Neuroplasticity

Health care providers are facing greater time restrictions to render services to the individual with neurological dysfunction. However, the scientific community has recognized that the dynamic capacity of the central nervous system (CNS) is far greater than previously thought. The tremendous potential for CNS reorganization and recovery is being realized. Intervention strategies designed to help patients access this potential for recovery while engaging in functional task practice will help in meeting these two opposing challenges. This webinar will explore research in neuroplasticity and consider important parameters of intervention known to induce both brain and behavioral recovery in individuals with neuropathological disorders.

Objectives

1. To review scientific and clinical literature related to recovery of function after neurologic insult due to traumatic, vascular, and degenerative processes.
2. To identify how behavioral compensation can limit brain recovery.
3. To name practice parameters that can be manipulated in order to induce neuroplasticity and behavioral recovery.
4. To understand mechanisms underlying neuroplasticity from cellular to systems level analyses.
5. To learn about various forms of measuring neuroplasticity in animal models of neuropathology and in healthy humans as well as individuals with neuropathological disorders.

Differential Diagnosis I

Objectives

1. Describe the roles a physical therapist has in the process of differential diagnosis across practice settings.
2. Choose when to perform components of a neurologic examination based on patients’ clinical presentations.
3. Identify special concerns related to the nervous system.
4. Hypothesize neuroanatomic lesion locations based on subjective history and objective examination data.
5. Apply a hypothesis-driven reasoning strategy to formulate a list of possible diagnoses.

Differential Diagnosis II

Normal Gait

The purpose of this webinar is to review the components of normal gait in preparation for effective evaluation and treatment of pathologic gait. The instructors will provide a framework for observational gait analysis by addressing muscle activity, joint motions, torque demands, and critical events which are essential to achieve normal gait.

Objectives

1. Identify the components of normal gait including gait cycle, phases, functional tasks, and critical events.
2. Identify and describe the significance of normal joint positions, muscle activity, torque demand, and task accomplishments for each phase and functional task of the gait cycle.
3. Develop a framework for systematic observational gait analysis based on a foundational understanding of normal gait.
Evidence Based Practice
Introduces critical resources for the evidence-based neurologic physical therapist. Learn where and how to look for the best available evidence to inform neurologic practice. Learn how to develop an EBP technology profile to stay current as evidence for neurologic practice evolves.

Objectives
1. Define EBP and describe how it can be realistically integrated into everyday practice
2. Write a focused clinical question to support efficient searching
3. Use widely available databases to quickly access relevant research evidence
4. Develop a technology profile for EBP

Neuro-Imaging
Recent evidence in motor learning, control and neuroplasticity suggests that a network of specialized neural structures work cohesively for control, learning and recovery following neurological injury. Neurological examination and movement assessment provide clinicians with information about factors that contribute towards impaired motor control. Neuroimaging provides clinicians with additional critical information that allows diagnosis, prognosis, planning and administration of clinical intervention to improve functional movement recovery. Neuroimaging techniques such as Computerized tomography (CT) and Magnetic Resonance imaging (MRI) provide information about structural integrity of the nervous system. Advances in neuroimaging such as Functional MRI (fMRI), Diffusion Tensor Imaging (DTI) and Transcranial magnetic stimulation provide information about functional changes in the nervous system following injury and recovery.

Objectives:
1. To understand different neuroimaging techniques and outline basic principles, advantages and limitations of these techniques
2. Specific focus on Computerized Tomographic scanning (CT Scan) and Magnetic Resonance Imaging (MRI)
   a. Reading a CT scan and Brain MRI
   b. Identification of key structures and levels of scanning
   c. Examples of patients with brain injuries
3. Role of Neuroimaging (e.g. fMRI and TMS) in clinical decision making for effective neurologic physical therapy interventions.

Motor Control
Commonly, data gathered from the neurologic exam represents the clinicians‘ assessment of impaired ‘motor control.’ Limitations with respect to the utility of this perspective for developing interventions aimed at improving motor control in individuals with neuropathology will be highlighted. Instead an alternative representation of the field of motor control and potential translation of this basic science research to clinical practice will be presented. Reach and Grasp, Locomotion and Postural Control are three key areas of research in the field of motor control. These are also functions that are severely affected in a variety of neurological disorders. Limitations in the use of the upper
extremity, in postural control and in locomotion represent profoundly disabling problems for individuals with neurological disorders. Effective intervention can be developed through an understanding of guiding principles derived from basic motor control research. In this webinar hypotheses with respect to clinical intervention that will promote improved motor control in each of these three areas will be presented.

Objectives
1. To identify and discuss the relevance of motor control research in reach and grasp to neurorehabilitation
2. To identify and discuss the relevance of postural control research to neurorehabilitation
3. Learn intervention strategies to improve both reactive and anticipatory postural control strategies
4. To identify and discuss the relevance of motor control research in locomotion to physical therapy practice
5. To understand the limitations in interpreting the results of the neurologic exam as the assessment of motor control deficits in individuals with neuropathological disorders

Motor Learning Principles
The ability of an individual to acquire motor skills is fundamental to human life. While the primary role of the physical therapist is to design intervention that enables a patient to learn or re-learn motor skills, the relevance of the field of motor learning to physical therapy practice and education has only been realized in the last 25 years. A critical early insight gained from the alliance of motor learning research and physical therapy practice was the important distinction between whether changes in performance represented true persistent motor learning. Since then research from the field of motor learning has enabled physical therapists to understand how the manipulation of practice variables can optimize learning outcomes for patients. As such, knowledge with respect to the role and schedule of augmented feedback, variability in practice, mental practice, contextual interference, modeling, attentional focus, part- vs. whole-task practice to name a few has impacted the strategies used by physical therapists to ensure permanent changes in the capability to perform fundamental motor skills. Importantly, while most of the research that has established the important outcomes achieved with manipulation of various practice variables has been conducted in healthy, young adults, a recent effort in the research has been made to determine how the manipulation of practice variables impacts learning in individuals with neuropathology such as stroke and Parkinson’s disease.

Objectives
1. To review terms, concepts and principles of motor learning
2. Discuss the relevance of motor learning research to optimizing outcomes in neurorehabilitation
3. Learn how to manipulate motor learning practice variables in the design of effective intervention
4. Learn the research evidence regarding similarities and differences between practice variable effects on motor learning in healthy individuals compared with individuals with neuropathology

Pediatrics
The purpose of this webinar is to: present key information (e.g. etiology, incidence, clinical signs, and differential diagnosis) and discuss current evidence-based
interventions of the common pediatric neurological conditions that the residents may encounter (e.g. cerebral palsy and autism).

Objectives: Upon completion of this webinar, the resident will be able to:

1. Discuss key information (e.g. etiology, incidence, clinical signs, and differential diagnosis) related to cerebral palsy and autism spectrum disorder.
2. Design treatment goals and interventions for children and adolescents with cerebral palsy and/or autism spectrum disorder.
3. List impairments often associated with cerebral palsy and autism that might present unique challenges to the physical therapist.

Electrophysiology
Objectives:
1. Describe clinical applications of electrical stimulation for persons with neurological diagnoses
2. Summarize the evidence of electrical stimulation for persons with stroke
3. List potential mechanisms of electrical stimulation for persons with neurological diagnoses
4. List indications, contraindications and precautions of electrical stimulation for persons with neurological diagnoses
5. Develop an evidence based treatment plan involving electrical stimulation for persons with stroke

Pharmacology
Objectives:
1. Understand the basic mechanisms and clinical relevance of drug-receptor interactions.
2. Identify the common modes of drug administration, absorption and excretion
3. Explain the relationship between drug metabolism and the pharmacology of drug activation/inactivation, excretion and toxic metabolite formation.
4. Recognize the role of drug therapeutic index in dosing and risks for toxicity.
5. Describe the practical and physiologic challenges of prescribing drugs to an aging population.

Vestibular I
Review of the anatomy and physiology of the vestibular system followed by an overview of common conditions that affect the vestibular system and how patients with these conditions present in practice.

Objectives
1. Link peripheral and central vestibular anatomic structures to common diagnoses of vestibular dysfunction.
2. Recognize impairments, functional limitations, and potential for recovery associated with common conditions of vestibular dysfunction.

Vestibular II
Introduction to examination and evaluation of patients who have dizziness and disequilibrium followed by an introduction to the fundamental interventions used in vestibular rehabilitation.
Neurologic Physical Therapy Professional Education Consortium

Webinar Course Objectives

Objectives

1. Describe the components of an examination for persons with dizziness and disequilibrium.
2. Interpret the results of a physical therapy examination for persons with dizziness and disequilibrium.
3. Describe the underlying principles of vestibular rehabilitation with respect to canalith repositioning and adaptation, substitution, and habituation exercises.

Cerebellar Rehabilitation

This course is designed to assist participants in applying neuroscience knowledge and motor control principles to the physical therapy examination, assessment, and treatment of individuals with cerebellar damage. The role of the cerebellum in predictive motor control and motor learning is emphasized. Learning is facilitated through lecture, discussion, case examples, and videos.

Objectives

1. Analyze the role that the cerebellum plays in the control of voluntary limb movements, gait, and balance.
2. Describe the typical causes of cerebellar damage
3. Summarize the types of movement control problems, sensory and perceptual deficits observed in persons with cerebellar damage
4. Understand and describe the clinical signs of cerebellar ataxia
5. Explain how cerebellar damage affects motor learning and adaptation
6. Based on the evidence, describe the "key ingredients" of a rehabilitation program to improve function in patients with cerebellar damage
7. Understand the rationale behind the use of split-belt treadmill training in understanding locomotor adaptability

Spinal Cord Plasticity

Locomotor Principles

Locomotor training (LT) is one example of a task-specific training strategy to promote recovery of walking function. Several variations of LT exist in current clinical practice, and there is decided controversy regarding both the optimal training approach and the target outcomes. Locomotor training has its foundation in principles of activity-dependent neural plasticity and was originally developed for rehabilitation of individuals with incomplete spinal cord injuries and stroke. Limited work has addressed its utility in other populations such as people with traumatic brain injury and cerebral palsy. As evidence continues to emerge, LT will likely continue to develop as a possible "tool" in a therapist's "toolbox". This webinar will advance participants' understanding of both the current evidence and controversies relevant to promoting locomotor recovery in patients with neurological disorders. Key variables in an effort to understand the "active ingredients" of effective therapeutic interventions will be examined.

Objectives

1. Provide a framework for clinical decision-making as it pertains to locomotor rehabilitation.
2. Consider current controversies regarding current approaches to locomotor rehabilitation, including body-weight support systems and approaches to guidance.
Contemporary Management of Parkinson’s Disease

Parkinson disease is considered a chronic health condition which must be successfully managed over the course of the disease. Despite advances in medical management, patients with Parkinson disease experience a decline in quality of life and physical function over the course of the disease. There is a growing body of evidence revealing the benefits of physical therapy and exercise in improving participation, activity limitations and impairments of body structure and function in people with Parkinson disease. This webinar will begin with differential diagnosis and pharmacological/surgical intervention. An evidence-based approach to examination, diagnosis, prognosis and intervention will follow. Responsiveness of commonly used outcome measures will be discussed. The most current research supporting specific elements of treatment will be highlighted – including the use of external cueing, treadmill training, cardiovascular fitness training, strengthening and balance training.

Objectives
1. Compare and contrast the signs and symptoms associated with typical and atypical Parkinsonism
2. Categorize the types of pharmacological treatments for PD and explain their mechanism of action
3. Explain the how fluctuations in status associated with PD impact PT intervention
4. Summarize the evidence supporting the benefits of PT for people with PD
5. Justify the benefits of physical therapy intervention to persons with PD, other health care providers and to 3rd party payers based on the evidence from the literature
6. Appraise commonly used outcome measures for evaluating person with PD
7. Evaluate which outcome measures to implement considering disease stage and clinical presentation
8. Describe the key elements of treatment that may be necessary to promote a neuroprotective effect
9. Select and apply evidence-based therapeutic interventions to improve cardiovascular fitness, flexibility and strength in persons with PD
10. Select and apply treatment strategies to improve postural instability, freezing of gait and mobility deficits
11. Explain the relevance of physical therapy for people with PD across the continuum of care starting with early through moderate and advanced PD

Exercise-induced brain changes (neuroplasticity) in Parkinson’s Disease

The brain’s capacity for recovery from damage is far greater than previously recognized. It is now understood that neuroplasticity can be facilitated through experience including environmental enrichment, exercise, forced-use, and complex skills training. Most of our understanding of this recovery, termed experience-dependent plasticity is derived from animal models of stroke and spinal cord injury, but there is now evidence that the same phenomenon occurs in animal models of Parkinson’s disease (PD). Animal models of stroke and spinal injury have led to successful human trials and the development of specific interventions to develop neuroplasticity and behavioral recovery. Most PD physical intervention studies in the past have promoted compensation and training individuals with PD to use compensatory strategies to achieve functional outcomes. This
approach to intervention stems from the assumption that in the case of a
ever degenerative process as exists in PD, there is no potential for recovery. A
significant challenge to this assumption has come with the demonstration of experience-
dependent behavioral recovery and neuroplasticity in animals with basal ganglia injury
(model of PD) that undergo intensive treadmill exercise or forced-use of the affected
limb. An indication that this phenomenon of neuroplasticity and recovery extends to
humans with PD has come with recent intervention studies and is turning the attention of
the field on determining the potential disease-modifying effects of physical therapy
intervention.

Objectives
1. Participants will identify the neuroanatomical structures of the Basal Ganglia
2. Participants will describe basal ganglia physiology and circuitry important for motor
control
3. Participants will describe the underlying neurochemical and morphological
mechanisms that govern neuroplasticity in the injured basal ganglia
4. Participants will explain the role of physical therapy intervention in promoting
neuroplasticity and behavioral recovery in individuals with stroke and Parkinson's
disease.
5. Participants will distinguish between intervention strategies for Parkinson’s disease
that are currently being tested in clinical trials and relate them to clinical practice
6. The participant will be able to design a treatment plan that demonstrates an
understanding of parameters of practice that may induce experience-dependent
neuroplasticity in Parkinson’s disease.

Motivational Principles of Rehabilitation
Support for patients’ fundamental psychological needs (autonomy, competence, and
social relatedness) is of universal importance but has special significance for physical
therapy. Recent evidence links stronger motor learning and performance to opportunities
for choice and control, positive feedback and enhanced expectations, and learning with
others. This 2-hour webinar will present descriptions of recent basic, applied, and clinical
research with discussion of practical approaches and clinical implications to facilitate
patients’ motor learning in neurorehabilitation. This course is designed to bring the
science regarding fundamental psychological needs to clinicians working in varied age
and diagnostic contexts.

Objectives:
1. Participants will be able to summarize research addressing the added value of positive
expectations and autonomy support in motor learning.
2. Participants will be able to identify at least three ways in which physical therapists can
strengthen patients’ learning and engagement through competence enhancement and
provision of choices.

Innovating change in neurologic rehabilitation: Investigating novel clinical
efforts to more effectively induce neuroplasticity.
This will be a cutting-edge look at a different type of EBM - EMPIRICALLY based
medicine in the neurologic rehabilitation clinic. This webinar will showcase the tried and
the true attempts at forcing changes in patients using applications that have a basis in
evidence, yet are not currently in practice (yet). If you dare to be challenged to think critically, you will want to attend this webinar.

Objectives
1. Attendees will be proficient in analyzing clinical applications to determine merit based on current evidence and understandings of neuroplasticity.
2. Attendees will be able to state how to utilize objective measures in the examination and re-examination of a patient in an effort to determine the efficacy of an intervention for each patient as their own case study.
3. Attendees will be able to critically appraise interventions in neurologic rehabilitation, individualizing their merit based on the condition being treated.

Innovations in Neurorehabilitation
Technology is a ubiquitous part of both everyday life and healthcare and has developed rapidly over the past 20 years. For the healthcare practitioner, developing and maintaining competency in technological innovations can be a daunting tasking. This course will introduce students to digital technologies that can be used in neurorehabilitation. Robotic technology, mobile applications, video games, and virtual reality will be covered and include clinical, research, and teaching applications.

Objectives:
1. Describe three technologies that can be readily accessed in a clinical, research, or academic setting.
2. Select and evaluate one technology for a specific neurorehabilitation population, including accessibility by that population.
3. Compare and contrast the benefits and challenges of using the different technologies discussed in the course.

Wheelchair Seating & Positioning
Persons with disabilities have a need for standard and custom seating and positioning devices. This webinar will review the key elements needed for a comprehensive seating evaluation and the current tools available for assessment. Case studies will be used to identify which devices (wheelchairs, cushions, backrests and other accessories) are appropriate for individuals based on their function, impairments, environment and goals.

Objectives
1. Identify the key elements of performing a comprehensive seating evaluation
2. Review payment for Durable Medical Equipment
3. Explain the relationship between vendors and health care professionals
4. Understand how to adapt seating and positioning based on common orthopedic changes.
5. Understand the role of pressure mapping; common causes of pressure sores and available seat cushions
6. Describe the different categories of manual wheelchairs
7. Describe the different categories of powered mobility

Cardiovascular
The purpose of this webinar is to discuss the role of cardiovascular fitness in the clinical and self-management of progressive and non-progressive neurological conditions across
Webinar Course Objectives

the lifespan. Participants will be engaged in discussions about the importance of cardiovascular fitness and the implications for health and quality of life.

Objectives
Prior to participation in this module, residents should review basic principles of aerobic exercise in order to:

1. Distinguish among physical activity, exercise, and physical fitness. (See the Physical Activity Guidelines for Americans document and the Jewell article)
2. Consider energy systems used by human skeletal muscle. (refer to any Exercise Physiology textbook, or Kisner and Colby, Therapeutic Exercise, 6th ed, chapter 7)
3. Define oxygen consumption, submaximal oxygen consumption, and maximal oxygen consumption. (see Noonan article)
4. State how submaximal and maximal oxygen consumption can be measured. (Noonan article)
5. State acute and adaptive responses to aerobic exercise. (refer to any Exercise Physiology textbook, or Kisner and Colby, Therapeutic Exercise, 6th ed, chapter 7)

Upon completion of this learning module, participants should be able to:
1. Discuss current research evidence of the effects of aerobic exercise in patients with neurological deficits.
2. Describe the role of aerobic conditioning for patients with neurological disorders to other medical practitioners and to patients/clients.
3. Discuss benefits of aerobic training across levels of the international classification of health and disability (ICF).
4. Select and administer a test of aerobic capacity to a patient/client, and formulate an exercise prescription based on the test results.
5. Interpret the physiological response to aerobic exercise, including oxygen consumption and metabolic equivalents (MET), for a given patient

Health & Wellness

Persons with chronic neurologic disabilities often have significant impairments and progressive disease processes that lead to immobility, physical inactivity, secondary disease, decreased cognition and compromised health and wellness. These conditions are confounded by limited education about sleep, hydration, nutrition, exercise, medical equipment and community resources and limited access to insurance coverage. This webinar will define important terms of wellness, health, maintenance physical therapy, review the common co-morbidities associated with physical inactivity, summarize the evidence about hydration, healing, sleep, nutrition, exercise, communication, social engagement, cost benefit analysis and discuss the role of the physical therapist to implement appropriate intervention programs at home and in the community.

Objectives:

1. Summarize the incidence of physical inactivity as the number one health problem today
2. Describe the secondary impairments resulting from physical inactivity
3. Discuss the role of a positive lifestyle, and physical activity on neural adaptation, maintenance of function and prevention of major secondary consequences related to a
chronic neurologic disability
4. Outline the critical nature of nutrition on maintaining positive health and addressing the secondary consequences of chronic inflammation, medications, chemotherapy and radiation for the treatment of chronic neurological insults
5. Discuss key factors for developing exercise programs at home and in community fitness centers for persons with chronic neurologic disabilities (e.g., stroke, Parkinson’s disease, multiple sclerosis, spinal cord injury, and diabetes mellitus).
6. Summarize the impact of social isolation, depression and cognitive decline on patient compliance, motivation to be physically active and maintain functional independence.
7. Identify strategies for increasing accessibility, usability, safety and reimbursement of commercial exercise equipment for persons with neuromusculoskeletal impairments.
8. Discuss the challenges of the family and care-giver for patients who have lost the ability to be independent.
9. Discuss the cost benefit of maintaining patient mobility despite severe physical and mental impairments.
10. Summarize the opportunity for the physical therapist to overcome barriers and promote wellness and physical fitness across the healthcare continuum into the home and the community.

Ethics
This talk will review our health care values and how they drive our moral decision-making and behavior. It will include a brief historical overview of the landmark cases in health law that have shaped our application of the ethical principles involved in deciding for others, including respecting autonomy and providing a benefit. Interactive case discussions will serve to reflect on and highlight our ethical responsibilities in cases where patients refuse to follow our recommendations and / or discontinue their care.

Objectives
1. Understand how values drive moral decision-making and behavior
2. Define informed consent and competency
3. Differentiate between refusing medical intervention and committing suicide
4. Outline legal framework for understanding ethical principles related to the right to refuse
5. Recognize quality of life judgments made regarding individuals with disability
6. Participate in a discussion of potential evaluative strategies for determining informed consent after acquiring a disability

Documentation & Billing
Effective documentation and accurate billing are essential for success in today’s healthcare market. Medicare standards continue to change and new departments from the federal government to conduct audits continue to appear. This webinar will review current payment and billing methodologies specific to Medicare. Case studies will be used to identify effective documentation for patient care in a variety of settings. Tips and resources for surviving internal audits will also be reviewed.

Objectives
1. Understand payment and billing methodologies specific to Medicare beneficiaries.
2. Identify the appropriate code to bill for each intervention
3. Discuss documentation needs for various areas of practice and review examples
4. Discuss how to best document maximizing: Efficiency, Defensibility, and Payment
5. Identify resources for improving documentation