

Neuroplasticity-A Paradigm Sea Change

I. Sea change

- A. Something that is multitudes of change above what you might expect
- B. A change of such magnitude that it alters the very nature of the subject

II. The Brain

- A. ... is not just a static, soft, round mass, bathed in a fluid and surrounded by a hard case
- B. ... can change its form and resultant function through neuroplasticity

III. Critical/Sensitive Periods

- A. A *critical period* occurs when the individual is sensitive to environmental influences and stimulation
 - 1. The Precritical period: The initial formation of neuronal circuits that is not dependent on visual experience.
 - 2. The Critical period: A distinct onset of robust plasticity in response to the visual experience when the initially formed circuit can be modified by experience
 - 3. Closure of the critical period: After the end of the critical period, the same visual experience no longer elicits the same degree of plasticity.
- B. The concept of a critical period does not imply that neuroplasticity ends after a certain age.
- C. *Sensitive period* begins and ends gradually (not abruptly like the critical period) and provides for maximum sensitivity to stimuli.

III. Neuroplasticity and the Brain

- A. Can adult brain neurons actually exhibit neuroplasticity? The short answer is yes.
- B. Resultant changes are noted in not only functional outcomes but also in brain anatomy and structure.

IV. Neuroplasticity and Rehabilitation

- A. The Key Principles of Experience-Dependent Neural Plasticity
 - 1. Use it or lose it
 - 2. Use it and improve it
 - 3. Specificity
 - 4. Repetition matters
 - 5. Intensity matters
 - 6. Time matters
 - 7. Salience matters
 - 8. Age matters
 - 9. Transference
 - 10. Interference
- B: Examples of Changes in Function and Structure

1. Jugglers

2.) Typists

V. Neuroplasticity and Optometry

- A. Evolutionary neuroplasticity
- B. Reactive plasticity
- C. Adaptational plasticity
- D. Reparation plasticity

VI. Management and Treatment of Disorders of the Visual System and Neuroplasticity

- A. Refractive error development
- B. Amblyopia
- C. Strabismus
- D. Non-strabismus, non-amblyopic binocular vision disorders
- E. Learning related vision anomalies
- F. Vision development/perception disorders

VII. Vision dysfunction association with acquired brain injury

- A. Exotropia (or high exophoria)
- B. Accommodative dysfunction
- C. Convergence insufficiency
- D. Decreased blink rate
- E. Spatial disorientation
- F. Pursuit/saccade dysfunction
- G. Unstable ambient vision (Magnocellular pathway).

VIII. Improving Brain Function and Neuroplasticity

- A. Brain Foods
- B. Drugs
- C. Exercise
- D. Learning new and challenging things