

2003-2006	Professor	Department of Kinesiology University of Waterloo
2000-2003	Chair for Graduate Studies	Department of Kinesiology University of Waterloo
1997-2003	Associate Professor	Department of Kinesiology University of Waterloo
January 1999 – July 1999	Visiting Professor	Department of Physiology Universite de Montreal
1992-1997	Assistant Professor	Department of Kinesiology University of Waterloo
1993-1996	Honorary Lecturer	Department of Psychiatry Faculty of Medicine University of Western Ontario London, Ontario
1992-1995	Honorary Assistant Professor	Department of Physical Therapy University of Western Ontario London, Ontario
1990-1992	Assistant Professor/Career Scientist	Department of Physical Therapy University of Western Ontario London, Ontario
1991-1992	Honorary Assistant Professor	Faculty of Kinesiology University of Western Ontario London, Ontario
1991-1992	Member of Faculty of Graduate Studies	University of Western Ontario London, Ontario
1989-1990	NSERC Postdoctoral Fellow	Department of Psychology University of Western Ontario London, Ontario

AWARDS AND DISTINCTIONS:

2005	Award of Distinguished Service, <u>Research Quarterly For Exercise and Sport</u>
2004	Macleans Magazine “Most Popular” Professor
1989-1991	NSERC Postdoctoral Fellowship
1988	Young Scientist Award, Canadian Society for Psychomotor Learning
1987-1989	NSERC Graduate Scholarship

1985 & 1986 McMaster Entrance Scholarship

SCHOLARLY AND PROFESSIONAL ACTIVITIES:

Consulting Editor: Journal of Motor Behavior (1992-1997)

Section Editor: Research quarterly for Exercise and Sport (1999-2005)

Grant Reviewer: 1) Canadian Fitness and Lifestyle Research Institute
 2) The Ontario Mental Health Foundation
 3) NSERC
 4) National Fund for Scientific Research – Belgium
 5) National Science Foundation – U.S.A.
 6) Saskatchewan Health Research Foundation
 7) CIHR

Ad Hoc Referee: Acta Psychologica, American Journal of Industrial Medicine, Aviation Space and Environmental Medicine, Behavioral Brain Research , Brazilian Journal of Medical and Biological Research, Canadian Journal of Experimental Psychology, Ergonomics, Experimental Brain Research ,Gait and Posture, International Journal of Sport Psychology, Journal of Experimental Psychology: HPP, Journal of Gerontology: Psychological Sciences, Journal of Motor Behavior , Journal of Neurophysiology, Medicine and Science in Sports and Exercise, Motor Control, Neuroscience Letters, Perception and Psychophysics , Psychological Science, Quarterly Journal of Experimental Psychology, Research Quarterly for Exercise and Sport.

Organizing Committees: 1) Canadian Society for Psychomotor Learning Conference, 1991, London, ON.
 2) NASPSPA Conference, Motor Learning and Control Program Committee Member, 1993 & 1996
 3) Canadian Society for Psychomotor Learning Conference, 2000, Waterloo, ON.

Coordinator: 1) Movement Science in Physical Therapy Symposium, 1991, London.
 2) NASPSPA Pre-Conference Symposium Co-organizer, 1996, Minnett.
 3) NASPSPA Conference, Motor Learning Program Chair, 1997, St. Charles, Ill.
 4) Southwestern Ontario Psychomotor Behaviour Meeting, 2003, Waterloo.

PUBLICATIONS: (* denotes student from my lab)**A) Journals:**

1. Carnahan, H., Elliott, D., & Lee, T.D. (1986). Dual-task interference between speaking and listening and a unipedal force production task. Neuropsychologia, *24*, 583-586.
2. Carnahan, H., & Elliott, D. (1987). Pedal asymmetry in the reproduction of spatial locations. Cortex, *23*, 157-159.
3. Elliott, D., Edwards, J.M., Weeks, D.J., Lindley, S., & Carnahan, H. (1987). Cerebral specialization in young adults with Down Syndrome. American Journal of Mental Deficiency, *91*, 480-485.
4. Lee, T.D., Elliott, D., & Carnahan, H. (1987). The preparation of actions and parameters of action: A fixed or variable process? Acta Psychologica, *66*, 83-102.
5. Carnahan, H., & Lee, T.D. (1989). Training for the transfer of a movement timing skill. Journal of Motor Behavior, *21*, 48-59.
6. Carnahan, H., VanEerd, D., & Allard, F. (1990). A note on the relationship between task requirements and contextual interference. Journal of Motor Behavior, *22*, 159-169.
7. Lee, T.D., & Carnahan, H. (1990). Bandwidth knowledge of results and motor learning: More than just a relative frequency effect. Quarterly Journal of Experimental Psychology, *42A*, 777-789.
8. Lee, T.D., & Carnahan, H. (1990). When to provide knowledge of results during motor learning: Scheduling effects. Human Performance, *3*, 87-105.
9. Lee, T.D., White, M.A., & Carnahan (1990). On the role of knowledge of results in motor learning: Exploring the guidance hypothesis. Journal of Motor Behavior, *22*, 191-208.
10. Carnahan, H., & Marteniuk, R.G. (1991). The temporal organization of eye, head and hand movements when pointing and grasping. Journal of Motor Behavior, *23*, 109-119.
11. Marteniuk, R.G., & Carnahan, H. (1991). The issue of motor equivalence. Behavioral and Brain Sciences, *14(2)*, 356-357.
12. Carnahan, H., Goodale, M.A., & Marteniuk, R.G. (1993). Reaching versus grasping and the differential use of visual feedback. Human Movement Science, *12*, 219-234.
13. Carnahan, H., Roy, E.A., & Elliott, D. (1993). Eye, head and hand co-ordination while pointing with the left and right hands. Journal of Human Movement Studies, *25*, 1-10.
14. Carnahan, H., Chua, R., Elliott, D., Velamoor, R., & Carnahan, C.J. (1994). The effects of schizophrenia and prefrontal leukotomy on movement preparation and generation. Journal of Clinical and Experimental Neuropsychology, *16*, 253-260.
15. Carnahan, H., & Marteniuk, R.G. (1994). Hand, eye and head coordination while pointing to perturbed targets. Journal of Motor Behavior, *26*, 135-146.
16. Chua, R., Pollock, B.J., Elliott, D., Swanson, L.R., & Carnahan, H. (1995). The influence of aging on manual asymmetries in movement preparation and execution. Developmental Neuropsychology, *11*, 129-137.
17. *Cockell, D.L., Carnahan, H., & McFadyen, B.J. (1995). A preliminary analysis of the coordination of reaching, grasping and walking. Perceptual and Motor Skills, *81*, 515-519.

18. Malla, A.K., Norman, R.M.G., *Aguilar, O., Carnahan, H., & Cortese, L. (1995). Voluntary movement dysfunction and life time psychopathology profiles in schizophrenia. British Journal of Psychiatry, *167*, 211-215.
19. Carnahan, H., Elliott, D., & Velamoor, V.R. (1995). Manual performance in leukotomized and unleukotomized individuals with schizophrenia. Schizophrenia Research, *17*, 267-278.
20. *Forwell, L.A., & Carnahan, H. (1996). The relationship between shoulder instability and proprioceptive deficits. The Journal of Orthopaedic and Sports Physical Therapy, *23*, 111-119.
 - b. Reprinted with permission in T.A Black (Ed.), (1996). Athletic training: Sports health care prospectus. Moseby-Year Book.
21. Carnahan, H., Elliott, D., & Velamoor, V.R. (1996). The influence of object size on prehension in leukotomized and unleukotomized individuals with schizophrenia: A kinematic approach. Journal of Clinical and Experimental Neuropsychology, *1*, 136-147.
22. Carnahan, H., & McFadyen, B.J. (1996). Anticipatory control and coordination when reaching toward and grasping moving targets. Acta Psychologica, *92*, 17-32.
23. Carnahan, H., Vandervoort, A.A., & Swanson, L.R. (1996). The influence of summary knowledge of results and aging on motor learning. Research Quarterly for Exercise and Sport, *67*, 280-287.
24. Carnahan, H., McFadyen, B.J., *Cockell, D.L., & *Halverson, A.H. (1996). The combined control of locomotion and prehension. Neuroscience Research Communications, *19*, 91-100.
25. Carnahan, H., Hall, C., & Lee, T.D. (1996). Delayed visual feedback while learning to track a moving target. Research Quarterly for Exercise and Sport, *67*, 416-423.
26. Lee, T.D., Swanson, L.R., Cunningham, S., & Carnahan, H. (1997). Modeled timing information during random practice eliminates the contextual interference effect. Research Quarterly for Exercise and Sport, *68*, 100-105.
27. Carnahan, H., *Aguilar, O., Malla, A., & Norman, R. (1997). An investigation into movement planning and execution deficits in individuals with schizophrenia. Schizophrenia Research, *23*, 213-221.
28. McFadyen, B.J., & Carnahan, H. (1997). Anticipatory locomotor adjustments for accommodating versus avoiding different terrain irregularities. Experimental Brain Research, *114*, 500-506.
29. Carnahan, H., Vandervoort, A.A. & Swanson, L.R. (1998). The influence of aging and target motion on the control of prehension. Experimental Aging Research, *24*, 289-306.
30. Carnahan, H. (1998). Manual asymmetries when pointing and grasping in response to rapid target movement. Brain and Cognition, *37*, 237-253.
31. *Mason, A.H. & Carnahan, H. (1999). Target viewing time and velocity effects on prehension. Experimental Brain Research, *127*, 83-94.
32. *Dubrowski, A., & Carnahan, H. (2000) Action - Perception dissociation in response to target acceleration. Brain and Cognition, *43*, 172-177. Montreal, PQ.
33. Connelly, D., Carnahan, H., & Vandervoort, T. (2000). Practice effects on concentric-eccentric patterns during isokinetic strength training in old adults. Experimental Aging Research, *26*, 209-228.

34. Servos, P., Carnahan, H., & Fedwick, J. (2000). The visuomotor system resists the horizontal-vertical illusion. Journal of Motor Behavior, 32, 400 – 404.
35. *Dubrowski, A., *Lam, J., & Carnahan, H. (2000). Target velocity effects on manual interception kinematics. Acta Psychologica, 104, 103-118.
36. Westwood, D.A., *Dubrowski, A., Carnahan, H., & Roy, E.A. (2000). The effect of illusory size on force production when grasping objects. Experimental Brain Research, 135, 535-543.
37. *Dubrowski, A., & Carnahan, H., (2001). Control strategies when intercepting slowly moving targets. Journal of Motor Behavior, 33, 37-48.
38. Proteau, L., & Carnahan, H. (2001). What causes specificity of practice in a manual aiming movement: Vision dominance or transformation errors. Journal of Motor Behavior, 33, 226-234.
39. *Shih, R.H., *Vasarahelyi, E.M., *Dubrowski, A., & Carnahan, H. (2001). The effects of latex gloves on grasping kinetics. International Journal of Industrial Ergonomics, 28, 265-273.
40. Pare, M. Carnahan, H. & Smith, A.M. (2002). Magnitude estimation of tangential force applied to the fingerpad. Experimental Brain Research, 142, 342-348.
41. *Dubrowski, A., & Carnahan, H. (2002). Action-perception dissociation in response to target acceleration. Vision Research, 42, 1465-1473.
42. *Dubrowski, A., Bock, O., Carnahan, H., & Jungling, S. (2002). The coordination of hand transport and grasp formation during single-and double-perturbed human prehension movements. Experimental Brain Research, 145, 365-371.
43. Dubrowski, A., & Carnahan, H. (2003). Principles of Motor Learning: Can they be applied to surgical education. Focus On Surgical Education, 20 (3), 22-25.
44. *Dubrowski, A., & Carnahan, H. (2004). Grip force production when intercepting moving cylinders: Implications for assembly line performance. International Journal of Industrial Ergonomics, 34, 69-76.
45. *Dubrowski, A., Proteau, L., & Carnahan, H. (2004). Practice effects on the use of visual and haptic cues during grasping. Journal of Motor Behavior, 36, 327-338.
46. *Gonzalez D., Carnahan H., *Praamsma M., Macrae H., and Dubrowski A. (2005). Control of laparoscopic instrument motion in an inanimate bench model: Implications for the training and evaluation of technical skills (pointing). Studies in Health Technology and Informatics, 111, 149-52.
47. Dubrowski, A., Sidhu, R., Park, J., & Carnahan, H. (2005). Quantification of motion characteristics and forces applied to the tissues during suturing. American Journal of Surgery, 190, 131-136.
48. Dubrowski, A. Roy, E.A., Black, S.E., & Carnahan, H. (2005). Basal ganglia damage and grip and load force control when grasping targets with unexpected mass. Current Trends in Neurology, 1, 125-132.
49. Dubrowski, A., Backstein, D., Abughaduma, R., Leidl, D., & Carnahan, H. (2005). The influence of practice schedules in the learning of a complex bone-plating surgical task. American Journal of Surgery, 190, 359-363.
50. *Brydges, R., Carnahan, H., *Praamsmsa, M. & Dubrowski, A. (2005). Surface exploration using laparoscopic surgical instruments: The perception of surface roughness. Ergonomics, 48, 874-94.

51. Dubrowski, A., Roy, E.A., Black, S.E. & Carnahan, H. (2005). Unilateral basal ganglia damage causes deficits in force control: A case study. Neuropsychologia, 43, 1379-1384.
52. *Shang, D., Carnahan, H., & Dubrowski, A. (2005). Structural flexibility of laparoscopic instruments: Implication for the design of virtual reality simulators. Studies in Health Technology and Informatics, 119, 503-5.
53. *Grierson, L. & Carnahan, H. (2006). Manual exploration and the perception of slipperiness. Perception & Psychophysics, 68, 1070-1081.
54. Girgenrath, M., Bock, O., & Carnahan, H. (2006). Grasping of virtual objects is affected by near-weightlessness of parabolic flight. Journal of Gravity Physiology, 158, 415-420.
55. *Leming, J. K., Dorman, K., Brydges, R., Carnahan, H., & Dubrowski, A. (2006). Tensiometry as a measure of improvement in knot quality in undergraduate medical students. Advances in Health Sciences Education. July 1. Pub Med [Ahead of print]
56. Dubrowski, A., *Larmer, J.C., *Leming, J.K., Brydges, R., Carnahan, H., & Park, J. (2006). Quantification of process measures in laparoscopic suturing. Surgical Endoscopy. Oct 9; [Epub ahead of print]
57. *Gonzalez D, Carnahan H, *Praamsma M, & Dubrowski A. (2007). Control of laparoscopic instrument motion in an inanimate bench model: Implications for the training and the evaluation of technical skills (grasping). Applied Ergonomics, 38, 123-132.
58. Brydges R, Carnahan H, Backstein D, & Dubrowski A. (2007). Application of motor learning principles to complex surgical tasks: searching for the optimal practice schedule. Journal of Motor Behavior, 39, 40-8.
59. Ni, L., Wang, D.W.L., Dubrowski, A., & Carnahan, H. (2007). A user friendly interface for surgeons to create haptic effects in medical simulation. Studies in Health Technology and Informatics, 125, 349-351.
60. *Hung, C., Dubrowski, A., *Gonzalez, D., & Carnahan, H. (2007). Surface exploration using instruments: The perception of friction. Studies in Health Technology and Informatics, 125, 191-193.
61. Schneider, S., Brummer, V., Gobel, S., Carnahan, H., Dubrowski, A., & Struder, H.K. (2007). Parabolic flight experience is related to increased release of stress hormones. European Journal of Applied Physiology, March 10 [Epub ahead of print].
62. *Gonzalez, D., *Kowalski, K., Dubrowski, A., & Carnahan, H. (In press). Magnification of the visual field and touch perception when exploring surfaces with the index finger and surgical snaps. Human Factors.
63. *Praamsmsa, M., Carnahan, H., Backstein, D., & Dubrowski, A. (In press). Objective evaluation of the effect of distracting noise on the performance of an orthopedic drilling skill. Canadian Journal of Surgery.
64. Lund, L., Dubrowski, A., & Carnahan H. (In press). A modular approach for training laparoscopy to Urologists. British Journal of Urology.
65. *Brydges, R., Dubrowski, A., & Carnahan, H. (In press). Attentional focus and motor learning: Applications to Health Professions Education. Bewegung und Training.

B) Book Chapters:

1. Carnahan, H. (1992). Eye, head and hand coordination during manual aiming. In L. Proteau, & D. Elliott, (Eds.), Visual Control of Movement. (pp.179 - 196). Amsterdam: North-Holland.
2. Carnahan, H. (1993). The role of three dimensional movement analysis in the assessment of motor expertise. In J. Starkes, & F. Allard, (Eds.), Cognitive Issues in Motor Expertise. (pp.35-53). Amsterdam: Elsevier.
3. Carnahan, H., Vandervoort, A.A., & Swanson, L.R. (1993). The influence of aging on motor learning. In G. Stelmach & V. Homberg (Eds.), Sensorimotor Impairments in the Elderly. (pp.41-56) Dordrecht: Kluwer.
4. *McCullough, S.E., *Dubrowski, A., & Carnahan, H. (2001). The duration of haptic memory for object mass. In N. Gantchev, (Ed.), From Basic Motor Control to Functional Recovery II. (pp. 259-266). Academic Publishing: Sofia, Bulgaria.
5. Carnahan, H. (in press). Methods for teaching and learning motor skills. In D.A. DaRosa, G.L. Dunnington, & H. MacRae (Eds.), The ACS/APDS National Surgical Skills Curriculum: A Guidebook for Program Directors.

C) Published Proceedings:

1. McFadyen, B.J., & Carnahan, H. (1993). The superimposed adjustments for obstacle clearance and level-to-stair transition during normal human gait. Proceedings of the International Society for Biomechanics XIVth Congress, 844-845, Paris France.
2. McFadyen, B.J., Carnahan, H., & Marchand, S. (1993). Mechanical organization of obstructed reaching. Proceedings of the International Society for Biomechanics XIVth Congress, 846-847, Paris France.
3. McFadyen, B.J., & Carnahan, H. (1994). Effects of the continuous environment on anticipatory locomotor adjustments. Proceeding of the Canadian Society for Biomechanics, 240-241, Calgary AB.
4. *Wells, C., & Carnahan, H. (1998). A mathematical model of grasp. Proceedings of the North American Congress on Biomechanics, 561-562, Waterloo, ON.
5. Xin, H., Zelek, J.S., & Carnahan, H. (2006). Laparoscopic surgery, perceptual limitations and force: A review. Canadian Student Conference on Biomedical Engineering, 44-46, Kingston, ON.
6. Carnahan, H., McKee, P., & *Chen, A. (2007). The influence of orthotic design on grip force. Proceedings of the 2nd International Conference on Technology and Aging (ICTA).(4 pages), Toronto, ON.
7. Singh, G., Pichora-Fuller, K., Hayes, D., & Carnahan, H. (in press). The role of manual dexterity in hearing aid ergonomics. Proceedings of the 2nd International Conference on Technology and Aging (ICTA). (4 pages), Toronto, ON.
8. Carnahan, H., Harvey, A., & Dubrowski, A. (in press). Strategies Related to Effective Design in Surgical Simulation. Proceedings of Cybernetics of Information Technology and Systems and Applications, 242- 246, Orlando, FL.

PRESENTATIONS TO SCHOLARLY GROUPS:

A) Invited:

i) University Groups:

1. Carnahan, H. Eye, head and hand coordination during grasping and pointing. March, 1990, Hamilton, ON, McMaster University, Department of Physical Education.
2. Carnahan, H. The effects of target movement on reaching, grasping and pointing kinematics. April, 1991, Waterloo, ON, University of Waterloo, Department of Kinesiology.
3. Carnahan, H. Movement Preparation in Schizophrenia, October, 1991, London, ON, Department of Psychiatry, Victoria Hospital.
4. Carnahan, H. Time to contact estimation in manual aiming, February, 1991, Montreal, PQ, University of Quebec, Dept. of Physical Education.
5. Carnahan, H. The influence of target movement on prehension, February, 1992, Montreal, PQ, University of Montreal, Dept. of Physical Education.
6. Carnahan, H. Chaos and movement disorders, April, 1992, London, ON, Neuromuscular rounds, University Hospital.
7. Carnahan, H. Motor control and schizophrenia. February, 1993, Waterloo, ON, University of Waterloo, Department of Psychology.
8. Carnahan, H. The control of prehension in leukotomized and unleukotomized schizophrenics: A kinematic approach, December, 1993, London, ON, Department of Psychiatry, Victoria Hospital.
9. Carnahan, H. Movement planning and production deficits in individuals with schizophrenia. January, 1997, Quebec City, PQ, Institut de readaptation en deficiences physiques de Quebec.
10. Carnahan, H. Dynamic visual information and the control of manual aiming and prehension. April, 1998, University of Waterloo, Department of Psychology.
11. Carnahan, H. Manual interception of moving targets: An overview. May, 1998, Rotterdam, The Netherlands, Vakgroep Fysiologie, Erasmus Universiteit.
12. Carnahan, H. Integration of vision and haptics when capturing moving targets. May, 1988, Koeln, Germany, Institute of Physiology, German Sports University.
13. Carnahan, H. The role of vision in target trajectory estimation. August, 1998, Toronto, ON, Department of Psychology, York University.
14. Carnahan, H. Anticipatory control during manual interception. August, 1998, Burnaby, B.C., Department of Kinesiology, Simon Fraser University.
15. Carnahan, H. The contributions of haptics and vision to prehension. October, 2000, Birmingham, UK, Department of Psychology, University of Birmingham.
16. Carnahan, H. The control of prehension: From space to surgery. November 2003, Waterloo, ON, Department of Biology, Wilfrid Laurier University.
17. Carnahan, H. Applications of the science of prehension. May 2005, London, ON, Department of Kinesiology, University of Western Ontario.
18. Carnahan, H. Future of Human Kinetics. July 2005, St. John's NFL, Department of Human Kinetics and Recreation, Memorial University.

19. Carnahan, H. A motor learning approach: Can it provide insights into competency based training of technical surgical skills? January 2007, Wilson Centre Rounds, Toronto General Hospital, Toronto, Ontario.
20. Carnahan, H. Simulation for the learning of technical skills: What is the role for this approach in the education of Occupational Therapists? January 2007, Department of Occupational Science and Occupational Therapy
21. Carnahan, H. Procedural skills: The Cinderella of medical education. February 2007, Ontario Medical Education Network Rounds, Toronto Ontario.
22. Carnahan, H. The application of Cognitive Orientation to Occupational Performance (or CO-OP) approach to remediation in medical education. June 2007, Wilson Centre Rounds, Toronto, Ontario.

ii) Scholarly Groups:

1. Carnahan, H., Marteniuk, R.G., & MacKenzie, C.L. Inferring movement planning representations through the use of three-dimensional kinematics: theories, dependent variables and findings, June, 1988, Ottawa, ON, Canadian Psychological Association.
2. Carnahan, H. The role of skill learning research in the acquisition of motor skills. November, 1991, Chatham, ON, Technology for Everyone II Conference.
3. Swanson, L.R., & Carnahan, H. Theoretical issues in motor learning: Implications for Physiotherapy. Pre Convention Course. February, 1992, Hamilton, ON, Ontario Physical Therapy Association Convention.
4. Carnahan, H. Motor learning and therapeutics, September, 1992, Northern Outreach Lecture.
5. Carnahan, H., Lee, T.D., & Swanson, L.R. Current issues in motor control and learning: Implications for therapeutic intervention, November, 1992, Hamilton, ON, Ontario Physiotherapy Association.
6. Carnahan, H., Vandervoort, A.A. & Swanson, L.R. The influence of aging on motor learning., September, 1992, Bad Windsheim, Germany, NATO Conference on Sensorimotor Impairments in the Elderly.
7. Carnahan, H. Disorders of voluntary movement in individuals with schizophrenia. March, 1994, London, ON, Continuing Medical Education, Faculty of Medicine, University of Western Ontario.
8. Carnahan, H. Aging and psychomotor indicators. Active Living Research Symposium and Consensus Conference. April, 1995, Fredericton. New Brunswick.
9. Carnahan, H. Movement planning and schizophrenia. April, 1996, London, ON, Continuing Medical Education, Faculty of Medicine, University of Western Ontario.
10. Vandervoort, A.A., Connelly, D., & Carnahan, H. Learning to make strong muscular contractions in older adults. August, 1996, Heidelberg, Germany, The Physical Activity and Aging IV International Conference.
11. Carnahan, H. Dynamic visual information and the control of manual aiming and prehension. November, 1997, Marseille, France, 7^{ème} Congrès International de l'ACAPS.
12. Carnahan, H. Principles of motor learning applied to surgery. Association for Surgical Education. Vancouver, May, 2003.

B) Self-Initiated:

1. Carnahan, H., Elliott, D., & Lee, T.D. Dual-task interference between speaking and listening and a unipedal force production task, October, 1985, Montreal, PQ, Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS).
2. Lee, T.D., Elliott, D., & Carnahan, H. Can an action be parameterized before being selected? June, 1986, Phoenix, AZ, North American Society for Psychology of Sport and Physical Activity (NASPSPA).
3. Carnahan, H., Lee, T.D., & Elliott, D. Further evidence regarding a variable order model for the preparation of actions and parameters of action. October, 1986, Ottawa, ON, SCAPPS.
4. Lee, T.D., Elliott, D., & Carnahan, H. Preparation of actions and movement parameters: A reprogramming study, November, 1986, New Orleans, LO, Psychonomic Society.
5. Carnahan, H., & Lee, T.D. Factors influencing the acquisition of a timed sequential movement, June, 1987, Vancouver, BC, NASPSPA.
6. Lee, T.D., & Carnahan, H. KR-scheduling effects in motor skill acquisition, October, 1987, Banff, AB, NASPSPA.
7. Leavitt, J.L., Marteniuk, R.G., & Carnahan, H. Arm movement trajectories and movement control strategies of expert and non-expert dart throwers, November, 1987, New Orleans, LO, Society for Neuroscience.
8. Carnahan, H. Who's on first: A look at hand, eye and head coordination. March, 1988, Hamilton, ON, Southwestern Ontario Motor Behaviour Meeting.
9. Lee, T.D., White, M., & Carnahan, H. On the role of KR in motor learning: Some experiments on the guidance hypothesis, June, 1988, Knoxville, TN, NASPSPA.
10. Carnahan, H., & Marteniuk, R.G. Eye, head and hand coordination while grasping and pointing. October, 1988, Toronto, ON, Society for Neuroscience.
11. Carnahan, H., & Lee, T.D. Training for the transfer of a movement timing skill, November, 1988, Collingwood, ON, SCAPPS.
12. Carnahan, H., VanEerd, D., & Allard, F. Which task characteristics are necessary to find the contextual interference effect?, November, 1988, Collingwood, ON, SCAPPS.
13. Carnahan, H. Eye, head and hand coordination while pointing to visual targets. Southwestern Ontario Motor Behaviour Meeting, Waterloo, ON, March 1989.
14. Carnahan, H., & Marteniuk, R.G. The effect of fast and accurate instructions in the temporal organisation of eye, head and finger movements, June, 1989, Kent State, OH, NASPSPA.
15. Carnahan, H., & Marteniuk, R.G. Eye, head and hand coordination while pointing to perturbed visual targets either as fast or as accurately as possible, October, 1989, Phoenix, AZ, Society for Neuroscience.
16. Lee, T.D., & Carnahan, H. Optimizing the scheduling of KR for a multi-segmented timing task, October, 1989, Victoria, BC, SCAPPS.
17. Carnahan, H. Limb control during visually guided reaching towards perturbed targets. Southwestern Ontario Motor Behaviour Meeting, London, ON, March 1990.
18. Carnahan, H., & Goodale, M.A. Left and right hand differences in pointing to perturbed targets, October, 1990, St. Louis, MO, Society for Neuroscience.

19. Carnahan, H., Goodale, M.A., & Marteniuk, R.G. The effect of target movement on visually guided reaching, grasping and pointing, October, 1990, Windsor, ON, SCAPPS.
20. Carnahan, H. The organization of reaching and grasping in response to moving targets, April, 1991, Hamilton, ON, Southwestern Ontario Motor Behaviour Meeting.
21. Carnahan, H., & Lee, T.D. The influence of delayed visual feedback training on the retention and transfer of a tracking skill, June, 1991, Asilomar, CA, NASPSPA.
22. Carnahan, H. Manual asymmetries in response to target perturbations during pointing and grasping, October, 1991, London, ON, SCAPPS.
23. Carnahan, H., Allard, F., & Jones, N. Whole versus part practice and its application to Physical Therapy, October, 1991, London, ON, SCAPPS.
24. Carnahan, H. The effects of target velocity on human prehension, November, 1991, New Orleans, LO, Society for Neuroscience.
25. Carnahan, H. The influence of target velocity on time to contact estimation, June, 1992, Pittsburgh, PA, NASPSPA.
26. Chua, R., Pollock, B.J., Elliott, D., Swanson, L., & Carnahan, H. The Influence of Age of Manual Asymmetries in Movement Preparation and Execution, June, 1992, Pittsburgh, PA, NASPSPA.
27. Carnahan, H. Chua, R., Elliott, D., Velamoor, V.R., & Carnahan, C.J. Movement preparation in leukotomized and unleukotomized schizophrenics, October, 1992, Anaheim, CA, Society for Neuroscience.
28. Carnahan, H., Vandervoort, A.A., & Swanson, L.R. The influence of aging and summary knowledge of results on motor learning, October, 1992, Saskatoon, SK, SCAPPS.
29. *Aguilar, O., Carnahan, H., Norman, R., & Malla, A. Movement disorders in schizophrenia: A pilot study, June, 1993, London, ON, Department of Psychiatry, Academic Day.
30. Swanson, L.R., & Carnahan, H. Aging and knowledge of results effects in motor learning, June, 1993, Minnesota, NASPSPA.
31. Carnahan, H., Elliott, D., & Velamoor, V.R. Reaching and grasping in leukotomized and unleukotomized schizophrenics, October, 1993, Montreal, PQ, SCAPPS.
32. Lee, T.D., Swanson, L.R., & Carnahan, H. Modelled timing information during random practice eliminates the contextual interference learning effect, October, 1993, Montreal, PQ, SCAPPS.
33. Roy, E.A., Winchester, T., Elliott, D., & Carnahan, H. Spatial variability and manual asymmetries in pointing movements, October, 1993, Montreal, PQ, SCAPPS.
34. *Forwell, L., & Carnahan, H. Proprioceptive deficits associated with recurrent shoulder dislocation, February, 1994, Ottawa, ON, Canadian Association of Sports Medicine.
35. McFadyen, H., & Carnahan, H. The influence of locomotion on the control of prehension, June, 1994, Clearwater, FL, NASPSPA.
36. Carnahan, H., & McFadyen, B. The influence of subject and target motion on the control of prehension, June, 1994, Clearwater, FL, NASPSPA.
37. Malla, A., Norman, R., *Aguilar, O., Carnahan, H., & Cortese, L. Relationship between voluntary movement and cognition in schizophrenia. July, 1994, Ireland, Annual Meeting of the Royal College of Psychiatrists.

38. *Aguilar, O., Carnahan, H., Norman, R., Malla., A., & Cortese, L. Voluntary movement dysfunction and syndromes in schizophrenia, August, 1994, Vancouver, BC, Schizophrenia 1994.
39. Carnahan, H., Vandervoort, A.A., & Swanson, L.R. The influence of target motion and again on the control of prehension. October, 1994, Hamilton, ON, SCAPPS.
40. *Halverson, A.H., Carnahan, H., & McFadyen, B.J. Path formation when avoiding obstacles during manual aiming. October, 1994, Hamilton, ON, SCAPPS.
41. Carnahan, H., Elliott, D., & Velamoor, V.R. The influence of target movement on reaching and grasping in leukotomized and unleukotomized adults with schizophrenia. November, 1994, Miami, FL, Society for Neuroscience.
42. Roy, E.A., Winchester, T., Elliott, D., & Carnahan, H. Manual asymmetries in visual aiming movements: The effect of spatial variability, February, 1995, Seattle, WA, International Neuropsychological Society.
43. *Aguilar, O., Carnahan, H., Malla, A.K., Norman, R., Hinsberger, A., & Cortese, L. Movement planning in schizophrenia, June, 1995, London, ON, Department of Psychiatry, Academic Day.
44. *Sinden, K.E., & Carnahan, H. The role of vision in manual aiming to moving targets, October, 1995, Vancouver, BC, SCAPPS.
45. Carnahan, H. The influence of target motion on the control of manual aiming, November, 1995, San Diego, CA, Society for Neuroscience.
46. Carnahan, H., Proteau, L., *Halverson, A.H., Chaput, S., & *Sinden, K. The effects of background motion and precision on the control of manual aiming and prehension, June, 1996, Minett, ON, NASPSPA.
47. *Halverson, A.H., Carnahan, H., *Doerksen, C., & McFadyen, B.J. The influence of obstacle size on avoidance strategies during manual aiming, June, 1996, Minett, ON, NASPSPA.
48. *Lam, J., & Carnahan, H. The influence of target velocity shape on manual aiming trajectories, June, 1996, Minett, ON, NASPSPA.
49. *Sinden, K.E., & Carnahan, H. The role of target spatial and temporal information in manual aiming tasks, June, 1996, Minett, ON, NASPSPA.
50. Connelly, D., Carnahan, H., Vandervoort, A.A., & Inglis, T. Aging effects on motor skill learning as an early neuromuscular adaptation during concentric and eccentric dorsiflexor strength training, November, 1996, Washington, D.C., Society for Neuroscience.
51. McFadyen, B.J., & Carnahan, H. Obstructed versus unobstructed reaching to stationary and moving targets in humans, November, 1996, Washington, D.C., Society for Neuroscience.
52. Carnahan, H., Hall, C., & *Doerksen, C. The effect of practice on the manual interception of moving objects, November, 1996, Washington, D.C., Society for Neuroscience.
53. Carnahan, H., *Mason, A.H., & *Dubrowski, A. Is Tactile Input Used On-Line During Reaching and Grasping?, April, 1997, Cancun, Mexico. Annual Neural Control of Movement Meeting.
54. Carnahan, H., *Mason, A.H., & *Sinden, K. The contributions of target movement time and velocity to manual aiming velocity, June, 1997, Denver, CO, NASPSPA.

55. *Dubrowski, A., & Carnahan, H. What sort of information do we use when intercepting a target: Velocity or acceleration?, June, 1997, Denver, CO, NASPSPA.
56. *Mason, A.H., & Carnahan, H. The effects of target velocity and target viewing time on the generation of the transport and grasp components of manual aiming, June, 1997, Denver, CO, NASPSPA.
57. Weir, P.L., Carnahan, H., & LeBoeuf, K. Grasping with binocular and monocular vision: Is there a difference? June, 1997, Denver, CO, NASPSPA.
58. *Dubrowski, A., & Carnahan, H. The effect of target exposure duration on hand trajectory formation during the manual interception of moving targets, June, 1997, Toronto, ON, International Conference on Vision & Action.
59. Maharajh, M., Anvari, M., Starkes, J., Carnahan, H., & Reed, A. Effects of visuo-motor ability and bimanual dexterity on the acquisition of laparoscopic skills, September 1997, Vancouver, BC, Annual meeting of the Canadian Society for Clinical Investigation: The Royal College of Physicians and Surgeons of Canada.
60. McFadyen, B.J., Carnahan, H., & Dugas, C. The combined dynamics of reaching and walking to open a door, October, 1997, New Orleans, Society for Neuroscience.
61. Ambis, C., Roy, E., Kalbfleisch, L., Fraser, B., & Carnahan, H. The representation of object properties and the control of reaching, October 1997, Niagara Falls, ON, SCAPPS.
62. *Wells, C., & Carnahan, H. The effects of temporal constraints on the generation of grasp forces, October 1997, Niagara Falls, ON, SCAPPS.
63. *Dubrowski, A., & Carnahan, H. Can target acceleration be used during both manual interception and perceptual judgements? October 1997, Niagara Falls, ON, SCAPPS.
64. Carnahan, H., Roy, E.A., *Whiteside, R., & Ambis, C. Time delays between the presentation of visual information about moving targets and movement initiation do not alter interception kinematics, June 1998, Chicago, IL, NASPSPA.
65. *Wells, C., & Carnahan, H. Does the texture of an object influence the force exerted on it by the fingers during grasping. Conference for Research in Action and Perception, June, 1998, Kingston, Ontario.
66. Dubrowski, A., *Wells, C., & Carnahan, H. Momentum is a controlled variable in grasp force modulation. November, 1998, Los Angeles, Society for Neuroscience.
67. *Dubrowski, A., & Carnahan, H. Evidence of anticipatory planning when intercepting moving targets. November, 1998, Fredericton, N.B. SCAPPS.
68. Carnahan, H., Weir, P.L., Lemay, M., & *Wells, C. Binocular and monocular vision differences in reaching to grasp a moving object. June, 1999, Clearwater, Florida, NASPSPA.
69. *Snowden, H., *Taylor, L., Carnahan, H., & Starkes, J. The control of manual target interception in children. June, 1999, Clearwater, Florida, NASPSPA.
70. *Dubrowski, A., Elliott, D., *Vasarhelyi, T., & Carnahan, H. The effects of visual fixation and target motion on manual interception. June, 1999, Clearwater, Florida, NASPSPA.
71. *Dubrowski, A., & Carnahan, H. Action - Perception dissociation in response to target acceleration. June, 1999, Montreal, PQ, Theoretical and Experimental Neuropsychology meeting (TENNET).

72. *Dubrowski, A., Proteau, L., & Carnahan, H. Practice influences the coordination of visual and haptic inputs during grasping. October, 1999, Miami, Florida, Society for Neuroscience.
73. Pare, M., Carnahan, H., & Smith, A.M. Tactile discrimination of tangential force: Psychophysical performance in humans. October, 1999, Miami, Florida, Society for Neuroscience.
74. Proteau, L., Pouchelle, M., & Carnahan, H. Transfer of training from one hand to the other: A test of the specificity of practice hypothesis. October, 1999, Edmonton, Alberta, SCAPPS.
75. *Dubrowski, A., & Carnahan, H. Target momentum and torque contribute to force generation magnitude when grasping moving targets. October, 1999, Edmonton, Alberta, SCAPPS.
76. *Vasarhelyi, E.M., *Dubrowski, A., & Carnahan, H. The effects of vision on finger kinematics and force generation: A test of a new grasping model. October, 1999, Edmonton, Alberta, SCAPPS.
77. *Shih, R.H., *Vasarhelyi, E.M., & Carnahan, H. The effects of latex gloves on the kinetics of grasping. October, 1999, Edmonton, Alberta, SCAPPS.
78. Servos, P., Carnahan, H., & Fedwick, J. The visuomotor system resists the horizontal-vertical illusion. November, 1999, Los Angeles, Annual Meeting of the Psychonomic Society.
79. *Dubrowski, A., Carnahan, H., Roy, E.A., Westwood, D., Heath, M.D., & Black, S.E. Changes in grip-load force coordination in a patient with unilateral basal ganglia damage. April, 2000, Key West, Florida, Annual Neural Control of Movement Meeting.
80. Dubrowski, A., & Carnahan, H. Can target acceleration be used for both perception and action? October 2000, Amsterdam, Symposium: Eye movements and vision in the natural world.
81. *Dubrowski, A., Carnahan, H., Roy, E.A., Westwood, D., Heath, M.D., & Black, S.E. Visual size cues in the programming of grip and load force in an individual with unilateral basal ganglia damage. November, 2000, New Orleans, Society for Neuroscience.
82. *Vasarhelyi, E.M., *Dubrowski, A., & Carnahan, H. An evaluation of a single-channel model of prehension. November, 2000, New Orleans, Society for Neuroscience.
83. *Dubrowski, A., Carnahan, H., Roy, E.A., Westwood, D., Heath, M.D., & Black, S.E. Effects of unilateral basal ganglia damage on grip and load force control. October, 2000, Waterloo, ON, SCAPPS.
84. *McCullough, S.E., *Dubrowski, A., & Carnahan, H. Finger contact area and not grip aperture is the primary variable that determines gripping pressure. October, 2000, Waterloo, ON, SCAPPS.
85. *Shih, R.H., *Dubrowski, A., & Carnahan, H. Haptic memory: How long does it last? October, 2000, Waterloo, ON, SCAPPS.
86. Bedard, P., *Dubrowski, A., Proteau, L., & Carnahan, H. Grasping of objects in peripheral visual field. October, 2000, Waterloo, ON, SCAPPS.
87. *Grierson, L., *Dubrowski, A., & Carnahan, H. Visual information does not influence haptic perception of object curvature. October, 2000, Waterloo, ON, SCAPPS.
88. Carnahan, H. Sensory contributions to grip control (symposium). October 2000, Waterloo, ON, SCAPPS.

89. Girgenrath, M., Carnahan, H., Bock, O., & Jungling, S. The speed-accuracy trade-off in prehension movements. Annual Congress of the European college of Sport Science. July 2001, Cologne.
90. *Dubrowski, A., Proteau, L., & Carnahan, H. The integration of visual and haptic cues and practice schedules on grip force during lifting. August, 2001, Montreal, PQ, Progress in Motor Control: From Basic Science to Applications.
91. Girgenrath, M., Carnahan, H., & Jungling, S. The speed-accuracy trade-off for prehension movements under different gravity levels. August, 2001, Montreal, PQ, Progress in Motor Control: From Basic Science to Applications.
92. *Dubrowski, A., Roy, E.A., Black, S.E., & Carnahan, H. Effects of unilateral basal ganglia damage on the practice induced suppression of the size weight illusion. International Conference on Motor Control. September, 2001, Varna, Bulgaria.
93. *McCullough, S.E., *Dubrowski, A., & Carnahan, H. The duration of haptic memory for object mass. International Conference on Motor Control. September, 2001, Varna, Bulgaria.
94. Carnahan, H., *Dubrowski, A., & *McCullough, S.E. Temperature influences both haptic perception and force production when grasping. Society for Neuroscience, 2001, San Diego, CA.
95. *Dubrowski, A., Teigrob, A., *Vasarhelyi, E.M., & Carnahan, H. Finger placement strategies for torque compensation. Society for Neuroscience, October, 2001, San Diego, CA.
96. *Sinnaeve, S.E., *McCullough, S.E., *Dubrowski, A., & Carnahan, H. Temperature effects on haptic perception and force production when grasping: Is there a dissociation? SCAPPS. October, 2001, Montreal.
97. *McCullough, S.E., *Dubrowski, A., & Carnahan, H. The size-weight illusion does not transfer from the right hand to the left. SCAPPS. October, 2001, Montreal, ON.
98. Girgenrath, M., Jungling, S., Carnahan, H., & Bock, O. Grasping performance during exposure to microgravity. Annual European Space Agency Congress. June 2002. Stockholm.
99. Dubrowski, A., & Carnahan, H. Size mass illusion affects grip force production in the right hand when simultaneously lifting distractor objects in the left hand. Society for Neuroscience. November, 2002, Orlando, FL.
100. *Sinnaeve, A., Dubrowski, A., & Carnahan, H. Evidence for the use of both iconic and long term memory systems for friction when grasping. Society for Neuroscience, 2002, Orlando, FL.
101. *Grierson, L., & Carnahan, H. Haptic perception of slipperiness is enhanced by the presence of finger movement. SCAPPS, 2002, Vancouver, B.C.
102. *Praamsma, M., *Darroch, B.A., Dubrowski, A., & Carnahan, H. (2003). Learning to intercept targets moving at constant velocities: A space simulation. SCAPPS, Hamilton, ON.
103. *Brydges, R., *Praamsmas, M., Carnahan, H., & Dubrowski, A., (2003). Surface exploration using laparoscopic surgical instruments: the perception of surface roughness. SCAPPS, Hamilton, ON.
104. *Kowalski, K., *Gonzalez, D., Dubrowski, D., & Carnahan, H. (2003). The integration of visual and haptic inputs when perceiving surface roughness. SCAPPS, Hamilton, ON.

105. Carnahan, H., Girgenrath, M., & Jungling, S. (2003). Grasping virtual and real targets in microgravity. SCAPPS, Hamilton, ON.
106. *Gonzalez, D., *Kowalski, H., Carnahan, H., & Dubrowski, A., (2003). Magnification of the visual field and haptic perception when exploring surfaces with Surgical snaps. SCAPPS, Hamilton, ON.
107. Dubrowski, A., MacDonald, R., LeBlanc, V., *Praamsma, M., *Darroch, B.A & Carnahan, H. (2003). Sensory and performance decrements when wearing hazardous materials gloves. SCAPPS, Hamilton, ON.
108. Girgenrath, M., Bock, O., Carnahan, H., & Jungling, S. The speed-accuracy tradeoff for grasping movements during weightlessness. IBRO, Prague, July, 2003.
109. *Praamsma, M., *Darroch, B., Dubrowski, A., & Carnahan, H. Intercepting moving objects in simulated weightlessness. Aerospace Medical Association Meeting, May, 2004. Anchorage, Alaska.
110. Dubrowski, A., Sidhu, R., Park, J., & Carnahan, H. Quantification of motion characteristics and forces applied to the tissues during suturing. Association for Surgical Education, May 2004, Houston.
111. Carnahan, H., *Gonzalez, D., *Brydges, R., *Kowalski, K. & Dubrowski, A. Haptic feedback for texture discrimination: From open to minimally invasive surgery. Association for Surgical Education, May 2004, Houston, TX.
112. *Praamsma, M., Carnahan, H., Backstein, D., *Gonzalez, D., Veillette, C., & Dubrowski, A. Don't talk to me while I am drilling. The Wilson Centre Research Day, October, 2004, Toronto.
113. *Praamsma, M., Carnahan, H. Backstein, D. *Gonzalez, D. Veillette, C., & Dubrowski, A., The use of auditory cues when drilling in a bone by novice and expert orthopedic surgeons. SCAPPS, October 2004, Saskatoon.
114. *Richards, L. *Whitelaw, M. Dubrowski, A., & Carnahan, H. The perception of mass is influenced by lifting when interacting with white and black objects. SCAPPS, October 2004, Saskatoon.
115. *Weber, J., Carnahan, H., MacRae H., & Dubrowski, A. Timing of performance on instrument suturing and knot tying in open surgery is not an optimal measure of skill acquisition. SCAPPS, October 2004, Saskatoon.
116. *Hung, C., *Gonzalez, D., Dubrowski, A., & Carnahan, H. Surface exploration using tools: The perception of friction. SCAPPS, October 2004, Saskatoon.
117. *Gonzalez, D., Dubrowski, A., *Praamsma, M., MacRae, H., & Carnahan, H., Control of laparoscopic grasping: Is it similar to prehension? SCAPPS, October 2004, Saskatoon.
118. *Weber, J., Carnahan, H., MacRae, H., & Dubrowski, A. Time does not tell: Timing of performance on instrument suturing and knot tying in open surgery is not an optimal measure of skill acquisition. The Wilson Centre Research Day, October, 2004, Toronto.
119. *Gonzalez, D., Dubrowski, A., *Praamsma, M., & Carnahan, H. Here's a tip: Don't measure just the hand when evaluating laparoscopic performance. The Wilson Centre Research Day, October, 2004, Toronto.
120. Dubrowski, A., Sidhu, R., Park, J., & Carnahan, H. Objective process measures of technical skills in open surgery. Research in Medical Education, November 2004, Boston, MA.

121. McFadyen, B.J., Carnahan, H., & Dubrowski, A. Orthogonal control during obstructed pointing. Society for Neuroscience, November, 2004, San Diego, CA.
122. Veillette, C., Praamsma, M., Backstein, D. Carnahan, H. Gonzalez, D. & Dubrowski, A. Are auditory cues used to control hand motion and force application during bone drilling. Canadian Orthopaedic Residents Association Annual Meeting, November 2004, Toronto, Ont.
123. *Gonzalez, D., Carnahan, H., *Praamsma, M. , MacRae, H., & Dubrowski, A. Control of laparoscopic instrument motion in an inanimate bench model: Implications for the training and evaluation of technical skills. Medicine Meets Virtual Reality, January, 2005, Long Beach, CA.
124. *Whitlaw, M., Dubrowski, A., & Carnahan, H. How much practice is required to build haptic memory. World Haptics, March, 2005, Pisa, Italy.
125. Dubrowski, A., *Leming, K., *Larmer, J., & Carnahan, H. The coordination of gripping forces during oscillatory movements performed using laparoscopic grasper. World Haptics, March, 2005, Pisa, Italy.
126. Brydges, R., Dubrowski, A., Backstein, D., & Carnahan, H. Can contextual interference facilitate the learning of a complex surgical task? NASPSPA, June 2005, St. Pete's FL.
127. *Gonzalez, D., Dubrowski, A., & Carnahan, H. The role of auditory cues in the anticipation of object mass when grasping. SCAPPS, Niagara Falls, October 2005.
128. *Leming, J.K., Carnahan, H., *Larmer, J., Xeroulis, G., and Dubrowski, A. Influence of the use of a laparoscopic grasper on the anticipatory control of grasping forces. SCAPPS, Niagara Falls, October 2005.
129. Carnahan H, Dubrowski A, *Richards L, *Whitlaw M, & *Leduc J. Colour/Value cues in the programming of grasping forces during precision grip. SCAPPS, Niagara Falls, October 2005.
130. *Larmer, J., Carnahan, H., & Dubrowski, A. The effects of lifting unevenly balanced objects using a three digit grasp. SCAPPS, Niagara Falls, October 2005.
131. *Shang, D., & Carnahan, H. Pressure versus force control during manual grasping. SCAPPS, Niagara Falls, October 2005.
132. *Shang, D, Carnahan, H, & Dubrowski A. Modeling of a laparoscopic needle driver: Implication for the design of virtual reality simulators. Medicine Meets Virtual Reality. Long Beach, CA, January 2006.
133. Carnahan, H., *Larmer, J. Dubrowski, A., MacDonald, R., LeBlanc , V., *Praamsma, M., & *Darroch, B.A. The effects of hazardous materials gloves on the performance of fine manual skills. Health & Safety Canada: Industrial Accident Prevention Association Conference, May 2006, Toronto, ON.
134. *McCullough, S., Dubrowski, A., & Carnahan, H. Transfer effects and the size-weight illusion. NASPSPA, June 2006, Denver, CO.
135. *Larmer, J.C., Tupling, A.R., & Carnahan, H. Force scaling as a function of object mass during a precision grasp lift while fatigued. Society for Neuroscience. October 2006, Atlanta.
136. *Shang, D., & Carnahan, H. The integration and dissociation of thermal and frictional cues during material identification . Society for Neuroscience, October 2006, Atlanta.

137. Behich, J., Carnahan, H., Brydges, R., Gray, G., & Dubrowski, A. Full body tilt affects execution of complex manual skills. The Wilson Center Research Day. October 2006, Toronto, ON.
138. *Leming, J.K., Dorman, K., Brydges, R., Carnahan, H., & Dubrowski, A. Tensiometry as a measure of improvement in knot tying quality in undergraduate medical students. The Wilson Center Research Day. October 2006, Toronto, ON.
139. *Kurahashi, A., *Leming, K., Carnahan, H., & Dubrowski, A. The effects of practice on adaptation to visual field rotations. The Wilson Center Research Day. October 2006, Toronto, ON.
140. Brydges, R., Carnahan, H., Backstein, D., & Dubrowski, A. The impact of practice schedules on the learning of a complex surgical skill. . Association for Medical Education in Europe, September 2006, Genoa, Italy.
141. Behich, J., Carnahan, H., Brydges, R., Gray, G., & Dubrowski, A. Full body tilt affects execution of complex manual skills. Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS), November 2006, Halifax, NS.
142. *Kurahashi, A., *Leming, K., Carnahan, H., & Dubrowski, A. The effects of practice on adaptation to visual field rotations. Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS). November 2006, Halifax, NS.
143. *Leming, J.K., Carnahan, H., Brydges, R., & Dubrowski, A. The effects of visual field rotation on the performance of a laparoscopic task by novice and expert laparoscopists. Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS), November 2006, Halifax, NS.
144. *Gonzalez, D., Dubrowski, A., & Carnahan, H. Is vision the only afferent system that provides relevant pre-contact cues? Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS). November 2006, Halifax, NS.
145. *Hung, C., Dubrowski, A., *Gonzalez, D., & Carnahan, H. Surface exploration using a surgical instrument: The perception of friction. Medicine Meets Virtual Reality 15, January 2007, California.
146. Liya, N., Wang, D.L., Dubrowski, A., & Carnahan, H. A user-friendly interface for surgeons to create haptic effects in medical simulation. Medicine Meets Virtual Reality 15, January 2007, California.
147. Okrainec, A., Carnahan, H., Wang, D.W.L., Ni, L., & Dubrowski, A. Building virtual reality haptic devices: The contributions of operative experience, SAGES, April 2007, Las Vegas.
148. *Kurahashi, A., *Lemming, K., Carnahan, H., & Dubrowski, A. The effects of practice organization on visuo-motor misalignment adaption, SAGES, April 2007, Las Vegas.
149. Carnahan, H., McKee, P., & *Chen, A. The influence of orthotic design on grip force. The 2nd International Conference on Technology and Aging (ICTA). June 2007, Toronto, ON.
150. Singh, G., Pichora-Fuller, K., Hayes, D., & Carnahan, H. The role of manual dexterity in hearing aid ergonomics. The 2nd International Conference on Technology and Aging (ICTA). June 2007, Toronto, ON.
151. Carnahan, H., Harvey, A., & Dubrowski, A. Strategies related to effective design in surgical simulation. Cybernetics and Information Technologies, Systems and Applications: CITSA 2007, July 2007, Orlando, FL.

152. Singh, G., Pichora-Fuller, K., Hayes, D., & Carnahan, H. The role of manual dexterity in hearing aid ergonomics. The Ninth International Sensory Aids Conference (ISAC-07) May 2007, Portland, Maine.
153. Brümmer, V., Okrainec, A. Carnahan, H., Dubrowski, A. Altered gravity affects the execution of surgical skills. 12th annual Congress of European College of Sport Science (ECSS), July, 2007, Jyväskylä, Finland.
154. Carnahan, H., & Dubrowski, A., Proficiency based learning as a predictor of the retention of a technical surgical skill. Association for Medical Education in Europe. August 2007, Todenheim, Norway.
155. Singh, G., Pichora-Fuller K., Hayes' D., Carnahan, H. The aging hand and hearing aid ergonomics. Canadian Academy of Audiology. October 2007, Niagara Falls, ON.
156. Mirksy, L., Chen, A., McKee, P., & Carnahan, H. The influence of orthotic design on motor control during prehension. SCAPPS, November 2007, Windsor, ON.
157. Hagemann, E., Dubrowski, A., & Carnahan, H. How does learning influence forgetting? SCAPPS, November 2007, Windsor, ON.

RESEARCH GRANTS AND CONTRACTS:

1. Carnahan, H., 1990-1992, Ontario Ministry of Health Career Scientist, Salary and benefits
2. Carnahan, H., 1991, Optotrak optoelectric system, Ont. Min. of Health Clinical Equipment, \$83,000
3. Carnahan, H., 1991, Movement science in physical therapy, Ont. Min. of Health Conference Grant, \$4,991
4. Carnahan, H., 1991-1992, Anticipatory control during reaching, Ontario-Quebec Travel Grant, \$1,050
5. Carnahan, H. & Vandervoort, T., 1991-1992, Learning and control of motor skills in the young and elderly, Can. Fitness and Lifestyle Research Institute, \$11,031
6. Carnahan, H., 1991-1994, Vision and motor learning and control, NSERC Research, \$54,000
7. Carnahan, H. & Malla, A.K., 1992, Schizophrenia & movement disorders, Victoria Hospital Internal Equipment Award, \$7,000
8. Carnahan, H., 1992, Travel money, Academic Human Resources, \$300
9. Carnahan, H. & Roy, E.A., 1993, Optotrak three-dimensional motion analysis system, NSERC Equipment, \$71,923
10. Carnahan, H., 1993-1994, Integration of prehensile and locomotor activity, Ontario-Quebec Travel Grant, \$2,000
11. Carnahan, H. & *Forwell, L., 1993-1994, Proprioceptive deficits associated with shoulder dislocation, Sport Canada, \$10,000
12. Carnahan, H., 1994-1998, Target movement and manual aiming, NSERC Research, \$76,000
13. Norman, R., Malla, A.K., *Aguilar, O. & Carnahan, H., 1994-1995, Voluntary movement psychopathology in schizophrenia, Victoria Hospital Research Development Fund, \$11,500
14. Carnahan, H., 1995, The effects of perturbations on motor control, Ontario-Quebec Travel Grant, \$2,500

15. *Aguilar, O., Malla, A.K., Carnahan, H. & Norman, R., 1995, Movement disorders study, Janssen Pharmaceutical, \$20,000
16. Roy, E.A., Carnahan, H. & Bryden, P., 1995, Computer hardware system for data analysis, NSERC Equipment, \$11,361
17. Maharaj, K., Starks, J. & Carnahan, H., 1995, Visuomotor and bimanual assessment of Laparoscopic Surgeons, Hamilton Civic Hospital Research Fund , \$2,500
18. Carnahan, H., 1996, The influence of learning and perturbations on motor control II, Ontario-Quebec Travel Grant, \$1,300
19. Carnahan, H., 1997, The influence of learning and perturbations on motor control III, Ontario-Quebec Travel Grant, \$2,300
20. Carnahan, H., 1998-2002, The role of vision and haptics in the control of reaching and grasping, NSERC Research, \$110,880
21. Carnahan, H. & Roy, E.A., 1998, Multi-axis force/torque Sensors, NSERC Equipment, \$13,150
22. Carnahan, H., 1999-01, Specificity of motor learning, Ontario-Quebec Travel Grant, \$9,600
23. Jungling, S. & Carnahan, H., 1999-01, Effects of weightlessness on the CNS, German Space Agency (DLR), DM 168,000
24. Backstein,, D., Dubrowski, A. & Carnahan, H., 2004, Acquisition of bone plating surgical procedure, Physicians' Services Incorporated Foundation, \$24,930
25. Wells, R., Frazer, M., Maracle, S., Dunk, W. & Carnahan, H., 2005-2006, Powerline maintainers' gloves: Improving safety and reducing injury, WSIB, \$36,350
26. Carnahan, H., 2002-07, Sensory contributions to human prehension, NSERC Discovery, \$170,000.
27. Schneider, S., Struder, H., Kleinert, J. & Carnahan, H., 2005-2007, The influence of weightlessness on sensorimotor adaptation, German Space Agency (DLR), 200,000 EURO
28. Wells, R., Potvin, J., Moore, A., Carnahan, H. & Frazer, M., 2006-2007, Multi-task jobs: Hazard assessment and job rotation, WSIB RAC "Solutions for Workplace Change", \$28,695
29. Steeles, C.M., Bressman, T. & Carnahan, H., 2007-2008, The role of skilled tongue pressure formation in swallowing, CIHR, \$81,635
30. Pichora-Fuller,K., Carnahan, H. & Singh, G., 2007, Role of manual dexterity in hearing aid ergonomics, Unitron, \$3,600
31. Carnahan, H., 2007-2012, Touch perception and the control of movement, NSERC Discovery, \$173,725
32. Safir, O. Carnahan, H. & Dubrowski, 2007, A. Arthroscopy Equipment. Liventek Canada Inc., \$100,000
33. Carnahan, H., 2007, Motion analysis system to quantify manual skills, NSERC Equipment, \$76,000
34. H. Carnahan, & P. McKee. 2007, Model and curriculum development for training rehabilitation specialists using simulation. Faculty of Medicine Educational Development Fund, \$20,000
35. Pirhora-Fuller, K., Carnahan, H., & Singh, G., 2007, The role of manual dexterity in hearing aid ergonomics: Part II, Unitron, \$4,200

36. Carnahan, H. & Zelek, J. 2007-09, Application of a way-finding belt to facilitate navigation, Alzheimer's Association, \$165,000
37. Steeles, C.A., Bressman, T. & Carnahan, H., 2007-2010, The role of tongue pressure generations kill in the oral phase of swallowing, CIHR, \$325,576
38. Safir, O., Carnahan, H. (Co-PI), Dubrowski, A. & Backstein, D., 2007-08. Self regulated scheduling of practice of a technical surgical skill, Royal College of Physicians and Surgeons, \$22,680

SUPERVISION:

Postdoctoral Fellow (1)

1. **Omar Aguilar**, Voluntary Movement Disorders Associated with Schizophrenia, 1994-1995, Faculty of Medicine, University of Western Ontario.

Ph.D. (2)

1. **Adam Dubrowski**, 2001. The role of vision in manual aiming to moving targets
Department of Kinesiology, University of Waterloo.
Faculty of Applied Health Science UW gold medal award nominee.
UW Award for Outstanding Achievement in Graduate Studies
SCAPPS 2001 Young Scientist Award Winner.
2. **Ryan Brydges** (co-advised with A. Dubrowski), 2006 – Ph.D. in progress (Institute for Medical Science). Wilson Centre Fellow. Self assessment and learning of technical surgical skills, University of Toronto.

Masters (17)

1. **Lorie Forwell**, Physical Therapy, Proprioceptive deficits associated with recurrent shoulder dislocation, 1994, University of Western Ontario.
2. **Kathryn Sinden**, Kinesiology, The influence of moving target trajectory shape on manual interception, 1996, University of Waterloo.
3. **Andrea Mason** (Halverson), Kinesiology, The effects of target speed and viewing time on reaching and grasping, 1997, University of Waterloo. NASPSPA 1997 Student Abstract Award Winner.
4. **Adam Dubrowski**, Kinesiology, Can target acceleration be used during both manual interception and perceptual judgements?, 1997, University of Waterloo.
5. **Cari Wells**, Kinesiology, Generation of grasp forces under time constraints, 1998, University of Waterloo.
6. **Ron Shih**, Kinesiology. An investigation into haptic memory: How long does it last?, 2001, University of Waterloo.
7. **Ted Vasarahelyi**, Kinesiology, Influence of object colour on the perception of mass and the control of grasp forces, 2001, University of Waterloo.
8. **Sharon McCullough**, Kinesiology, Transfer effects on grasping force control, 2002, University of Waterloo.

9. **Lawrence Grierson**, Kinesiology, Finger movement and the haptic perception of slipperiness: An action-perception dissociation, 2003, University of Waterloo.
10. **Monate Praamsma**, Kinesiology. (co-advised with A. Dubrowski) Kinesiology, The effects of auditory cues on bone drilling in experts and novice surgeons, 2004, University of Waterloo.
11. **Michael Whitlaw**, Kinesiology (co-advised with A. Dubrowski) Kinesiology, Practice effects and haptic memory, 2004, University of Waterloo.
12. **David Gonzalez**, M.Sc.. Kinesiology, The integration of sound and haptics for grasp control. 2006, University of Waterloo.
13. **Daniel Shang**, M.Sc., Kinesiology, Temperature effects on haptic perception and manual control, October 2006, University of Waterloo.
14. **James Larmer**, M.Sc., Kinesiology, Fatigue and the internal model for force control, October 2006, University of Waterloo.
15. **Oleg Safir**, M.Ed. candidate. OISE , Wilson Centre Fellow & Surgeon Scientist Fellow. Self directed learning of technical surgical skills. (2007 – present), University of Toronto.
16. **Catharine Walsh**, M.Ed. candidate. OISE & Wilson Centre Fellow, Pediatric Fellow. Forgetting of endoscopy skills. (2007 – present) University of Toronto.
17. **Eric Hagemann**, M.Sc candidate. Graduate Department of Rehabilitation Sciences, Motor learning principles applied to training rehabilitation specialists. (2007 - present), University of Toronto.
18. **Ando Stefonovich**, MSOT candidate. Department of Occupational Science and Occupational Therapy, The use of simulation in training occupational therapists. (2007-present) University of Toronto.

Undergraduate (37 undergraduate theses completed):

Students Currently Supervised (3):

1. CREMS Student: **Gurbir Sekhon**, Faculty of Medicine, Ergonomics of the surgical team in the operating room (surgeon, nurse and trainee), University of Toronto
2. CREMS Student: **Adam Weathermon**, Faculty of Medicine, An ergonomic comparison of two laparoscopic approaches: trainees versus experts, University of Toronto
3. Queen's University Undergraduate Medical Student: **Cliff Lin**, The development of a simulator for training arthroscopic procedures

SERVICE:

A) University Committees:

1993-96	Davis Center Library Committee, U.W.
1999-02	Senate, U.W.
2000 & 02	Senate Finance, U.W.
1999-00	Vice-President Research Nominating Committee, U.W.
2000-06	University Tenure and Promotion Advisory Committee (UTPAC), U.W.
2001	UTPAC Appeals Committee, U.W.

2001-04	Senate Graduate Committee, U .W.
2002-06	University of Waterloo Faculty Association Hagey Keynote Speaker Committee, U.W.
2005	Research Ethics Subcommittee, U.W.
2007-10	Research Ethics Health Science I Committee Member, U of T

B) Faculty Committees:

1991	Department of Physical Therapy Representative for Dean's Advisory Committee on Computing, U.W.O.
1994-96	Applied Health Sciences Executive Committee, U.W.
1994	Committee on Issues of Gender and Inclusivity, U.W.
1995-98	Chair, Committee on Issues of Gender and Inclusivity, U.W.
1996-98	Applied Health Sciences Endowment Fund Committee, U.W.
2000-02	Faculty Graduate Committee, U.W.
2005-06	Chair of the AHS Faculty Committee on Student Appeals (FCSA), U.W.
2005-06	Faculty Graduate Studies Committee, and Graduate Appeals Committee, U.W.

C) Department Committees:

1991	Department Representative for Assistive Devices Development Program U.W.O.
1991-92	Department of Physical Therapy Scientific Affairs Committee, U.W.O.
1992	Department of Physical Therapy Safety of Women Committee, U.W.O.
1992-94	Department of Kinesiology Planning Committee, U.W.
1993-98	Department of Kinesiology Library Representative, U.W.
1994-05	Department of Kinesiology Graduate Committee, U.W.
1996-97	Chair, Department of Kinesiology Executive Committee, U.W.
1996-00	Faculty Advisor for first year undergraduates, U.W.
1997, 02-06	Department of Kinesiology Hiring Committee, U.W.
1999-00	Faculty Undergraduate Studies Committee, U.W.
2000-01	Kinesiology Executive Committee, U.W.
2001	Department of Kinesiology Research Chair Selection Committee, U.W.
2001	Web page Development Ad Hoc Committee, U.W.
2002-05	Kinesiology Steering Committee, U.W.
2000-02	Kinesiology Department Chair for Graduate Studies, U.W.
2006	Occupational Science and Occupational Therapy Research Committee, U of T
2007-2009	Graduate Department of Rehabilitation Sciences Theme Leader: Movement Science, U of T
2007	Occupational Science and Occupational Therapy Progression Through the Ranks Committee, U of T
2007	Wilson Centre Research Day Committee, U of T

COURSES TAUGHT:

Cited in Macleans Magazine 2004 University Edition as one of the University of Waterloo's "Most Popular" Professors

1991	Physical Therapy 540 Physical Therapy 550 Psychology 398a & 399b Kinesiology 555 Physical Therapy 513Y	Graduate Applied Physiology Graduate Research Methods Undergraduate Independent Study Graduate Reading Course Graduate Independent Study
1992-06	Kinesiology 652 Kinesiology 686 Kinesiology 470 Kinesiology 242 Kinesiology 393, 431, 432, 433 & 472	Graduate Motor Behavior Selected Topics in Psychomotor Behavior (not taught every year) Senior Undergraduate Seminar (not taught every year) Undergraduate Movement Disorders Undergraduate Thesis/Research Projects
1995, 98, 02, 06	Kinesiology 670	Graduate Seminar
1997	Kinesiology 456	Cognitive Dysfunction and Motor Skill
2000-06	Kinesiology 264 Psychology 677A	Motor Development Fundamentals of Behavioural Neuroscience (1 week)
2006 2006	REH 1100H	One lecture – Research Overview High school student outreach - Ursula Franklin Academy - 20 students (7 hours).
2007	Occupational Therapy	One lecture – Motor Learning and Neurorehabilitation
2007	OISE	Reading Course in Motor Learning (co-taught with A. Dubrowski)
2007	Occupational Therapy 1220	Research Project Co-taught with Alex Milhailidis