS IN PREPARATION

Stirling L.M., von Tscharnner V., Fletcher J.R., Nigg B.M., Index to quantify fatigue during prolonged running

Stirling L.M., von Tscharnner V., Nigg B.M., Piper rhythm in EMG is synchronized to heel-strike during running

Stirling L.M., Kugler P., von Tscharnner V., Nigg B.M., Support vector machine classification of EMG from early and late phases of prolonged running