



RESEARCH IN REVIEW

Dear Members,

We are pleased to bring to you this issue of **Research in Review** highlighting research articles relevant to neurologic physical therapy over the past months. We hope that you enjoy perusing through the collection of articles we selected for this edition.

We select recently published articles that are available through a link on PubMed or directly through the journal website in the Research in Review citation. We are now also including relevant articles from APTA journals. We appreciate any suggestions or comments you may have to help improve the newsletter.

The Research in Review is a newsletter run by ANPT members, for other ANPT members. We therefore welcome your suggestions of recently published manuscripts for inclusion in the Research in Review. Those who are interested in assisting in this endeavor are welcome to contact [Dr. Antoinette Domingo](#).

Please follow [@APTANeuroPT](#) on Twitter for [#ResearchThursday](#) to learn more about our colleagues' research!

Finally, Dr. Kesar is stepping down as co-chair of Research in Review, and would like to send a warm farewell to all our readers. We greatly appreciate the leadership she has provided and many years of service for the Research in Review.

Sincerely,

Research in Review Co-Chairs

Trisha Kesar, PT, PhD
Associate Professor
Division of Physical Therapy
Department of Rehabilitation Medicine
Emory University School of Medicine

and

Antoinette Domingo, PT, PhD
Associate Professor
Doctor of Physical Therapy Program
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website

RESEARCH TOPICS

- Feature Article
- Motor Control
- Rehabilitation
- Clinical Neurophysiology
- Technologies



Full text articles in [JNPT](#) are **free** for members

FEATURE ARTICLES

Acute High-Intensity Interval Exercise Modulates Corticospinal Excitability in Older Adults.
Neva JL, Greeley B, Chau B, Ferris JK, Jones CB, Denyer R, Hayward KS, Campbell KL, Boyd LA.

Med Sci Sports Exerc. 2022 Apr 1;54(4):673-682. doi: 10.1249/MSS.0000000000002839.
PMID: 34939609

Movement System Diagnoses for Balance Dysfunction: Recommendations From the Academy of Neurologic Physical Therapy's Movement System Task Force.

Gill-Body KM, Hedman LD, Plummer L, Wolf L, Hanke T, Quinn L, Riley N, Kaufman R, Verma A, Quiben M, Scheets P.

Phys Ther. 2021 Sep 1;101(9):pzab153. doi: 10.1093/ptj/pzab153.
PMID: 34160028

Vestibular Rehabilitation for Peripheral Vestibular Hypofunction: An Updated Clinical Practice Guideline From the Academy of Neurologic Physical Therapy of the American Physical Therapy Association.

Hall CD, Herdman SJ, Whitney SL, Anson ER, Carender WJ, Hoppes CW, Cass SP, Christy JB, Cohen HS, Fife TD, Furman JM, Shepard NT, Clendaniel RA, Dishman JD, Goebel JA, Meldrum D, Ryan C, Wallace RL, Woodward NJ.

J Neurol Phys Ther. 2022 Apr 1;46(2):118-177. doi: 10.1097/NPT.0000000000000382.
PMID: 34864777 Free PMC article.

MOTOR CONTROL

Individuals with Chronic Mild-to-Moderate Traumatic Brain Injury Exhibit Decreased Neuromuscular Complexity During Gait.

Acuña SA, Tyler ME, Thelen DG.

Neurorehabil Neural Repair. 2022 Apr;36(4-5):317-327. doi: 10.1177/15459683221081064. Epub 2022 Mar 23.

PMID: 35321610 Free PMC article.

Investigation of neural and biomechanical impairments leading to pathological toe and heel gaits using neuromusculoskeletal modelling.

Bruel A, Ghorbel SB, Russo AD, Stanev D, Armand S, Courtine G, Ijspeert A.

J Physiol. 2022 Apr 20. doi: 10.1113/JP282609. Online ahead of print.

PMID: 35442531

Corticospinal Tract Lesion Load Originating From Both Ventral Premotor and Primary Motor Cortices Are Associated With Post-stroke Motor Severity.

Ito KL, Kim B, Liu J, Soekadar SR, Winstein C, Yu C, Cramer SC, Schweighofer N, Liew SL.

Neurorehabil Neural Repair. 2022 Mar;36(3):179-182. doi: 10.1177/15459683211068441. Epub 2021 Dec 24.
PMID: 34951947 Free PMC article.

Neural Control of Stopping and Stabilizing the Arm.

Jayasinghe SAL, Scheidt RA, Sainburg RL.
Front Integr Neurosci. 2022 Feb 21;16:835852. doi: 10.3389/fnint.2022.835852.
eCollection 2022.
PMID: 35264934 Free PMC article. Review.

Balance performance analysis after the COVID-19 quarantine in children aged between 8 and 12 years old: Longitudinal study.

Martínez-Córcoles V, Nieto-Gil P, Ramos-Petersen L, Ferrer-Torregrosa J.
Gait Posture. 2022 Mar 27;94:203-209. doi: 10.1016/j.gaitpost.2022.03.019. Online ahead of print.
PMID: 35366430 Free PMC article.

Mind your step: Target walking task reveals gait disturbance in individuals with incomplete spinal cord injury.

Mohammadzada F, Zipser CM, Easthope CA, Halliday DM, Conway BA, Curt A, Schubert M.
J Neuroeng Rehabil. 2022 Mar 25;19(1):36. doi: 10.1186/s12984-022-01013-7.
PMID: 35337335 Free PMC article.

The Effects of Aging and Time of Day on Inhibitory Control: An Event-Related Potential Study.

Rabi R, Chow R, Paracha S, Hasher L, Gardner S, Anderson ND, Alain C.
Front Aging Neurosci. 2022 Mar 11;14:821043. doi: 10.3389/fnagi.2022.821043.
eCollection 2022.
PMID: 35360220 Free PMC article.

Balance control in unstable sitting in individuals with an acute episode of low back pain.

van den Hoorn W, Meroni R, Klyne DM, Alshehri MA, Hodges PW.
Gait Posture. 2022 Mar 24;95:15-21. doi: 10.1016/j.gaitpost.2022.03.014. Online ahead of print.
PMID: 35398705

History of Mild Traumatic Brain Injury Affects Static Balance under Complex Multisensory Manipulations.

Wright WG, Handy JD, Haskell A, Servatius L, Servatius RJ.
J Neurotrauma. 2022 Mar 31. doi: 10.1089/neu.2020.7600. Online ahead of print.
PMID: 35229645

REHABILITATION

Acute intermittent hypercapnic-hypoxia elicits central neural respiratory motor plasticity in humans.

Welch JF, Nair J, Argento PJ, Mitchell GS, Fox EJ.
J Physiol. 2022 Mar 29. doi: 10.1113/JP282822. Online ahead of print.
PMID: 35348218

Blended-Learning Pain Neuroscience Education and Exercise in High School Students With Chronic Neck Pain: A Randomized Controlled Trial.

Andias R, Silva AG, Sa-Couto P.
Phys Ther. 2022 Apr 28:pzac048. doi: 10.1093/ptj/pzac048. Online ahead of print.
PMID: 35485186

Effects of high-intensity resistance training on strength, mobility, balance, and fatigue in individuals with multiple sclerosis: a randomized controlled trial.

Hayes HA, Gappmaier E, LaStayo PC.
J Neurol Phys Ther. 2011 Mar;35(1):2-10. doi: 10.1097/NPT.0b013e31820b5a9d.
PMID: 21475078 Clinical Trial.

A Framework for Movement Analysis of Tasks: Recommendations From the Academy of

Neurologic Physical Therapy's Movement System Task Force.

Quinn L, Riley N, Tyrell CM, Judd DL, Gill-Body KM, Hedman LD, Packel A, Brown DA, Nabar N, Scheets P.

Phys Ther. 2021 Sep 1;101(9):pzab154. doi: 10.1093/ptj/pzab154.

PMID: 34160044

Health Promotion and Wellness in Neurologic Physical Therapy: Strategies to Advance Practice.

Rafferty MR, Held Bradford EC, Fritz S, Hutchinson KJ, Miczak K, Resnick A, Billinger SA.

J Neurol Phys Ther. 2022 Apr 1;46(2):103-117. doi: 10.1097/NPT.0000000000000376.

PMID: 34507339

Mobility and Depressive Symptoms in Persons With Mild Cognitive Impairment and Alzheimer Dementia.

Flugon SJ, Jøranson N, Tangen GG.

J Neurol Phys Ther. 2022 Jan 1;46(1):11-17. doi: 10.1097/NPT.0000000000000378.

PMID: 3450734

Fluid Cognition Relates to Locomotor Switching in Neurotypical Adults, Not Individuals After Stroke.

French MA, Cohen ML, Pohlig RT, Reisman DS.

J Neurol Phys Ther. 2022 Jan 1;46(1):3-10. doi: 10.1097/NPT.0000000000000373.

PMID: 34507340

Quality of life assessment after total knee arthroplasty in patients with Parkinson's disease.

Zong Y, Hao C, Zhang Y, Wu S.

BMC Musculoskelet Disord. 2022 Mar 9;23(1):230. doi: 10.1186/s12891-022-05176-1.

PMID: 35264128 Free PMC article.

Tailored Sitting Tai Chi Program for Subacute Stroke Survivors: A Randomized Controlled Trial.

Zhao J, Chau JPC, Chan AWK, Meng Q, Choi KC, Xiang X, Zhao Y, He R, Li Q.

Stroke. 2022 Apr 7;101161STROKEAHA121036578. doi:

10.1161/STROKEAHA.121.036578. Online ahead of print.

PMID: 35387494

Pain in atypical parkinsonism, vascular parkinsonism, and Parkinson's disease.

Sung YH, Kang SY.

Neurol Sci. 2022 Mar 26. doi: 10.1007/s10072-022-06035-6. Online ahead of print.

PMID: 35347528

Quantifying Quality of Reaching Movements Longitudinally Post-Stroke: A Systematic Review.

Saes M, Mohamed Refai MI, van Beijnum BJF, Bussmann JBJ, Jansma EP, Veltink PH,

Buurke JH, van Wegen EEH, Meskers CGM, Krakauer JW, Kwakkel G.

Neurorehabil Neural Repair. 2022 Mar;36(3):183-207. doi: 10.1177/15459683211062890.

Epub 2022 Jan 31.

PMID: 35100897 Free PMC article.

Unique features of central neuropathic pain in multiple sclerosis: Results of a cluster analysis.

Rivel M, Achiron A, Dolev M, Stern Y, Zeilig G, Defrin R.

Eur J Pain. 2022 May;26(5):1107-1122. doi: 10.1002/ejp.1934. Epub 2022 Mar 22.

PMID: 35263811

Temporomandibular disorder in individuals with spinal cord injuries.

Rangel M, Ferreira MV, Dos Santos MTBR, da Silva CBG, Romano MM, Guaré RO.

J Spinal Cord Med. 2022 Mar 29:1-7. doi: 10.1080/10790268.2022.2046421. Online ahead of print.

PMID: 35349395

Cerebrovascular response to exercise interacts with individual genotype and amyloid-beta deposition to influence response inhibition with aging.

Palmer JA, Kaufman CS, Vidoni ED, Honea RA, Burns JM, Billinger SA.

Neurobiol Aging. 2022 Jun;114:15-26. doi: 10.1016/j.neurobiolaging.2022.02.014. Epub 2022 Mar 4.
PMID: 35344819

Cervicovestibular Rehabilitation in Adults with Mild Traumatic Brain Injury: A Randomized Clinical Trial.

Langevin P, Frémont P, Fait P, Dubé MO, Bertrand-Charette M, Roy JS.
J Neurotrauma. 2022 Apr;39(7-8):487-496. doi: 10.1089/neu.2021.0508.
PMID: 35102743 Clinical Trial.

The Effects of Relaxation Techniques on Pain, Fatigue, and Kinesiophobia in Multiple Sclerosis Patients: A 3-Arm Randomized Trial.

Kesik G, Ozdemir L, Mungan Ozturk S.
J Neurosci Nurs. 2022 Apr 1;54(2):86-91. doi: 10.1097/JNN.0000000000000620.
PMID: 35149625 Clinical Trial.

Early, Intensive, Lower Extremity Rehabilitation Shows Preliminary Efficacy After Perinatal Stroke: Results of a Pilot Randomized Controlled Trial.

Hurd C, Livingstone D, Brunton K, Smith A, Gorassini M, Watt MJ, Andersen J, Kirton A, Yang JF.
Neurorehabil Neural Repair. 2022 Apr 15:15459683221090931. doi: 10.1177/15459683221090931. Online ahead of print.
PMID: 35427191

Effects of a Virtual Reality-Based Mirror Therapy Program on Improving Sensorimotor Function of Hands in Chronic Stroke Patients: A Randomized Controlled Trial.

Hsu HY, Kuo LC, Lin YC, Su FC, Yang TH, Lin CW.
Neurorehabil Neural Repair. 2022 Mar 28:15459683221081430. doi: 10.1177/15459683221081430. Online ahead of print.
PMID: 35341360

An observational study of centrally facilitated pain in individuals with chronic low back pain.

Georgopoulos V, Akin-Akinyosoye K, Smith S, McWilliams DF, Hendrick P, Walsh DA.
Pain Rep. 2022 Apr 13;7(3):e1003. doi: 10.1097/PR9.0000000000001003. eCollection 2022 May-Jun.
PMID: 35441119 Free PMC article.

Post-Concussive Vestibular Dysfunction Is Related to Injury to the Inferior Vestibular Nerve.

Gard A, Al-Husseini A, Kornaropoulos EN, De Maio A, Tegner Y, Björkman-Burtscher I, Markenroth Bloch K, Nilsson M, Magnusson M, Marklund N.
J Neurotrauma. 2022 Mar 7. doi: 10.1089/neu.2021.0447. Online ahead of print.
PMID: 35171721

Assisted Movement With Proprioceptive Stimulation Augments Recovery From Moderate-To-Severe Upper Limb Impairment During Subacute Stroke Period: A Randomized Clinical Trial.

Cordo P, Wolf S, Rymer WZ, Byl N, Stanek K, Hayes JR.
Neurorehabil Neural Repair. 2022 Mar;36(3):239-250. doi: 10.1177/15459683211063159. Epub 2022 Jan 24.
PMID: 35067125 Clinical Trial.

The Best Choice of Oxygen Cost Prediction Equation for Computing Post-Stroke Walking Energy Expenditure Using an Accelerometer.

Compagnat M, Salle JY, Vinti M, Joste R, Daviet JC.
Neurorehabil Neural Repair. 2022 Apr;36(4-5):298-305. doi: 10.1177/15459683221076469. Epub 2022 Feb 15.
PMID: 35168439

Staying active after rehab: Physical activity perspectives with a spinal cord injury beyond functional gains.

Baehr LA, Kaimal G, Hiremath SV, Trost Z, Finley M.
PLoS One. 2022 Mar 23;17(3):e0265807. doi: 10.1371/journal.pone.0265807. eCollection 2022.
PMID: 35320294 Free PMC article.

Should non-pharmacological and non-surgical interventions be used to manage neuropathic pain in adults with spinal cord injury? - a systematic review.

Almeida C, Monteiro-Soares M, Fernandes Â, Almeida CAS.

J Pain. 2022 Apr 10;S1526-5900(22)00290-5. doi: 10.1016/j.jpain.2022.03.239. Online ahead of print.

PMID: 35417793 Review

CLINICAL NEUROPHYSIOLOGY

Safety and efficacy of transcranial direct current stimulation in upper extremity rehabilitation after tetraplegia: protocol of a multicenter randomized, clinical trial.

Arora T, O'Laughlin K, Potter-Baker K, Kirshblum S, Kilgore K, Forrest GF, Bryden AM, Wang X, Henzel MK, Li M, Perlic K, Richmond MA, Pundik S, Bethoux F, Frost F, Plow EB.

Spinal Cord. 2022 Mar 5;1-5. doi: 10.1038/s41393-022-00768-z. Online ahead of print.

PMID: 35246620 Free PMC article.

The Effects of Non-Invasive Brain Stimulation on Quantitative EEG in Patients With Parkinson's Disease: A Systematic Scoping Review.

Costa TDC, Godeiro Júnior C, Silva RAE, Dos Santos SF, Machado DGDS, Andrade SM. Front Neurol. 2022 Mar 2;13:758452. doi: 10.3389/fneur.2022.758452. eCollection 2022.

PMID: 35309586 Free PMC article.

Epidural spinal stimulation enables global sensorimotor and autonomic function recovery after complete paralysis: 1st study from India.

Kandhari S, Sharma D, Samuel S, Sharma G, Majumdar P, Edgerton VR, Gad P.

IEEE Trans Neural Syst Rehabil Eng. 2022 Mar 10;PP. doi:

10.1109/TNSRE.2022.3158393. Online ahead of print.

PMID: 35271446

Robotic mapping of motor cortex in children with perinatal stroke and hemiparesis.

Kuo HC, Zewdie E, Giuffre A, Gan LS, Carlson HL, Wrightson J, Kirton A.

Hum Brain Mapp. 2022 Apr 22. doi: 10.1002/hbm.25881. Online ahead of print.

PMID: 35451540

Advances in Epidural Spinal Cord Stimulation to Restore Function after Spinal Cord Injury: History and Systematic Review.

Mansour N, Peña Pino I, Freeman D, Carrabre K, Venkatesh S, Darrow D, Samadani U, Parr AM.

J Neurotrauma. 2022 Apr 10. doi: 10.1089/neu.2022.0007. Online ahead of print.

PMID: 35403432

OIDA: An optimal interval detection algorithm for automatized determination of stimulation patterns for FES-Cycling in individuals with SCI.

Schmoll M, Le Guillou R, Fattal C, Coste CA.

J Neuroeng Rehabil. 2022 Apr 14;19(1):39. doi: 10.1186/s12984-022-01018-2.

PMID: 35422040 Free PMC article.

Implanted System for Orthostatic Hypotension in Multiple-System Atrophy.

Squair JW, Berney M, Castro Jimenez M, Hankov N, Demesmaecker R, Amir S, Paley A, Hernandez-Charpak S, Dumont G, Asboth L, Allenbach G, Becce F, Schoettker P, Wuerzner G, Bally JF, Courtine G, Bloch J.

N Engl J Med. 2022 Apr 7;386(14):1339-1344. doi: 10.1056/NEJMoa2112809.

PMID: 35388667

The Prognostic Utility of Electroencephalography in Stroke Recovery: A Systematic Review and Meta-Analysis.

Vatinno AA, Simpson A, Ramakrishnan V, Bonilha HS, Bonilha L, Seo NJ.

Neurorehabil Neural Repair. 2022 Apr;36(4-5):255-268. doi:

10.1177/15459683221078294. Epub 2022 Mar 20.

PMID: 35311412 Free PMC article.

Comparing different montages of transcranial direct current stimulation on dual-task

walking and cortical activity in chronic stroke: double-blinded randomized controlled trial.
Wong PL, Yang YR, Tang SC, Huang SF, Wang RY.
BMC Neurol. 2022 Mar 25;22(1):119. doi: 10.1186/s12883-022-02644-y.
PMID: 35337288 Free PMC article. Clinical Trial.

TECHNOLOGIES

A Survey of Technologies Facilitating Home and Community-Based Stroke Rehabilitation
Sun X, Ding J, Dong Y, Ma X, Wang R, Jin K, Zhang H, Zhang Y.
International Journal of Human–Computer Interaction. 2022 Apr 20 DOI:
10.1080/10447318.2022.2050545

Is robotic gait training effective for individuals with cerebral palsy? A systematic review and meta-analysis of randomized controlled trials.
Conner BC, Remec NM, Lerner ZF.
Clin Rehabil. 2022 Mar 25;2692155221087084. doi: 10.1177/02692155221087084. Online ahead of print.
PMID: 35331027

Bimanual motor skill learning with robotics in chronic stroke: comparison between minimally impaired and moderately impaired patients, and healthy individuals.
Gerardin E, Bontemps D, Babuin NT, Herman B, Denis A, Bihin B, Regnier M, Leeuwerck M, Deltombe T, Riga A, Vandermeeren Y.
J Neuroeng Rehabil. 2022 Mar 17;19(1):28. doi: 10.1186/s12984-022-01009-3.
PMID: 35300709 Free PMC article.

Visual guidance can help with the use of a robotic exoskeleton during human walking.
Kim M, Jeong H, Kantharaju P, Yoo D, Jacobson M, Shin D, Han C, Patton JL.
Sci Rep. 2022 Mar 10;12(1):3881. doi: 10.1038/s41598-022-07736-w.
PMID: 35273244 Free PMC article.

Can humans perceive the metabolic benefit provided by augmentative exoskeletons?
Medrano RL, Thomas GC, Rouse EJ.
J Neuroeng Rehabil. 2022 Feb 26;19(1):26. doi: 10.1186/s12984-022-01002-w.
PMID: 35219335 Free PMC article.

Use of Robotic Devices for Gait Training in Patients Diagnosed with Multiple Sclerosis: Current State of the Art.
Pérez-de la Cruz S.
Sensors (Basel). 2022 Mar 28;22(7):2580. doi: 10.3390/s22072580.
PMID: 35408195 Free PMC article. Review.

Overground robotic training effects on walking and secondary health conditions in individuals with spinal cord injury: systematic review.
Tamburella F, Lorusso M, Tramontano M, Fadlun S, Masciullo M, Scivoletto G.
J Neuroeng Rehabil. 2022 Mar 15;19(1):27. doi: 10.1186/s12984-022-01003-9.
PMID: 35292044 Free PMC article. Review.

Settings matter: a scoping review on parameters in robot-assisted gait therapy identifies the importance of reporting standards.
van Dellen F, Labruyère R.
J Neuroeng Rehabil. 2022 Apr 22;19(1):40. doi: 10.1186/s12984-022-01017-3.
PMID: 35459246 Free PMC article. Review.

Comparison of Efficacy of Lokomat and Wearable Exoskeleton-Assisted Gait Training in People With Spinal Cord Injury: A Systematic Review and Network Meta-Analysis.
Zhang L, Lin F, Sun L, Chen C.
Front Neurol. 2022 Apr 13;13:772660. doi: 10.3389/fneur.2022.772660. eCollection 2022.
PMID: 35493806 Free PMC article.



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Evan Papa, DPT, PhD
Tufts University



Elisa Gonzalez-Rothi, DPT, PhD
University of Florida



Trisha Kesar PT, PhD
Emory University (Co-Chair)

The Research in Review was designed using Medline filters to extract high impact research articles related to the field of neuroscience and physical therapy, which includes areas of motor control, rehabilitation, clinical neurophysiology, and technology. Emphasis is placed heavily on articles published within the last eight weeks, that cover issues related to spinal cord injury, stroke, balance and falls, brain injury, degenerative diseases, and vestibular rehabilitation. The list contains the full citation and a link to the abstract or full text article. The Research in Review is published once every 2 months and will arrive in your email box in a format that is easily viewable by both HTML and text-based readers. Articles with no volume, issue or page numbers indicate that the article has not been published in paper form yet, but may be available in electronic form through the publisher. We welcome requests for article postings at the first and third Mondays of each month. Those interested in assisting with this endeavor are welcome to contact [Dr. Antoinette Domingo](#).

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