Neuroscience of Equine Assisted Activities and Therapies

PATH, Intl. 2012 Annual Conference

Susan E. Grant, OTR/L
Director of Therapy and Adaptive Programs
Carlisle Academy, Lyman, ME
PATH, Intl Certified Therapeutic Riding Instructor and Level I Therapeutic Driving Instructor, PATH, Intl Registered Therapist, AHA Level II

Assumptions

- It’s not just a pony ride.
- It’s not rocket science; it’s neuroscience.
- We will seek out what we need.
- Movement and touch are the foundations of neurodevelopment and neurorecovery due to brain neuroplasticity.
- The brain readily assimilates information when the information is meaningful. (Foundation of the Theory of Occupation and Occupational Therapy.)
- The mind and body are connected.
- It’s in our best interest to keep the horse moving!
- Our bodies are masters of interconnectivity; as humans we are born and driven to execute our “occupation” of interacting with the environment.
- The human to animal bond provides a direct impact to the rider’s emotional system.
- The rider’s sensory-motor and emotional systems are interconnected.
- Sensory-motor and emotional systems foundations lie within the central nervous system.
- Learning is enhanced when a multi-sensory approach is used.
- Equine movement provides a direct impact to the rider’s sensory-motor systems.
- Equine movement provides a direct impact to the rider’s soft tissue and skeletal system.
- Equine movement affects brain chemistry and neural connections positively affecting neurodevelopment and neurorecovery.
Neuroscience Basics

1. Basic neural structures

2. Basic neural chemistry

3. Central Nervous System
   - Brain
   - Cerebral Cortex
   - Spinal Cord
   - Brainstem
   - Cerebellum
   - Thalamus
   - Hypothalamus
   - Basal Ganglia
   - Limbic System

4. Peripheral Nervous System: Nerve links from central nervous system to rest of body.
   - Cranial Nerves: 12 pairs Cranial Mixed sensory/motor to control facial, oral, eye smell, taste, hearing, swallow
   - Spinal Nerves: 31 pairs of sensory/motor nerves
   - Two subdivisions: Automatic (ANS/PNS) and Somatic

Neuroplasticity

- **Functional map expansion**: healthy cells surrounding an injured area change function and shape to perform the duties by damaged cells.

- **Compensatory masquerade**: Brain cells reorganize existing neural pathways.

- **Homologous region adoption**: Allows one entire brain area to take over functions from a distant brain area.

- **Cross model reassignment**: One type of sensory input is used to replace another one. Using touch to read Braille. Touch is re-wired to replace the responsibilities of vision.
Typical neurodevelopment

- Sensory Development
- Motor Development
- Psychosocial Development
- Language and Cognitive Development
- Perceptual development

Learning New Information


Concepts of Abnormal Development, Trauma and Life Process

- Autism
- Depression
- Abuse/neglect
- PTSD
- Alzheimer’s Disease
- Brain Injury
- Aging
- Cerebral Palsy
- Down Syndrome

Equine impact: Biomechanical, Sensory/Motor/Neurodevelopmental/Social Emotional

Specialty Program Impact: Hippotherapy, Riding, Driving, Vaulting

Strategies to enhance success