BIOGRAPHICAL SKETCH

NAME: Carolee J. Winstein

eRA COMMONS USER NAME (credential, e.g., agency login): winstein

POSITION TITLE: Professor, Director Motor Behavior & Neurorehabilitation Laboratory; Biokinesiology and Physical Therapy; USC

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of California, Los Angeles, CA	B.A.	06/72	Kinesiology/Psychology
University of California, San Francisco, CA	B.S./Certif. Phys. Ther.	08/73	Physical Therapy
Univ. of Southern Calif., Los Angeles, CA	M.S.	05/84	Physical Therapy
University of California, Los Angeles, CA	Ph.D.	01/88	Kinesiology
Waisman Ctr., University of WI, Madison, WI	Postdoctoral	12/89	Behavioral Neuroscience

A. Personal Statement

I am Professor of Biokinesiology and Physical Therapy and have been an active member in the interdisciplinary Neuroscience Graduate Program at USC since 1998. In addition, I hold a joint appointment in the Department of Neurology, Keck School of Medicine. I direct an interdisciplinary and collaborative research program focused on understanding rehabilitation outcomes at the systems/person level and promoting optimal recovery of goal-directed movement behaviors that emerge from a dynamic brain-behavior system in brain-damaged conditions. My research program from its inception in the early 1990's until now has concentrated on the development of non-pharmacologic rehabilitation interventions motivated and informed by brain and behavioral science to enhance or even accelerate recovery in persons who have damage to the CNS. I have conceived and led small scale mechanistic-based research projects, medium size phase I and II clinical trials and large scale, Phase III pragmatic trials, all in rehabilitation medicine. My research program has been funded variously through NIH, NIDRR (now NIDILRR) and the Foundation for Physical Therapy consistently over the past three decades. From 2015-2019, I served as a standing member of the NIH Musculoskeletal Rehabilitation Sciences study section. I serve on the editorial board of the journal *Neurorehabilitation and Neural Repair* and served as president for the American Society of Neurorehabilitation from 2016-2018. I have over 30 years of multidisciplinary collaborative research experience with a focus on neurorehabilitation, rehabilitation engineering and clinical trials; I have (co)-authored more than 100 research papers including chapters, perspectives, proceedings and commentaries with an overall h-index of 64, one indication of the impact of my research on the neurorehabilitation community.

Along with my research program, I am committed to mentoring junior scientists in research and career development. Mentoring is an essential part of an individual's development. I believe that effective mentoring entails a collaboration consisting of structured training and education tailored specifically to the individual. During my career, I've had the honor of mentoring a fantastic group of predoctoral students, postdoctoral scholars, and junior faculty with diverse backgrounds in engineering, neuroscience, and rehabilitation through both individual and institutional training mechanisms including the NIH F31, K01, K12, K99/R00 and CTSI KL2 programs. Since 2017, I have participated as a faculty mentor for the NIH funded Training in Grantsmanship in Rehabilitation Research (TIGRR) program.

B. Positions and Honors

Positions and Employment

1973 - 1976 Staff Physical Therapist, Rancho Los Amigos Medical Center (RLAMC), Downey, CA

1978 - 1982	Physical Therapy Clinical Instructor, Adult Neurology, Rancho Los Amigos Medical Center
1985 - 1987	Research Associate, Motor Control Lab, Dept. of Kinesiology, Univ. of California, Los Angeles
1988 - 1989	Postdoctoral Research Associate, Speech and Motor Control Labs, Waisman Center on Mental Retardation and Human Development, University of Wisconsin, Madison, WI
1990 - 1996	Assistant Professor, Dept. of Biokinesiology and Physical Therapy (BKN&PT), University Southern California (USC), Los Angeles, CA
1990 - 2003	Director, Motor Behavior Laboratory
1996 - 2004	Associate Professor, BKN&PT, USC, Los Angeles, CA
1998 - present	Member, Neuroscience Graduate Program, USC, Los Angeles, CA
2000 - present	Associate Professor, Dept of Neurology, Keck School of Medicine, USC, Los Angeles, CA
2003 - present	Director, Motor Behavior and Neurorehabilitation Laboratory, USC
2005 - present	Professor, Biokinesiology and Physical Therapy, USC, Los Angeles, CA
2007 - 2010	Director of Research, Division of Biokinesiology and Physical Therapy
2007 - 2009	Member-at-Large, Executive Board of the Academic Senate, USC
2009 - 2010	Co-Chair University Research Committee, USC
2013 - 2014	Member, University Committee on Appointments, Promotion & Tenure
2015 – 2017	Member, University Committee on Appointments, Promotion & Tenure

Other Experience and Professional Memberships

1972 - present	Member, American Physical Therapy Association
1983 - present	Member, North American Society for the Psychology of Sport and Physical Activity
1985 - present	Member, Society for Neuroscience
1990 - present	Member, American Psychological Association
1997 - 2003	Editorial Board Member, Physical Therapy.
2002 - 2012	Advisory Board, NIDRR Rehab Engineering and Research Center, MARS, RIC, Chicago, IL
2005 - 2009	National Advisory Board on Medical Rehabilitation Research (NABMRR)
2012	Elected to the Executive Committee of the American Society of Neurorehabilitation
2012 - 2014	Secretary/Treasurer, American Society of Neurorehabilitation
2014 - 2016	Vice President, American Society of Neurorehabilitation
2016 - 2018	President, American Society of Neurorehabilitation (ASNR)
2018 – 2021	Past President, ASNR Education Foundation President
2014 - 2017	Appointed Sir Walter Murdoch Distinguished Collaborator, School of Psychology and Exercise Science, Murdoch University, Perth, Western Australia
2015 - 2019	Member, NIH Musculoskeletal Rehabilitation study section
2020 - 2022	Member, Nominating Committee of World Federation for NeuroRehabilitation (WFNR)

Honors

1998	Research Award, Neurology Section, APTA
2003	Elected Catherine Worthingham Fellow, FAPTA
2006	Marion Williams award for Research in Physical Therapy, APTA
2006	11th John Maley Lecturer, “Patient-Centered Practice”, Selected by BOD, APTA
2008	Irma Ruebling Distinguished Speaker, The Saint Louis University, Department of PT
2009	40th Mary McMillan Lecture Award, APTA
2012	Anne Shumway-Cook Lecture Award: Translating Neurorehabilitation Research into Practice, APTA
2012	Inaugural Robert L. Lamb Distinguished Lecture, “Challenges to Translating Neurorehabilitation Research into Practice”, Virginia Commonwealth U., Richmond, VA, Department of PT
2014	Kenneth Viste, Jr., MD Memorial Lecture Award, “Translating the Science into Neurorehabilitation Practice”, American Society of Neurorehabilitation
2016	Elected as a fellow of the American Heart Association, FAHA
2016	Annual University of Nevada, Las Vegas, Department of Physical Therapy Distinguished Lecturer for 2016
2018	Elected as a fellow of the National Academy of Kinesiology, FNAK
2018	Elected as a fellow of the American Society of Neurorehabilitation (ASNR), FASNR

I was invited to contribute to the Ask an Expert: BrainFacts.org, a public information initiative of the Kavli Foundation, Gatsby, and the Society for Neuroscience (published online 2014). http://www.brainfacts.org/about-neuroscience/ask-an-expert/articles/2014/does-practice-make-perfect.

C. Contribution to Science

I run an interdisciplinary research program focused on understanding control, rehabilitation and recovery of goal-directed movements that emerge from a dynamic brain-behavior system in brain-damaged conditions. My contributions to science can be divided into three major areas: 1) Neuroimaging and rehabilitation, 2) Clinical trials/ mechanistic-based projects in rehabilitation, and 3) Rehabilitation engineering research.

1) Neuroimaging and Rehabilitation.

Current Projects: 1) To determine if resting-state electroencephalography (rs-EEG) can be used to classify motor learning capability in non-disabled individuals (Hooyman, manuscript in preparation). 2) To determine feasibility that intracortical paired associative stimulation (c-PAS) can be used to increase resting-state functional connectivity (Hooyman, manuscript in revision). 3) To determine if corticospinal tract microstructure can be used to predict motor improvement in distal arm function in chronic stroke survivors (Bokkyu Kim, manuscript in press), 4) To determine the impact of intrinsic motivation on functional brain activity during motor learning (Dorsa Beroukhim-Kay, manuscript in preparation). 5) Characterizing hemisphere-specific deficits in bimanual motor control after stroke (Varghese, manuscripts in preparation). 6) Retrospective analysis of task-specific effects on brain activity associated with dexterity and power grasp (Winstein, Varghese, Demers—a retrospective data analysis in preparation), 7) Non-lesioned subcortical brain volumes are associated with post-stroke sensorimotor behavior across 28 cohorts worldwide: An ENIGMA Stroke Recovery Analysis (Liew + 66 co-authors, submitted, March, 2020).

Publications:

Kim B, Schweighofer N, Haldar J, Leahy R, **Winstein C**. (accepted, June 2, 2021). Corticospinal Track Microstructure Predicts Arm Motor Improvements in Chronic Stroke. Neurorehabilitation and Neural Repair.

Kim B, Fisher BE, Schweighofer N, Leahy RM, Haldar JP, Choi S, Kay DB, Gordon J, **Winstein CJ**. (2018). A comparison of seven different DTI-derived estimates of corticospinal tract structural characteristics in chronic stroke survivors. J. Neurosci Methods. Apr 21;304: 66-75. doi: 10.1016/j.jneumeth.2018.04.010. [Epub ahead of print] PMID: 29684462

Edwardson M, Wang X, Liu B, Ding L, Lane CJ, Park C, Nelsen MA, Jones TA, Wolf SL, **Winstein CJ**, Dromerick AW. (2017). Stroke lesions in a large upper limb rehabilitation trial cohort rarely match lesions in common preclinical models. Neurorehabilitation Neural Repair. ePub Jan1, 2017, DOI: https://doi.org/10.1177/1545968316688799

Kim B, **Winstein C**. (2017). Can neurological biomarkers of brain impairment be used to predict poststroke motor recovery? A systematic review. Neurorehabil Neural Repair, Jan;31 (1):3-24. Review. PMID: 27503908

2) Clinical Trials/Projects in Rehabilitation.

Current Projects: 1) To determine the best predictors of arm nonuse in chronic stroke survivors—This is a collaboration with the Buxbaum lab (Buxbaum, paper published in NNR, 2020); 2) Predicting Ipsilesional Motor Deficits in Stroke with Dynamic Dominance (phase II clinical trial in collaboration with Sainburg at Penn State); 3) Langarian Mindfulness training after stroke (Collaboration with Marika Demers, Deborah Philips, Francesco Pagnini, and Ellen Langer). 4) Effort, success, and side of lesion determine arm choice in chronic stroke survivors with mild-to-moderate impairment (Kim S, Han CE, Kim B, Winstein CJ, Schweighofer N (revised manuscript submitted), 5) Behavioral and kinematic determinants of limb choice during goal-directed stepping actions (Charalambous CC, Espinoza-Wade ER, Cesar GM, Gerger M, Lai Y-H, Winstein CJ (manuscript in preparation).

Publications:

Varghese R, **Winstein CJ**. (2020). Relationship between motor capacity of the contralesional and ipsilesional hand depends on the side of stroke in chronic stroke survivors with mild-to moderate impairment. Frontiers in Neurology, 10:1340. https://doi.org/10.3389/fneur.2019.01340

Geed S, Nelsen MA, Lane CJ, **Winstein CJ**, Wolf SL, Dromerick AW.(2020) Rasch Analysis of UE Fugl-Meyer in the ICARE stroke trial: Effects of rescaling on clinical assessment and measurement of recovering motor control. Arch Phys Med Rehab. Sep 28;. doi: 10.1016/j.apmr.2020.08.019. [Epub ahead of print] PubMed PMID: 32991872; NIHMSID:NIHMS1634769.

Buxbaum LJ, Varghese R, Stoll H, **Winstein CJ** (2020). Predictors of Arm Nonuse in Chronic Stroke: A Preliminary Investigation. Neurorehabil Neural Repair. 34(6):512-522. [Preprint]

Winstein CJ, 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. Jun 5:STROKEAHA118023603. doi: 10.1161/STROKEAHA.118.023603. [Epub ahead of print]

3) Rehabilitation Engineering Research:

Current Projects: 1) MiGo: Wearable sensors combine actionable data with a behavioral intervention to improve function after stroke (STTR pending, collaboration with Flint Rehab, Lauri Bishop, and Marika Demers); 2) mHealth technologies used to capture walking and arm use behavior in adult stroke survivors: a scoping review beyond measurement properties. (Camila Pasin-Toriani led this project, manuscript in press); 3) Impact of social-cognitive factors on paretic hand use after stroke (Yi-An Chen et al., manuscript in preparation)

Publications:

Torriani-Pasin C, Demers M, Polese J, Bishop L, Wade E, Hempel S, **Winstein C**. (in press). mHealth Techologies used to Capture Walking and Arm Use Behavior in Adult Stroke Survivors: A Scoping Review Beyond Measurement Properties. Disability and Rehabilitation. DOI: 10.1080/09638288.2021.1953623. https://doi.org/10.1080/09638288.2021.1953623

Chen Y-A, Demers M, Lewthwaite R, Schweighofer N, Monterosso J.R., Fisher B.E., **Winstein C**. (2021). A Novel combination of accelerometry and ecological momentary assessment for post-stroke paretic arm/hand use:Feasibility and Validity. J.Clin.Med. 10, 1328. https://doi.org/10.3390/jcm10061328

Demers M, **Winstein CJ.** (2020). A perspective on the use of ecological momentary assessment and intervention to promote stroke recovery and rehabilitation. Topics in Stroke Rehabilitation, https://doi.org/10.1080/10749357.2020.1856557.

Chanthaphun S, Heck SL, **Winstein CJ**, Baker L. (2019). Development of a training paradigm for voluntary control of the peri-auricular muscles: A feasibility study. J Neuroeng Rehabil. 16:75. https://doi.org/10.1186/s12984-019-0540-x

For a full list of my publications see:
http://www.ncbi.nlm.nih.gov/sites/myncbi/1d7ZrQLMyekh/bibliography/47150310/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

1R01AG046928 (Pa PI**, Winstein Co-I)**	09/15/15 – 04/30/21	0.43 calendar
NIH/NIA	$336,450 NCE	

Effects of Physical Activity on Brain Function and Network Connectivity in Mild Cognitive Impairment.

R56NS100528-01 (Schweighofer PI**, Winstein Co-I)**	09/28/17 – 07/31/21	0.50 calendar
NIH/NINDS	$350,000 NCE	

Optimizing Sensorimotor Training Post-Stroke

The recovery models and scheduling methods developed in this proposal will provide the basis for future clinical software that suggests timing, dosage, and content of therapy from early clinical data, kinematic performance, and routine scans. Such an approach will transform neurorehabilitation programs because the clinician, patient, and insurance company will be able to determine effective treatments while reducing costs.

R01HD059783-06A1 (Sainburg, Winstein, Multiple PI)	09/25/18 – 05/31/23	1.20 calendar
NIH/NICHD	$561,059	

Predicting Ipsilesional Motor Deficits in Stroke with Dynamic Dominance

This study will provide rigorous evidence for a therapy that can improve functional independence in a patient population for which there are currently no interventions with proven efficacy

Research Grant (Sargent)	01/01/19 – 11/30/21	0.30 calendar
Academy of Pediatric Physical Therapy	$29,831 NCE	

Understanding selective motor control of infants at high risk for cerebral palsy

To develop effective interventions to optimize selective leg joint control and walking outcomes of infants at HRCP.

Pediatric Research Grant (Sargent)	01/01/19 – 12/31/21	0.30 calendar

Foundation for Physical Therapy 010918-00001 $40,000 NCE
Quantifying Selective Motor Control of Infants at High Risk for Cerebral Palsy
To gain an understanding of the amount of selective control of infants with cerebral palsy, including the potential for selective control to improve with early intervention techniques.

R21 NS113613-01 (Valero-Cuevas PI; Winstein, Co-I) 09/01/19 – 08/31/21 0.60 calendar
NIH/NINDS $453,750
Functional reorganization of reticulospinal drive in hemiparetic stroke
Reticulospinal pathways are likely key contributors to bilateral disability and recovery that remain understudied. This R21 project explores alpha-band coherence as a valid neurophysiological assay to characterize mechanisms of motor impairment at the level of the reticulospinal tract—thereby opening up novel assessment and rehabilitation approaches.

F31HD098796 (Winstein, Varghese) 04/01/19 – 07/31/21 0.00 calendar
NIH/NICHD $74,632 NCE Mentor Only
Characterizing Hemisphere-Specific Deficits in Bimanual Motor Control After Stroke
To understand the specific role of each cerebral hemisphere in the control of bilateral movements in stroke survivors.

R01 NS115845-01 (Liew SL, PI; **Winstein**, Co-I) 04/01/20 – 03/31/25 0.36 calendar
NIH/NINDS/NCMRR $3,875,664
Effects of global brain health on sensorimotor recovery after stroke
This research will uncover new neurobiological influences on how people regain motor and sensory function after a stroke. Specifically, this study will examine the role of global brain health measures, which represent deterioration of systems across the whole brain, in stroke recovery by analyzing both:(a) a large existing database of neuroimaging and behavioral data on stroke patients and (b) new data that will be collected in the first 3 months following stroke, when the majority of stroke recovery is thought to occur. This project will create important new knowledge on the relationships of global brain health to post-stroke brain injury, brain repair, and sensorimotor recovery, which can be used to identify novel therapeutic targets to improve stroke recovery.

1R21NS120274-01A1(Schweighofer, PI; **Winstein**, Co-I) 09/01/20 – 08/31/22 0.40 calendar
NIH/NICHD $422,417
Fast training promotes recovery of arm movements post-stroke via cerebellar-mediated anticipatory feedforward control. Our general hypothesis is that intensive “speed training”, that is, a type of training that emphasizes many repetitions of fast arm movements in a skill learning task, is effective in improving the recovery of arm movements in individuals with mild to moderate motor impairment post-stroke. Importantly, such training promotes re-acquisition of feedforward control that is primarily mediated through cerebellar processes. The proposed work will lead to the development of a novel effective and efficient training method that can be prescribed to stroke survivors with relatively spared cortico-cerebellar tracts.

Foundation for Physical Therapy Research (Leech) 01/01/2021-12/31/2022 0.24 calendar
Magistro Family Foundation Research Grant $100,000
A novel, comprehensive approach to gait rehabilitation post-stroke
The primary goal of the MFFRG is to determine the feasibility and optimal parameters of a novel, comprehensive approach to gait training in individuals with chronic stroke.

Recently Completed

R01 HD065438 (Schweighofer/**Winstein**, Multiple PI) 01/01/11 – 12/31/17
NIH/NICHD
Optimizing the Dose of Rehabilitation After Stroke

U01 NS056256 (**Winstein**; Wolf; Dromerick; Multiple PI) 08/01/08 - 07/31/16
NIH/NINDS/NICHD
Interdisciplinary Comprehensive Arm Rehab Evaluation (ICARE) Stroke Initiative
The primary objective of ICARE (Interdisciplinary Comprehensive Arm Rehabilitation Evaluation) is to improve outpatient therapy for arm paresis after stroke.