

## BIOGRAPHICAL SKETCH

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NAME Richard E. Hughes	POSITION TITLE Associate Professor		
eRA COMMONS USER NAME REHUGHES			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Princeton University (Princeton, NJ)	BSE	1985	Civil Engineering
The University of Michigan (Ann Arbor, MI)	MSE	1990	Indust. and Oper. Eng.
The University of Michigan (Ann Arbor, MI)	PhD	1991	Indust. and Oper. Eng.
Mayo Clinic (Rochester, MN)	Fellowship	1994-1996	Phys. Med. and Rehab.

**A. Positions and Honors.** List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

### Positions

- |              |   |
|--------------|---|
| 1991-1994    | Ergonomist, Safety and Health Applications and Research for Prevention Division, Washington State Department of Labor and Industries, Olympia, WA.  |
| 1994-1996    | Research Fellow, Orthopedic Biomechanics Lab, Mayo Clinic, Rochester, MN.   |
| 1994-1996    | Instructor in Bioengineering, Mayo Medical School, Rochester, MN.   |
| 1997-1998    | Safety Engineer and Team Leader, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV. |
| 1998-2001    | Assistant Professor, Department of Surgery, University of Michigan, Ann Arbor, MI.  |
| 1999-2004    | Assistant Professor, Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI.   |
| 2001-2004    | Assistant Professor, Department of Orthopaedic Surgery, University of Michigan, Ann Arbor, MI.  |
| 2004-present | Associate Professor, Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI.   |
| 2004-present | Associate Professor, Department of Orthopaedic Surgery, University of Michigan, Ann Arbor, MI.  |
| 2004-present | Adjunct Associate Professor, Movement Science, Division of Kinesiology, University of Michigan, Ann Arbor, MI.                                      |
| 2004-present | Vice-President, White Pine Occupational Health Research LLC, Ann Arbor, MI.   |

**B. Selected peer-reviewed publications (in chronological order).** Do not include publications submitted or in preparation.

### Selected Peer-Reviewed Publications (from a total of 57)

1. Hughes, R.E., Bean, J.C., and Chaffin, D.B. (1995) Evaluating the effect of co-contraction in optimization models. *Journal of Biomechanics* 28(7):875-878.
2. Hughes, R.E. and An, K-N (1996) Force analysis of rotator cuff muscles. *Clinical Orthopaedics and Related Research* 330:75-83.
3. Hughes, R.E. and An, K-N (1997) Monte Carlo simulation of a planar shoulder model. *Medical and Biological Engineering and Computing* 35:544-548.
4. Hughes, R.E., Schneeberger, A.G., An, K-N, Morrey, B.F., and O'Driscoll, S.W. (1997) Reduction of triceps muscle force after shortening of the distal humerus: A computational model. *Journal of Shoulder and Elbow Surgery* 6(5):444-448.
5. Hughes, R.E., Rock, M.G., and An, K-N (1999) Identification of optimal strategies for increasing whole arm strength using Karush-Kuhn-Tucker multipliers. *Clinical Biomechanics* 14:628-634.
6. Hughes, R.E. (2000) Effect of optimization criterion on spinal force estimates during asymmetric lifting. *Journal of Biomechanics* 33(2):225-229.

7. Chang, Y-W, Hughes, R.E., Su, F-C, Itoi, E., and An, K-N (2000) Prediction of muscle force involved in shoulder internal rotation. *Journal of Shoulder and Elbow Surgery* 9(3):188-195.
8. Hughes, R.E., Bryant, C.R., Hall, J.M., Wening, J., Huston, L.J., Kuhn, J.E., Carpenter, J.E., and Blasier, R.B. (2003) Glenoid inclination is associated with full-thickness rotator cuff tears. *Clinical Orthopaedics and Related Research* 407:86-91.
9. Wong, A.S., Gallo, L., Kuhn, J.E., Carpenter, J.E. and Hughes, R.E. (2003) The effect of glenoid inclination on superior humeral head migration. *Journal of Shoulder and Elbow Surgery* 12(4):360-364.
10. McMullin, M., Woldstad, J., and Hughes, R.E. (2003) Optimization model estimates of trunk muscle forces do not correlate well with EMG activity of females as well as males. *Journal of Applied Biomechanics* 19:131-138.
11. Nakajima, T., Hughes, R.E., and An, K-N. (2003) Validation of MRI-based measurements of supraspinatus morphology. *Journal of Musculoskeletal Research* 7(1):15-23.
12. Nakajima, T., Hughes, R.E., and An, K-N (2004) Effects of glenohumeral rotations and translations on supraspinatus tendon morphology. *Clinical Biomechanics* 19:579-585.
13. Giorcelli, R.J., Hughes, R.E., Current, R.S., and Myers, J.R. (2004) Accuracy of system for measuring three-dimensional torso kinematics during manual materials handling. *Journal of Applied Biomechanics* 20:185-194.
14. Langenderfer, J., Jerabek, S.A., Thangamani, V.B., Kuhn, J.E., and Hughes, R.E. (2004) Musculoskeletal parameters of muscles crossing the shoulder and elbow and the effect of sarcomere length sample size on estimation of optimal muscle length. *Clinical Biomechanics* 19(7):664-670.
15. Langenderfer, J., LaScalza, S., Mell, A., Carpenter, J.E., Kuhn, J.E., and Hughes, R.E. (2004) An EMG-driven model of the upper extremity and estimation of long head biceps force. *Computers in Medicine and Biology* 35:25-39.
16. Carpenter, J.E., Wening, J.D., Mell, A.G., Hollis, R.F., Langenderfer, J., Kuhn, J.E., and Hughes, R.E. (2005) Changes in the long head of the biceps in rotator cuff tear shoulders. *Clinical Biomechanics* 20(2):162-165.
17. Mell, A.G., LaScalza, S., Guffey, P., Ray, J., Maciejewski, M., Carpenter, J.E., and Hughes, R.E. (2005) Effect of rotator cuff pathology on shoulder rhythm. *Journal of Shoulder and Elbow Surgery* 14(1S):58S-64S.
18. Mell, A.G., Childress, B.L., and Hughes, R.E. (2005) The effect of wearing a wrist splint on shoulder kinematics during object manipulation. *Archives of Physical Medicine and Rehabilitation* 86(8):1661-1664.
19. Langenderfer, J., Hughes, R.E., and Carpenter, J.E. (2005) A stochastic model of elbow flexion strength for subjects with and without long head biceps tear. *Computer Methods in Biomechanics and Biomedical Engineering* 8(5): 315-322.
20. Sommerich, C.M., and Hughes, R.E. (2006) Aetiology of work-related disorders of the rotator cuff tendons: Research and theory. *Theoretical Issues in Ergonomics Science* 7(1): 19-38
21. Silver, A.E., Lungren, M.P., Johnson, M.E., O'Driscoll, S.W., An, K-N, and Hughes, R.E. (2006) Using support vector machines to optimally classify rotator cuff strength data and quantify post-operative strength in rotator cuff tear patients. *Journal of Biomechanics* 39: 973-979.
22. Langenderfer, J.E., Carpenter, J.E., Johnson, M.E., An, K-N, Hughes, R.E. (2006) A probabilistic model of glenohumeral external rotation strength for healthy normals and rotator cuff tear cases. *Annals of Biomedical Engineering* 34(3):465-476.
23. Langenderfer, J.E., Patthanacharoenphon, C., Carpenter, J.E., Hughes, R.E. (2006) Variation in external rotation moment arms among sub-regions of supraspinatus, infraspinatus, and teres minor muscles. *Journal of Orthopaedic Research* 24(8):1737-1744.
24. Langenderfer, J., Patthanacharoenphon, C., Carpenter, J., and Hughes, R. (2006) Variability in isometric force and moment generating capacity of glenohumeral external rotator muscles. *Clinical Biomechanics* 21(7):701-709.
25. Swaringen, J.C., Mell, A.G., Langenderfer, J., LaScalza, S., Hughes, R.E., and Kuhn, J.E. (2006) Electromyographic analysis of physical examination tests for type II superior labrum anterior-posterior lesions. *Journal of Shoulder and Elbow Surgery* 15(5):576-579.
26. Srinivasan, R.C., Lungren, M.P., Langenderfer, J.E., and Hughes, R.E. (2007) Fiber type composition and maximum shortening velocity of muscles crossing the human shoulder. *Clinical Anatomy* 20(2):144-149.

**C. Research Support.** List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and responsibilities of principal investigator identified above.

**Research Projects Ongoing or Completed During the Last 3 Years**

“Development of three-dimensional biomechanical model of the glenohumeral joint.”

Principal Investigator: Richard E. Hughes, Ph.D

Funding source: The Whitaker Foundation.

Period: May 1, 2000 to June 30, 2004.

The objective of this project is to estimate the rotator cuff muscle contraction forces from EMG recordings. The P.I. is responsible for model formulation, experimental design, data analysis, supervision of staff, and project management.

“Structure-function of the glenohumeral joint.”

Principal Investigator: Richard E. Hughes, Ph.D.

Funding source: National Institutes of Health (R01)

Period: April 1, 2004 to March 31, 2007

The objective is to develop a stochastic three-dimensional biomechanical model of the glenohumeral joint for estimating the probability of superior humeral head migration. The P.I. is responsible for model formulation, experimental design, data analysis, supervision of staff, and project management.

“Innovation in knee navigation.”

Principal Investigator: Andrew Urquhart, M.D. (R. Hughes, Co-Investigator)

Funding source: Stryker orthopaedics

Period: October 1, 2005 to March 31, 2006

The purpose of the study is to develop improved methods for estimating landmarks for use in surgical knee navigation systems for total knee arthroplasty. The P.I. is responsible for interacting with corporate sponsor, assisting with experiment, and preparing manuscript for publication. Co-Investigator is responsible for designing and conducting experiments, as well as data analysis.