

CURRICULUM VITAE

Nicolas Schweighofer, PhD

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PERSONAL INFORMATION

University Address: Division of Biokinesiology and Physical Therapy
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EDUCATION AND PROFESSIONAL APPOINTMENTS

UNIVERSITY EDUCATION

- 1991-1995 PhD, University of Southern California, Los Angeles: *Neuroscience*,
(*Computational Neuroscience Emphasis*)
(Advisor: Prof. M. Arbib)
- 1988-1990 Diplôme d'ingénieur, Ecole Nationale Supérieure de Mécanique, Nantes,
France (newly 'Ecole Centrale de Nantes') : *Mechanics and Control*
System Engineering
- 1985-1987 Undergraduate training: Mathématiques Spéciales P', Lycée Descartes,
Tours, France: *Advanced Mathematics and Physics*

POST-GRADUATE TRAINING

- 1996-1997 Postdoctoral Fellow, Human Information Science, ATR, Kyoto, Japan:
Computational Neuroscience (Mentor: Prof. M. Kawato)

ACADEMIC APPOINTMENTS

- 2022-Present Professor with tenure, Division of Biokinesiology & Physical Therapy,
University of Southern California
- 2011-2021 Associate Professor with tenure, Division of Biokinesiology & Physical
Therapy, University of Southern California
- 2011-Present Joint Appointment (*courtesy*), Department of Biomedical Engineering,
Viterbi School of Engineering, University of Southern California
- 2004-Present Joint Appointment (*courtesy*), Department of Computer Science, Viterbi
School of Engineering, University of Southern California
- 2004-Present Joint Appointment (*courtesy*), Neuroscience Graduate Program, University
of Southern California

2004-2010 Assistant Professor (tenure-track), Division of Biokinesiology & Physical Therapy, University of Southern California

AFFILIATE APPOINTMENTS

2021-Present Director, Center for Statistics and Computation, Biokinesiology and Physical Therapy, University of Southern California

2019-Present Specially Appointed Professor, Tokyo Institute of Technology University, Japan

2017 Invited Professor, Empowerment Informatics, Tsukuba University, Japan

2012-2013 Associate Researcher, M2H, Euromov, Montpellier University I, France

2008-2017 Visiting Faculty, Keio University, Tokyo, Japan

2004-2013 Visiting Researcher, Advanced Telecom Research Institute, Kyoto, Japan

2002-2003 Researcher, Computational Neuroscience Group, CREST, Kyoto, Japan

2000-2001 Director of R&D, Cerego Inc., Tokyo, Japan

1997-1999 Researcher, Exploratory Research Advanced Technology Organization, Kyoto, Japan

PUBLICATIONS

(* indicates direct student or postdoctoral mentee; underline shows senior author on publications; # indicates equal contributions)

REFEREED JOURNAL ARTICLES

1. S.L. Liew, **N. Schweighofer**, Cramer S.C., & Thompson, P.M. (2023) Association of brain age, lesion volume, and functional outcome in patients with stroke, *Neurology*, In Press
2. Varghese R., Gordon, J., Sainburg R.E., Winstein C.J, & **Schweighofer, N.** (2023) Adaptive Control is Reversed Between Hands After Right Paretic Stroke, and Lost Following Left Paretic Stroke. *Proceedings of the National Academy of Sciences*, 120 (6)
3. Kettlety, S.A., JM. Finley, Reisman, DS, **Schweighofer, N.** and Leech, KA (2023) Speed-dependent biomechanical changes vary across individual gait metrics post-stroke relative to neurotypical adults, *Journal of NeuroEngineering and Rehabilitation*, 20 (1), 1-13
4. Chen, Y. A., Lewthwaite, R., **Schweighofer, N.**, Monterosso, J. R., Fisher, B. E., & Winstein, C. (2022). The Essential Role of Social Context and Self-Efficacy in Daily Paretic Arm/Hand Use after Stroke: An Ecological Momentary Assessment Study with Accelerometry. *Archives of Physical Medicine and Rehabilitation*.
5. Ballester, B.R., Winstein, C.J., & **Schweighofer, N.** (2022). Virtuous and vicious cycle of arm use and function post-stroke. *Frontiers in Neurology*, 13, 804211.

6. Liew, S.L., Zavaliangos-Petropulu, A., ... **Schweighofer, N.**, ... Cramer, S., & Thompson, P.M. (2022). The ENIGMA Stroke Recovery Working Group: Big data neuroimaging to study brain-behavior relationships after stroke. *Human Brain Mapping*, 43(1), 129-148.
7. Wang, P., VanGilder, J. L., **Schweighofer, N.**, & Schaefer, S. Y. (2022). Rey-Osterrieth complex figure recall scores and motor skill learning in older adults: A non-linear mixed effect model-based analysis. *Human Movement Science*, 86, 103004.
8. Juliano, J. M., **Schweighofer, N.**, & Liew, S. L. (2022). Increased cognitive load in immersive virtual reality during visuomotor adaptation is associated with decreased long-term retention and context transfer. *Journal of NeuroEngineering and Rehabilitation*, 19(1), 1-14.
9. Kim, S. *, Han, C., Kim, B., Winstein, C., & **Schweighofer, N.** (2022). Effort, success, and side of lesion determine arm choice in individuals with chronic stroke. 255-266. *Journal of Neurophysiology*, 127(1), 255-266.
10. Varghese, R., Chang, B., Kim, B., Liew, S. L., **Schweighofer, N.**, & Winstein, C. J. (2022). Corpus callosal microstructure predicts bimanual motor performance in chronic stroke survivors: A preliminary cross-sectional study. *Topics in Stroke Rehabilitation*, 1-9.
11. Zavaliangos-Petropulu, A., Lo, B., Donnelley, M., **Schweighofer, N.**, ... Cramer, S.C., Thompson, P.M., Liew, S.L. (2022). Chronic stroke sensorimotor impairment is related to smaller hippocampal volumes: An ENIGMA analysis. *Journal of the American Heart Association*, 11(10), e025109.
12. Cho, W., Barradas, V., **Schweighofer, N.**, & Koike, Y. (2022). Design of an isometric end-point force control task for electromyography normalization and muscle synergy extraction from the upper limb without maximum voluntary contraction. *Frontiers in Human Neuroscience*, 16, 805452.
13. Ito, K.L., Kim, B., Liu, J., Soekadar, S., Winstein, C., Yu, C. Cramer, S.C., **Schweighofer, N.**, & Liew, S.L. (2022). Corticospinal tract lesion load originating from both ventral premotor and primary motor cortices predicts post-stroke motor severity. *Neurorehabilitation and Neural Repair*, 36, 179-182.
14. Berret, B., Contessa, A., **Schweighofer, N.**, Burdet, E. (2021). Stochastic optimal feedforward-feedback control determines the timing and variability of arm movements with and without vision. *PLoS Computational Biology*, 17(6), e1009047.
15. Rossi, C., Ryan, T. Roemmich, R.T., **Schweighofer, N.**, Bastian, A.J., and Leech, K.A. (2021). Younger and late middle-aged adults exhibit different patterns of cognitive-motor interference during locomotor adaptation, with no disruption of savings. *Frontiers Aging Neuroscience*, 13, 729284.
16. Liew, S.L., Zavaliangos-Petropulu, A., **Schweighofer, N.**, Jahanshad, N. ... (2021). Smaller spared subcortical nuclei are associated with worse post-stroke sensorimotor outcomes in 28 cohorts worldwide. *Brain Communications*, 3(4), fcab254.
17. Nibras, N.*#, Liu, C.#, Wang, C., Mottet, D., Reinkensmeyer, D.J., Remy-Neris, O., Laffont, I.#, **Schweighofer, N.**# (2021). Dissociating sensorimotor recovery and compensation during exoskeleton training following stroke. *Frontiers in Human Neuroscience*, 15, 645021.

18. Sánchez, N., **Schweighofer, N.**, Finley, J.M. (2021). Different biomechanical variables explain within-subjects versus between-subjects variance in step length asymmetry post-stroke. *Transactions on Neural Systems & Rehabilitation Engineering*, 29, 1188-1198.
19. Kim, B.K., **Schweighofer, N.**, Haldar, J.P., Leahy, R.M., Winstein, C.J. (2021). Corticospinal tract microstructure predicts distal arm motor improvements in chronic stroke. *Journal of Neurologic Physical Therapy*, 45(4), 273-281.
20. Chen, Y.A., Demers, M., Lewthwaite, R., **Schweighofer, N.**, Monterosso, J.R., Fisher, B.E., & Winstein, C.J. (2021). A novel combination of accelerometry and ecological momentary assessment for post-stroke paretic arm/hand use: Feasibility and validity. *Journal of Clinical Medicine*, 10(6), 1328.
21. Ito, K.L., Cao, L., Keller, B., Monterosso, J., **Schweighofer, N.**, & Liew, S.L. (2021). Validating habitual and goal-directed decision-making performance online in healthy older adults. *Frontiers Aging Neuroscience*, 13, 702810.
22. Kambara, H., Takagi, A., Shimizu, H., Kawase, T., Yoshimura, N., **Schweighofer, N.**, & Koike, Y. (2021). Computational reproductions of external force field adaption without assuming desired trajectories. *Neural Networks*, 139, 179-198.
23. Wang, C.*, D'Argenio, D., Winstein, C., **Schweighofer, N.** (2020). The efficiency, efficacy, and retention of task practice in chronic stroke. *Neurorehabilitation and Neural Repair*, 34(10), 881-890.
24. Hoang, H., Lang, E.J., Hirata, Y., Tokuda, I.T., Aihara, K., Toyama, K., Kawato, M. & **Schweighofer, N.** (2020). Electrical coupling controls dimensionality and chaotic firing of inferior olive neurons. *PLOS Computational Biology*, 16(7), p.e1008075.
25. Varghese, R., Kutch, J., **Schweighofer, N.** & Winstein C.J. (2020). The probability of choosing both hands depends on an interaction between motor capacity and limb-specific control in chronic stroke. *Experimental Brain Research*, 238, 2569-2579.
26. Barradas, V.*, Kutch, J., Kawase, T., Koike, Y., **Schweighofer, N.** (2020). When 90% of the variance is not enough: Residual EMG from muscle synergy extraction influences task performance. *Journal of Neurophysiology*, 123, 2180-2190.
27. Oh, Y.*, **Schweighofer, N.** (2019). Minimizing precision-weighted sensory prediction errors via memory formation and switching in motor adaptation. *Journal of Neuroscience*, 39(46), 9237-9250.
28. Kim, A., **Schweighofer, N.**, Finley, J.M. (2019). Locomotor skill acquisition in virtual reality shows sustained transfer to the real world. *Journal of Neuroengineering and Rehabilitation*, 16(1), 1-10.
29. Winstein, C., Kim, B., Kim, S. *, Martinez, C., & **Schweighofer, N.** (2019). Dosage matters: A phase IIb randomized controlled trial of motor therapy in the chronic phase after stroke. *Stroke*, 50(7), 1831-1837.
30. Lefebvre, S., Jann, K., Schmiesing, A., Ito, K., Jog, M., Qiao, Y., Cabeen, R., Shi, Y., **Schweighofer, N.**, Wang, D.J., Liew, S.L. (2019). Differences in high-definition transcranial direct current stimulation over the motor hotspot versus the premotor cortex on motor network excitability. *Scientific Reports*, 9(1), 17605.

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32. Kim, S.*, Park, H.*, Winstein, C., & **Schweighofer, N.** (2018). Measuring habitual arm use post-stroke with a bilateral time-constrained reaching task *Frontiers in Neurology*, 9, 883.
33. **Schweighofer, N.**, Wang, C.*, Mottet, D.; Laffont, I., Bakhti, K., Reinkensmeyer, D., & Remy-Neris, O. (2018). Dissociating motor learning from recovery in exoskeleton training post-stroke. *Journal of NeuroEngineering and Rehabilitation*, 15(1), 89.
34. Kim, B., Fisher, B.E., **Schweighofer, N.**, Leahy, R.M., Haldar, J.P., Choi, S., Kay, D.B., Gordon, J., & Winstein, C.J. (2018). A comparison of seven different DTI-derived estimates of corticospinal tract structural characteristics in chronic stroke survivors. *Journal of Neuroscience Methods*, 304, 66-75.
35. Park H.*, & **Schweighofer, N.** (2017). Nonlinear mixed-effects model reveals a distinction between learning and performance in intensive reach training post-stroke. *Journal of NeuroEngineering and Rehabilitation*, 14(1), 21.
36. Bakhti, K.K.A., Mottet, D., **Schweighofer, N.**, Froger, J., & Laffont, I. (2017). Proximal arm non-use when reaching after a stroke. *Neuroscience Letters*, 657, 91-96.
37. Lang, E.J., Apps, R., Bengtsson, F., Cerminara, N.L., De Zeeuw, C.I., Ebner, T.J., Heck, D.H., Jaeger, D., Jörntell, H., Kawato, M., Otis, T.S., Ozyildirim, O., Popa, L.S., Reeves, A.M., **Schweighofer, N.**, Sugihara, I., & Xiao, J. (2017). The role of the olivocerebellar pathway in motor learning and motor control: A consensus paper. *Cerebellum*, 16(1), 230-252.
38. Reinkensmeyer, D.J., Burdet, E., Casadio, M., Krakauer, J.W., Kwakkel, G., Lang, C.E., Swinnen, S., Ward, N., & **Schweighofer, N.** (2016). Computational neurorehabilitation: Modeling plasticity and learning to predict recovery. *Journal of Neuroengineering and Rehabilitation*, 13(1), 42.
39. Wang, C.*, Xiao, Y*, Burdet, E., Gordon, J., & **Schweighofer, N.** (2016). The duration of reaching movement is longer than predicted by minimum variance. *Journal of Neurophysiology*, 116(5), 2342-2345. - Recommended by F1000
40. Lee, J.Y.*, Oh, Y.*, Scheidt, R., & **Schweighofer, N.** (2016). Optimal schedules in multitask motor learning. *Neural Computation*, 28(4), 667-685.
41. Park, H.*, Kim, S.*, Winstein, C., Gordon, J., & **Schweighofer, N.** (2016). Short-duration and intensive training improves long-term reaching performance in individuals with chronic stroke. *Neural Rehabilitation and Repair*, 30(6), 551-561.
42. Kim, S.S.*, Ogawa, K., Lv, J., **Schweighofer, N.#**, & Imamizu, H.#. (2015). Neural substrates related to motor memory with multiple timescales in motor adaptation. *PLoS Biology*, 13(12), e1002312. (NS: corresponding author)
43. Kim S.S*, Oh, Y.*, **Schweighofer, N.** (2015). Between-trial forgetting due to interference and time in motor adaptation. *PLoS ONE*, 10(11), e0142963.
44. Gueugneau, N., **Schweighofer, N.**, & Papaxanthis, C. (2015). Daily update of motor predictions by physical activity. *Scientific Reports*, 5, 17933.

45. **Schweighofer, N.**, Xiao, Y.* , Kim, S., Yoshioka, T., Gordon, J., & Osu, R. (2015). Effort, success, and non-use determine arm choice. *Journal of Neurophysiology*, 114(1), 551-9.
46. Bains, A.* , & **Schweighofer, N.** (2014). Time-sensitive reorganization of the somatosensory cortex post-stroke depends on interaction between Hebbian plasticity and homeoplasticity: A simulation study. *Journal of Neurophysiology*, 112(12), 3240-3250.
47. Sargent, B., **Schweighofer, N.**, Kubo, M., **Fetters, L.** (2014). Infant exploratory learning: Influence on leg joint coordination. *PLoS ONE*, 9(3), e91500.
48. **Laffont, I.**, Bakhti, K., Coroian, F., van Dokkum, L., Mottet, D., **Schweighofer, N.**, & Froger, J. (2014). Innovative technologies applied to sensorimotor rehabilitation after stroke. *Annals of Physical and Rehabilitation Medicine*, 57(8), 543-551.
49. **Schweighofer, N.**, Lang, E. & **Kawato, M.** (2013). Role of the olivo-cerebellar complex in motor learning and control. *Frontiers in Neural Circuits*, 7, 94.
50. Onizuka, M., Hoang, H., **Kawato, M.**, **Tokuka, I.T.**, **Schweighofer, N.**, Katori, Y., Aihara, K., Lang, E.J., & Toyama, K. (2013). Solution to the inverse problem of estimating gap-junctional and inhibitory conductance in inferior olive neurons from spike trains by network model simulation. *Neural Networks*, 47, 51-63.
51. Han, C.E.* , Kim, S.J., Chen, S., Lai, L.* , Lee, J., Osu, R., Lee, J.Y.* , Winstein, C., & **Schweighofer, N.** (2013). Quantifying arm non-use in individuals post-stroke. *Neural Repair and Neurorehabilitation*, 27(5), 439-47.
52. Tokuda I.T., Hoang, H., **Schweighofer, N.**, & **Kawato, M.** (2013). Adaptive coupling of inferior olive neurons in cerebellar learning. *Neural Networks*, 47, 42-50.
53. Chen, S., Lewthwaite, R., **Schweighofer, N.**, & **Winstein, C.** (2013). Discriminant validity of a new measure of self-efficacy for reaching movements after stroke-induced hemiparesis. *Journal of Hand Therapy*, 26(2), 116-22.
54. Hidaka, Y*., Han, C.E.* , Wolf, S., Winstein, C.J., & **Schweighofer, N.** (2012). Use it and improve it or lose it: Interactions between arm function and use in humans post-stroke. *PLoS Computational Biology*, 8(2), e1002343.
55. Demoto, Y., Okada, G., Okamoto, Y., Kunisato, Y., Aoyama, S., Onoda, K., Munakata, A., Nomura, M., Tanaka, S.C., **Schweighofer, N.** & **Doya, K.** (2012). Neural and personality correlates of individual differences related to the effects of acute tryptophan depletion on future reward evaluation. *Neuropsychobiology*, 65(2), 55-64.
56. **Schweighofer, N.**, Choi, Y.* , Winstein, C., & Gordon, J. (2012). Task-oriented rehabilitation robotics. *American Journal of Physical Medicine & Rehabilitation*, 91(11 Suppl 3), S270-S279.
57. Kawato, M., Kuroda, S., & **Schweighofer, N.** (2011). Cerebellar supervised learning revisited: Bioinformatics modeling and degrees-of-freedom control. *Current Opinion in Neurobiology*, 21(5),791-800.
58. **Frey, S.**, Fogassi, L., Grafton, S., Picard, N., Rothwell, J., **Schweighofer, N.**, Corbetta, M., Fitzpatrick, S. (2011). Neurological principles and rehabilitation of action disorders: Computation, anatomy and physiology (CAP) model. *Neurorehabilitation and Neural Repair*, 25(5 Suppl), 6S-20S.

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60. **Schweighofer, N.#**, Lee, J.Y.*#, Goh, H.T.* , Cho,i Y.G.* , Kim, S.S.* , Stewart, J., Lewthwaite, R. & Winstein, C. (2011). Mechanisms of the contextual interference effect in individuals post-stroke. *Journal of Neurophysiology*, 106(5), 2632-2641.
61. Choi, Y.G* , Gordon, J., Park, H.* , & **Schweighofer, N.** (2011). Feasibility of the adaptive and automatic presentation of tasks (ADAPT) system for rehabilitation of upper extremity function post-stroke. *Journal of NeuroEngineering and Rehabilitation*, 8(1), 42.
62. Onoda, K., Okamoto, Y., Kunisato, Y., Aoyama, S., Shishida, K., Okada, G., Tanaka, S., **Schweighofer, N.**, Yamaguchi, S., Doya, K., & Yamawaki, S. (2011). Inter-individual discount factor differences in reward prediction are topographically associated with caudate activation. *Experimental Brain Research*, 212(4), 593-601.
63. Qi, F.* , Wu, A., & **Schweighofer, N.** (2011). Fast estimation of transcranial magnetic stimulation motor threshold. *Brain Stimulation*, 4(1), 50-57.
64. Qi, F.* , & **Schweighofer, N.** (2011). Commentary: Including prior knowledge for accurate and fast MT estimation. *Brain Stimulation*, 4(1), 60-61.
65. Tokuda, I., Han, C.E.* , Aihara, K., Kawato, M., & **Schweighofer, N.** (2010). The role of chaotic resonance in cerebellar learning. *Neural Networks*, 23(7), 836-842.
66. Gentili, R.# , Han C.E.*# , **Schweighofer, N.#**, & Papaxanthis, C.#. (2010). Motor learning without doing: trial-by-trial improvement in motor performance during mental training. *Journal of Neurophysiology*, 104(2), 774-783.
67. Callan, D.E. & **Schweighofer, N.** (2010). Neural correlates of the spacing effect in explicit verbal semantic encoding support the deficient-processing theory. *Human Brain Mapping*, 31(4), 645-659.
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69. **Schweighofer, N.**, Han, C.* , Wolf, S., Arbib, M.A., & Winstein, C. (2009). A functional threshold for long-term use of hand and arm function can be determined: Predictions from a computational model and supporting data from the Extremity Constraint-Induced Therapy Evaluation (EXCITE) trial. *Physical Therapy*, 89(12), 1327-1336.
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71. Lee, J.Y.* , **Schweighofer, N.** (2009). Dual adaptation supports a parallel architecture of motor memory. *Journal of Neuroscience*, 29(33),10396-10404.
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79. **Schweighofer, N.**, Shishida, K., Han, C.E.*, Tanaka, S., Okamoto, Y., Yamawaki, S., & Doya, K. (2006). Humans can adopt optimal discounting strategy under real-time constraints. *PLoS Computational Biology*, 2(11), 1349-1356.
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BOOK CHAPTERS

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