

Timothy Adam Thrasher

Curriculum Vitae

Oct 2005

Mail address:

Toronto Rehabilitation Institute
Lyndhurst Centre – Research
520 Sutherland Drive
Toronto, Ontario, Canada
M4G 3V9

tel: 416-423-8900

fax: 416-425-9923

e-mail: adam.thrasher@utoronto.ca

Professional interests

Neuromuscular physiology and motor learning; Biomechanics and gait analysis;
Electrical stimulation of paralyzed muscles to restore function after spinal cord injury;
Rehabilitation engineering; Clinical measurement and instrumentation.

Education

- Jun 2002 Ph.D. in Medical Sciences – Biomedical Engineering
University of Alberta, Canada
Thesis: “A New generation of hybrid orthoses for paraplegic locomotion”
- Sep 1994 B.Sc. (with Honours) in Mechanical Engineering
University of Alberta, Canada

Academic employment

- May 2002 - Postdoctoral Researcher, Institute of Biomaterials and Biomedical
present Engineering, University of Toronto, and Toronto Rehabilitation Institute,
Canada
- May-Aug Research Consultant, Oxford Orthopedic Engineering Center, University
2000 of Oxford, U.K.
- 1996-2000 Teaching Assistant, Dept. Biomedical Engineering, University of Alberta,
Canada

Fellowships, scholarships and awards

- Sep 2002 – First recipient of the Canadian Paraplegic Association Ontario Spinal
Sep 2005 Cord Injury Research Fellowship (total \$210,000)
- 1996-2000 Alberta Heritage Foundation for Medical Research, Full Studentship

1996 Whitaker Student Scientific Paper Competition Award, Rehabilitation Engineering Society of North America, 1996

Book chapters

Popovic MR, **Thrasher TA**. "Neuroprostheses," In: *Encyclopedia of Biomaterials and Biomedical Engineering* [eds.: Wnek GE, Bowlin GL], Marcel Dekker, New York, July, 2004, pp. 1056-1065.

Journal publications

Popovic MR, **Thrasher TA**, Adams ME, Takes V, Zivanovic V, Tonack MI. Functional electrical therapy: Retraining grasping in spinal cord injury, *Spinal Cord* 2005 Aug 30 [Epub ahead of print].

Thrasher TA, Flett HM, Popovic MR. Gait training regimen for incomplete spinal cord injury using functional electrical stimulation, *Spinal Cord* 2005 Oct 25 [Epub ahead of print].

Graham GM, **Thrasher TA**, Popovic MR. The Effect of Random Modulation of Functional Electrical Stimulation Parameters on Muscle Fatigue, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. [In press]

Thrasher TA, Graham GM, Popovic MR. Reducing muscle fatigue due to Functional Electrical Stimulation using random modulation of stimulation parameters, *Artificial Organs*, 29(6):453-458, 2005.

Popovic MR, **Thrasher TA**, Zivanovic V, Takaki J, Hajek V. Neuroprosthesis for retraining reaching and grasping functions in severe hemiplegic patients, *Neuromodulation*, 8(1):58-72, 2005.

Thrasher TA, Popovic MR. Electrical stimulation and neuroprostheses for restoring swallowing function, *Perspectives on Swallowing and Swallowing Disorders (Dysphagia)*, June 2004, 13(2):28-31, 2004.

Steele CM, **Thrasher TA**, Popovic MR. Stimulation approaches to the restoration and rehabilitation of swallowing: A review. *Neurological Research*. [In review]

Thrasher TA, Andrews BJ. Passive gait in the medially linked knee-ankle-foot orthosis, *Computer Methods in Biomechanics and Biomedical Engineering*. [In review]

Editorials

Thrasher TA, "Functional Electrical Therapy," *Outspoken*, Spring 2005, p. 24.

Abstracts

Thrasher TA, Graham GM, Popovic MR. Attempts to reduce muscle fatigue by randomizing FES parameters, *Artificial Organs*, vol. 28, No. 8, p. 765, 2004.

Thrasher TA, Popovic MR. Neuroprostheses for short-term intervention in incomplete SCI, *Journal of Spinal Cord Medicine*, vol. 27, No. 2, p. 184-185, 2004.

Conference publications

Thrasher TA, Flores A, Popovic MR. Muscle synergies for pressure management during prolonged sitting, *Progress in Motor Control V*, State College, Pennsylvania, Aug 17-20, 2005, p. 8-29.

Thrasher TA, Keller T, Lawrence M, Popovic MR. Effects of isometric FES and dynamic FES on cardiovascular parameters on an active tilt-table stepper, *Proceedings of 10th International Functional Electrical Stimulation Society Conference*, Montreal, Canada, Jul 5-9, 2005, pp. 409-411.

Flores A, **Thrasher TA**, Popovic MR. Mechanisms of pressure redistribution during prolonged sitting, *2nd Annual Ontario Biomechanics Conference*, Barrie, Canada, Feb 18-20, 2005. [**Winner: NexGen Ergonomics Award**]

Graham GM, Popovic MR, **Thrasher TA**. Random Modulation of Functional Electrical Stimulation Parameters, *National Spinal Cord Rehabilitation Conference*, Toronto, Canada, Sep 16-18, 2004, p. 92.

Adams ME, Takes V, **Thrasher TA**, Zivanovic V, Bulsen A, Tonack MI, Popovic MR. Functional Electrical Stimulation: A therapeutic tool to restore hand function in patients with spinal cord injury, *National Spinal Cord Rehabilitation Conference*, Toronto, Canada, Sep 16-18, 2004, p. 83.

Thrasher TA, Graham GM, Popovic MR. Attempts to reduce muscle fatigue by randomizing FES parameters, *Proceedings of 8th Vienna International Workshop on Functional Electrical Stimulation*, Vienna, Austria, Sep 10-13, 2004, pp. 80-83.

Thrasher TA, Graham GM, Popovic MR. Effect of Random Modulation of FES Parameters on Muscle Fatigue, *Proceedings of 9th International Functional Electrical Stimulation Society Conference*, Bournemouth, England, Sept. 6-9, 2004, pp. 366-368.

Vanoncini M, **Thrasher TA**, Andrews BJ. Increasing trunk stiffness via FES in paraplegic subjects, *Proceedings of 9th International Functional Electrical Stimulation Society Conference*, Bournemouth, England, September 6-9, 2004, pp. 165-167.

Thrasher TA, Popovic MR. Neuroprostheses for short term intervention in incomplete SCI, *Annual Scientific Meeting of the American Spinal Injury Association*, Denver, Colorado, USA, May 14-16, 2004.

Thrasher TA, Popovic MR. Rehabilitation of incomplete spinal cord injury using a neuroprosthesis for walking, *Proceedings of 25th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Cancun, Mexico, September 17-21, 2003, pp. 1566-1568.

MacKnight EB, Popovic MR, **Thrasher TA**. Functional electrical therapy for assisted treadmill training: use of passive dynamics, *Proceedings of the 25th Annual International Conference the IEEE Engineering in Medicine and Biology Society*, Cancun, Mexico, September 17-21, 2003, pp. 1523-1526.

Thrasher TA and Popovic MR. FES-assisted walking for rehabilitation of incomplete spinal cord injury, *Proceedings of 8th International Functional Electrical Stimulation Society Conference*, Maroochydore, Australia, July 1-5, 2003, pp. 131-134.

MacKnight EB, Popovic MR, **Thrasher TA**. FES-assisted locomotion on an inclined treadmill: Use of passive dynamics, *Proceedings of 8th International Functional Electrical Stimulation Society Conference*, Maroochydore, Australia, July 1-5, 2003, pp. 235-238.

Thrasher TA, Andrews BJ. Dynamic lateral articulation of the rigid trunk produces foot clearance in MLKAFO gait, *IV World Congress on Biomechanics*, Calgary, Canada, August 4-9, 2002.

Andrews BJ, **Thrasher TA**, Chan A, Davoodi R. Trunk momentum can reduce upper limb forces in FES aided paraplegic locomotion, *Proceedings of 5th International Functional Electrical Stimulation Society Conference*, Aalborg, Denmark, June 18-21, 2000, pp. 482-485.

Andrews BJ, **Thrasher TA**, Chan A, Davoodi R. FES aided paraplegic locomotion: trunk momentum may be used to reduce upper limb forces, *Proceedings of 4th International Functional Electrical Stimulation Society Conference*, Sendai, Japan, 1999.

Andrews BJ, Cliquet A, Olin M, Burnham R, **Thrasher TA**. Paraplegic locomotion: a linked knee-angle-foot hybrid system, *Proceedings of 3rd International Functional Electrical Stimulation Society Conference*, Lucerne, Switzerland, August 20-26, 1998, pp. 165-167.

Thrasher TA, Andrews BJ, Wang F. Control of FES using reinforcement learning: accelerating the learning rate, *Proceedings of Annual International Conference the IEEE Engineering in Medicine and Biology Society*, vol. 19, 1997.

Son WK, Madan S, **Thrasher TA**, Andrews BJ. Fast neural system identification: application to rehabilitation engineering, *Proceedings of IEEE Pacific Rim Conference on Communications, Computers and Signal Processing*, 1997.

Wang F, **Thrasher TA**, Ouellette N, Williamson R, Andrews BJ. Machine learning control of FES: real time implementation, *Proceedings of 2nd International Functional Electrical Stimulation Society Conference*, Burnaby, Canada, August 16-21, 1997, pp. 75-76.

Wang F, **Thrasher TA**, Andrews BJ. Control of FES using unsupervised machine learning, *Proceedings of 2nd International Functional Electrical Stimulation Society Conference*, Burnaby, Canada, August 16-21, 1997, pp. 77-78.

Thrasher TA, Wang F, Andrews BJ. Developing complex FES controllers using a virtual patient, *Proceedings of 2nd International Functional Electrical Stimulation Society Conference*, Burnaby, Canada, August 16-21, 1997, pp. 101-102.

Andrews BJ, Cliquet A, Olin M, Burnham R, **Thrasher TA**. Paraplegic locomotion: a linked knee-ankle-foot hybrid system, *Proceedings of 2nd International Functional Electrical Stimulation Society Conference*, Burnaby, Canada, August 16-21, 1997, pp. 165-167.

Thrasher TA, Wang F, Andrews BJ. Self-adaptive neuro-fuzzy control of neural prostheses using reinforcement learning, *Proceedings of Annual International Conference the IEEE Engineering in Medicine and Biology Society*, Chicago, USA, vol. 18, 1996.

Thrasher TA, Wang F, Andrews BJ, Williamson R. Control of neural prostheses III: self adaptive neuro-fuzzy control using reinforcement learning, *Proceedings of Rehabilitation Engineering Society of North America*, Salt Lake City, Utah, USA, June 7-12, 1996, p. 186. [**Winner: Whitaker Student Scientific Paper Competition**]

Thrasher TA, Andrews BJ. Application of ballistic walking model to FES assisted gait analysis, *Proceedings of the 5th Vienna International Workshop on Functional Electrical Stimulation*, Vienna, Austria, 1995.

Invited lectures

Invited lecture: “Novel Rehabilitation Technology for People with Spinal Cord Injury,” Canadian Paraplegic Association Ontario 60th Anniversary Celebration, London, Ontario, Canada – October 18, 2005.

Invited lecture: “Functional Electrical Therapy: Recovery of Health and Function for Persons with Spinal Cord Injury,” Canadian Paraplegic Association Ontario 1st Symposium and 60th Anniversary Celebration, Barrie, Ontario, Canada – June 30, 2005.

Invited lecture with Dr. Milos Popovic: “The Role of Functional Electrical Stimulation Plays in Recovery and Increasing Health and Wellness for Persons with Spinal Cord Injury,” Canadian Paraplegic Association Ontario inaugural *Knowledge Mobilization Seminar Series*, Toronto, Canada – May 4, 2005.

Invited lecture at University of Toronto, Students for Technology and Engineering in Medicine: “Neuroprostheses: Functional and Therapeutic Applications,” Toronto, Canada – March 8, 2005.

Invited lecture at York University, Department of Kinesiology and Health Sciences: “Exercise After Spinal Cord Injury,” Toronto, Canada – March 8, 2005.

Invited lecture at Bloorview MacMillan Children’s Centre, Rehabilitation Engineering Department: “Functional Electrical Therapy for Incomplete Spinal Cord Injury,” Toronto, Canada – January 18, 2005.

Invited lecture at Rehabilitation Engineering Research Day, University of Toronto: “Carry-over Effects of Training with Functional Electrical Stimulation,” Toronto, Canada – November 26, 2004.

Invited workshop with Dr. Doug Weber: “Neuroprostheses for Gait Rehabilitation,” *National Spinal Cord Rehabilitation Conference*, Toronto, Canada – September 18, 2004.

Invited lecture at Chedoke Spinal Cord Rehabilitation Centre, Hamilton, Canada – June 21, 2004.

Invited lecture at Kinesiology and Health Science Student Organization, York University, Toronto, Canada – November 6, 2003.

Invited lecture at Seminar Series in Faculty of Physical Education and Health, University of Toronto, Toronto, Canada – November 5, 2002.

Invited lecture at Toronto Rehabilitation Institute “Researchers’ Network” series, Toronto, Canada – September 19, 2002.

Awarded Grants

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| 2005 | Canadian Institutes for Health Research (CIHR) – Team Planning and Development Grant, “Chronic pain and Quality of Life in Spinal Cord Injury,” <i>co-investigator</i> , total: \$100,000 |
| 2004 | Ontario Neurotrauma Foundation (ONF), “Functional Electrical Stimulation-assisted walking: reduction of secondary complications due to spinal cord injury,” <i>co-investigator</i> , total: \$152,540 |

- 2004 Canadian Institutes for Health Research (CIHR), “Neuroprostheses for sitting function in spinal cord injury,” *co-investigator*, total: \$283,074
- 2004 Canadian Fund for Innovation; Infrastructure Operating Funds, *co-author*, total: \$42,417
- 2002 Canadian Foundation for Innovation (CFI) New Opportunities Fund, “Rehabilitation engineering laboratory: facilities for developing advanced neuroprostheses for standing and locomotion in stroke and spinal cord injured patients,” *co-author*, total: \$141,390
- 2002 Ontario Innovation Trust (OIT), “Rehabilitation engineering laboratory: facilities for developing advanced neuroprostheses for standing and locomotion in stroke and spinal cord injured patients,” *co-author*, total: \$141,390

Courses Taught

- Winter 2005 “Engineering Dynamics” [MIE 100S], University of Toronto, planar and 3D kinetics of particles and rigid body, vibrations.
- Winter 2004 “Physiological Control Systems” [BME 350H], University of Toronto, nerve and muscle physiology.

Supervised Student Theses

- Sep 2004 – Albert Vette, M.A.Sc. Biomedical Engineering, University of Toronto
Sep 2006
- Sep 2004 – Vivian Sin, M.A.Sc. Biomedical Engineering, University of Toronto
Sep 2006
- Sep 2005 – Lorne Chi, B.Sc. Engineering Science thesis, University of Toronto
Apr 2006
- Sep 2005 – Robert Nguyen, B.Sc. Engineering Science thesis, University of Toronto
Apr 2006
- Sep 2004 – Virginia Chu, B.Sc. Engineering Science thesis, University of Toronto
Apr 2005
- Sep 2004 – Matthew Cousens, B.Sc. Engineering Science thesis, University of Toronto
Apr 2005
- Jun 2004 – Alejandra Flores, B.Sc. Biomedical Engineering thesis, Universidad Iberomerica, Mexico [**Winner: NexGen Ergonomics Award**]
Feb 2005
- May 2003 – Geoffrey Graham, M.A.Sc. Mechanical Engineering, University of Toronto
Apr 2004
- Sep 2003 – Jeremy Cohen, B.Sc. Engineering Science thesis, University of Toronto
Apr 2004
- Sep 2003 – Nancy Agbaje, B.Sc. Kinesiology/Psychology thesis, York University

Apr 2004
Sep 2002 – Charmaine Gonsalvas, B.Sc. Engineering Science thesis, University of
Apr 2003 Toronto

Reviewed Manuscripts for Journals

- 1 for *IEEE Sensors Journal*
- 1 for *Medical Engineering & Physics*
- 1 for *Journal of Neurophysiology*

Reviewed Grant Applications

- 1 for *Canadian Institutes of Health Research (CIHR) and Sick Kids Foundation – New Investigator Grants Program*

Membership

- 1998-present International Functional Electrical Stimulation Society (IFESS)
- 1999-2002 International Society of Biomechanics (ISB)
- 2000-2002 Gait and Clinical Movement Analysis Society (GCMAS)