Connecting Brain Science with Pilates Teaching & Practice

Anne Bishop Ed.M.
Mind, Brain & Education Harvard University

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The Need for Brain Science to Enhance Pilates Education

1. Better client/patient outcomes
2. Apply research to practice
   - evidence-based Pilates instruction
3. Improve Pilates Certifying Instruction
   - more balanced pedagogy

Pilates is a Body-brain Experience

Embodied Brains

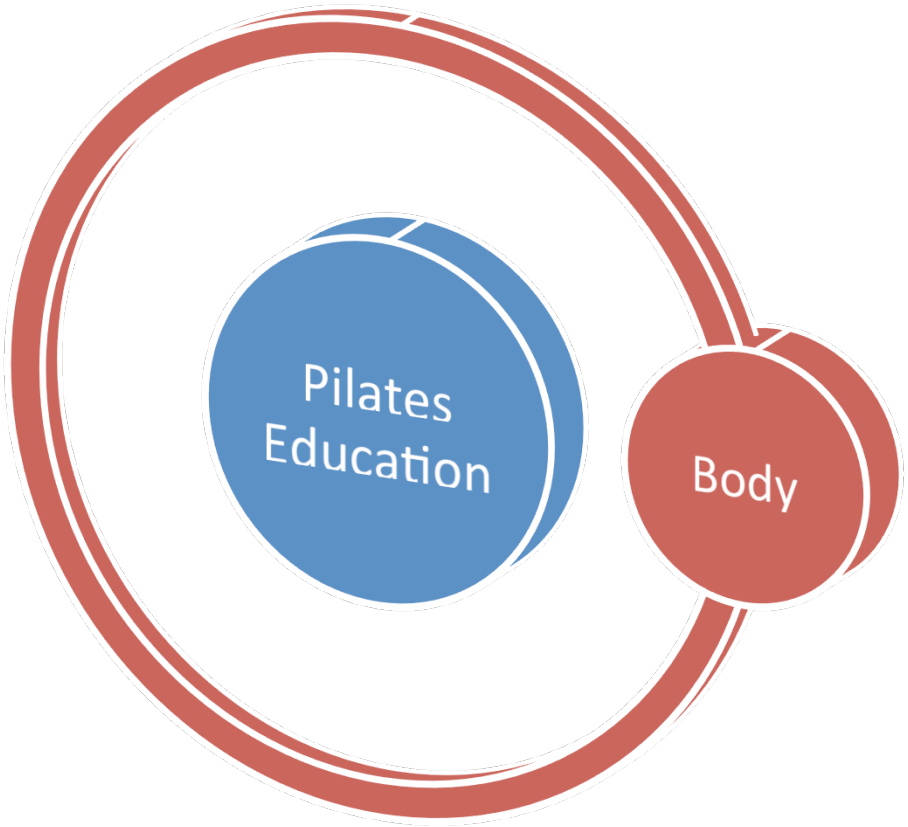
- Cannot dissociate your body from your brain
- "One of the major results of Contrology is gaining mastery of the mind over the complete control of your body." (Pilates & Miller, 2003, p19)

Joseph Pilates

Current Pilates Cues

Cues rely on

- anatomy
- biomechanics
- function
- posture

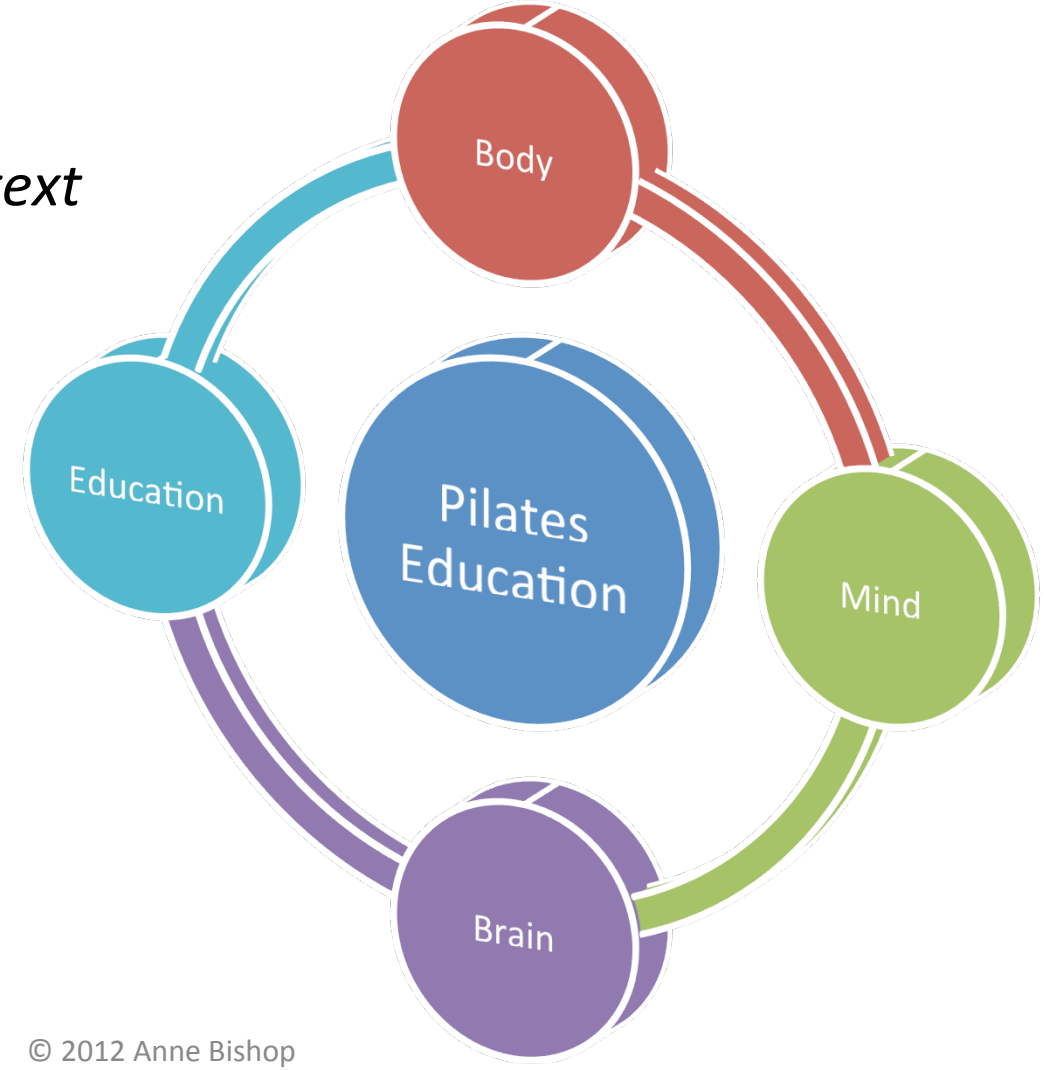


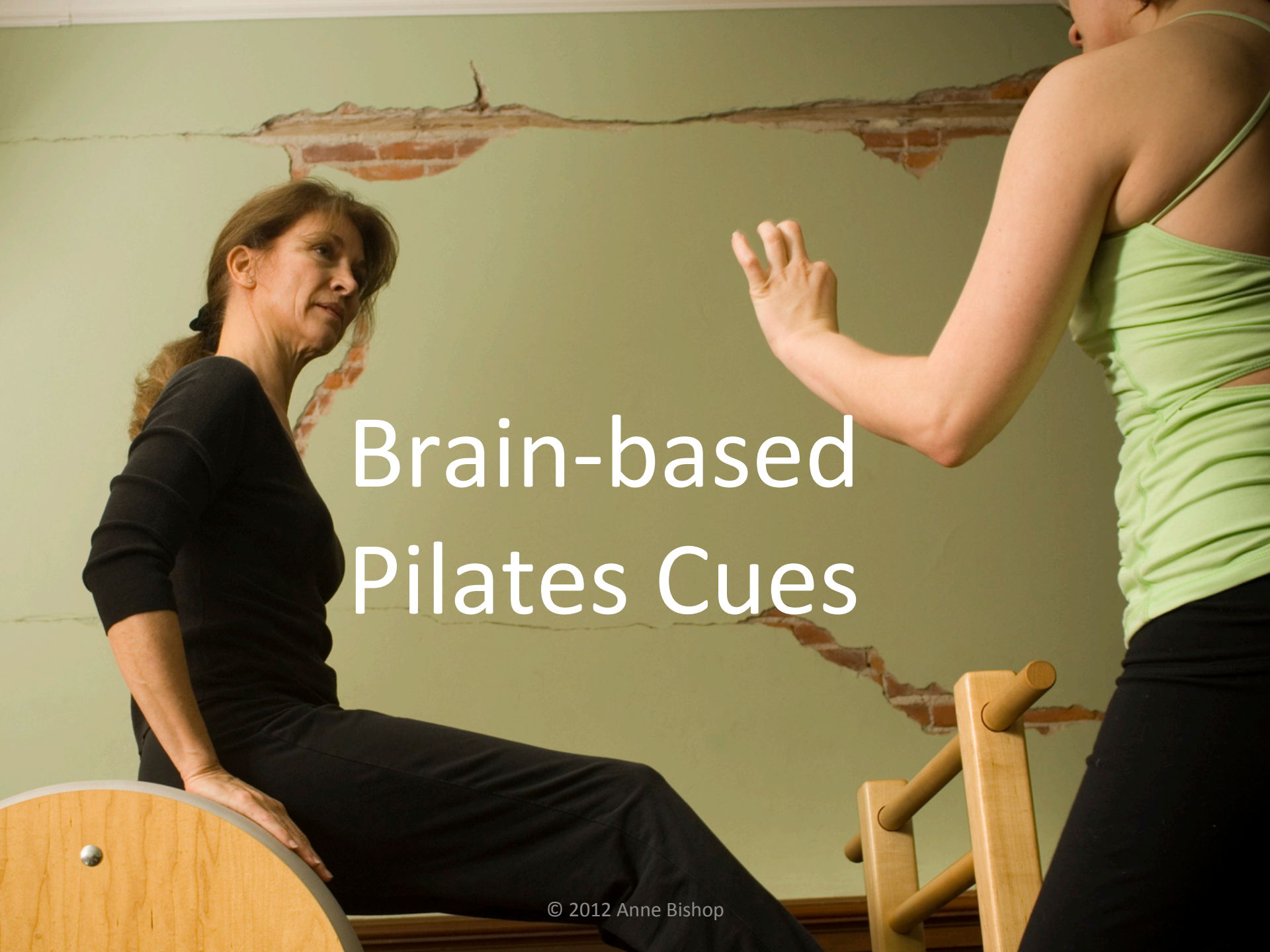
MBE applied to Pilates Teaching and Practice

Mind, Brain & Education

Applied to the Pilates Context

- Body
- Mind
- Brain
- Education





Brain-based Pilates Cues

Brain-based Pilates Cues

enhance the neural activation in the brain responsible for feeling, planning and/or creating action & leads to better motor learning outcomes.

Visual Cues

- Observation
  - Student watches teacher
- Imitation
  - Student observes and copies teacher simultaneously

Brain Principle

Brain-based Cues

Mirror Neuron System

- Mirror Neurons
  - distributed throughout the brain in sensory (feeling), motor planning & action areas
  - help people understand action
  - respond to **goal-based** movement

Optimize Pilates with Brain-based Cues

- Goal-based
  - Brain imitates most accurately when it understands the goal of a movement (Gazzaniga, 2009)

Brain Research

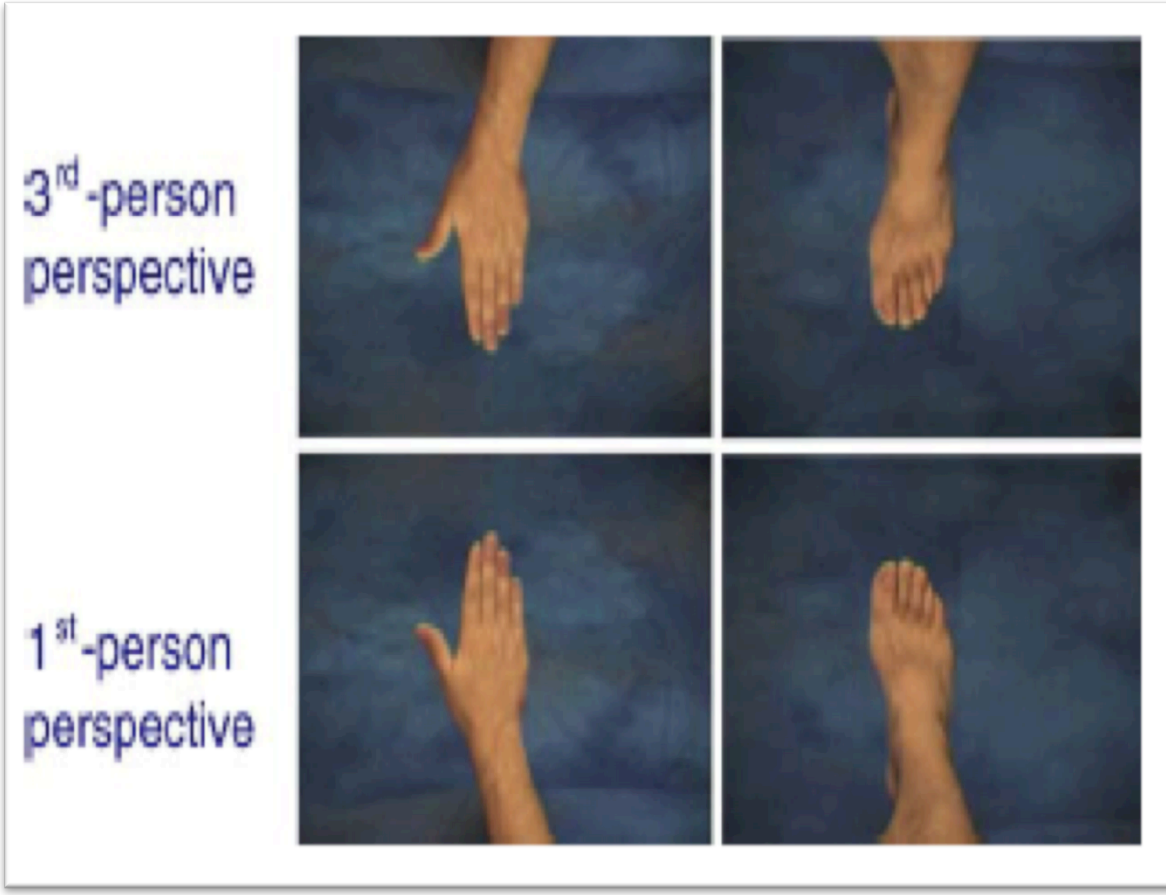
Brain-based Cues

Jackson, P. L., Meltzoff, A. N., & Decety, J. (2006). Neural circuits involved in imitations and perspective taking. *NeuroImage, 31*, 429-439.

Research

Perspective Taking

- Do you learn movement better in the 1st person perspective (1PP) or 3rd person perspective (3PP)?
- Does angle of observation matter?



Jackson, P. L., Meltzoff, A. N., & Decety, J. (2006)

Methods

- Subjects: 16 (8 female & 8 males)
- Video: 5-s video clip --2 repetitions of each movement
- Movements:
  - rotations (clockwise and counterclockwise)
  - horizontal (right or left)
  - vertical (upwards or downwards)

Methods

- Measured time of behavior
- Measured neural activity -- *functional* Magnetic Resonance Imaging (*f*MR*I)* activity
- Subjects Tasks
  - Observe 1PP
  - Observe 3PP
  - Imitate 1PP
  - Imitate 3PP
  - Control watch static cross on blue background

Behavioral Results

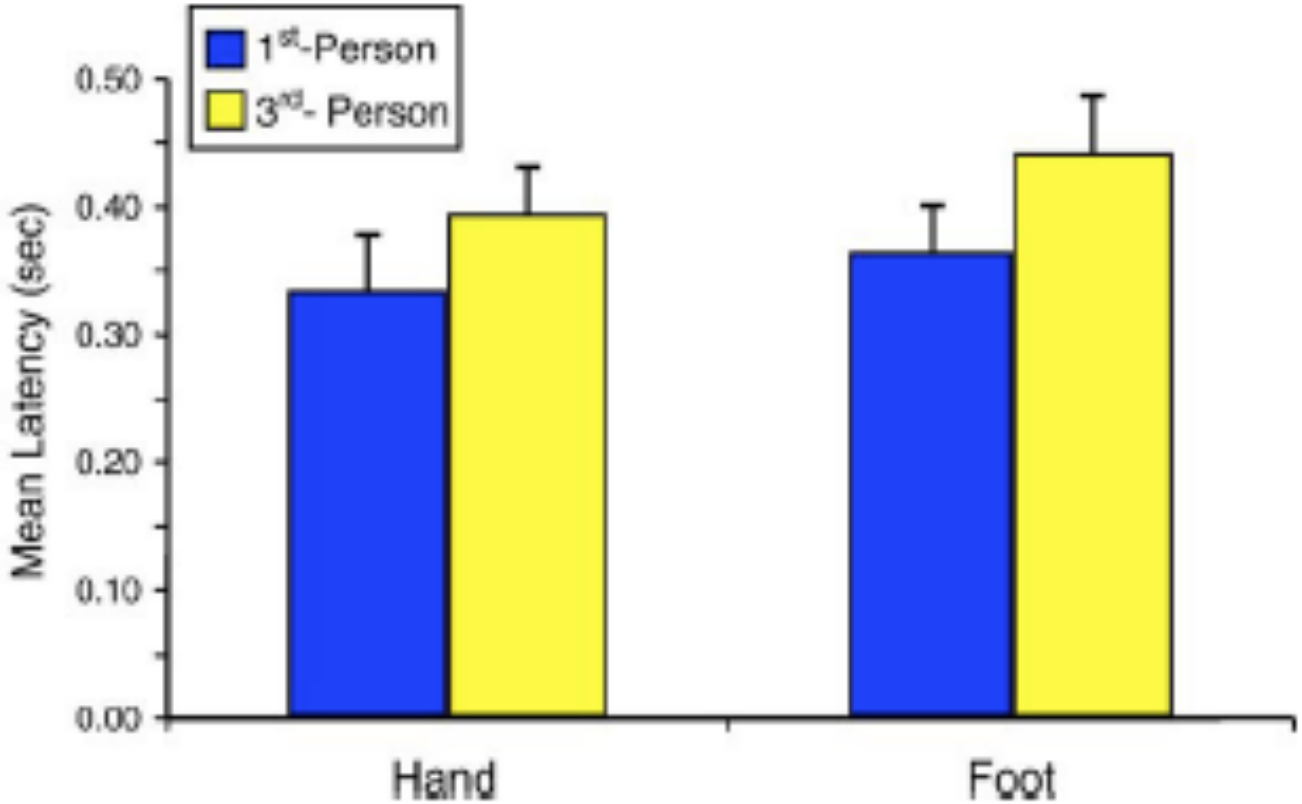


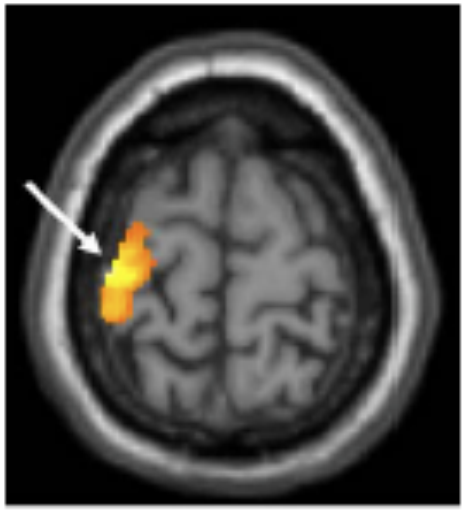
Fig. 2. Latency to imitate the actions (+SE) as a function of perspective from which the model was seen (1st vs. 3rd person) and limb used.

Neural Results

Perspective Taking

- 1PP>3PP for observed & imitated tasks

Left Sensory-motor Cortex



z = 70

Fig. 6. Left sensory–motor cortex activation ($x = -36$, $y = -22$, $z = 70$; $t = 7.59$) in the contrast 1st-person perspective vs. 3rd-person perspective, irrespective of the task. Results are superimposed on the MNI MRI template.

Visual Transformation

- Brain must reorient the body
  - This may take time
    - Greater time latency in behavioral results
  - 3PP more circuitous mapping process
  - 1PP a more direct mapping process

Optimize Pilates with Brain-based Cues

New Students

- 1PP
  - Orient student to view teacher in 1PP
  - Footwork
    - Reformer
      - Stand next to the Footbar
    - Cadillac
      - Stand behind the vertical bars
      - Bottom loaded push-through bar, watch ankle alignment

Advanced Students

- 3PP
  - Orient student to view teacher in 3PP
  - Challenge student by cuing him/her to observe teacher in the mirror

Summary Connecting Brain Science to Pilates Teaching & Practice

- Brain-based Cues
  - Enhance the neural activation in the brain responsible for feeling, planning and/or creating action & lead to better motor learning outcomes.
- Brain-based Cue Applications
  - Align visual cues with goal-directed verbal cues to optimize the mirror neuron system
  - Teach in 1PP for beginning Pilates students and 3PP for advanced students

References

- Gazzaniga, M., Ivry, R., & Mangun, G. (2009). In Durbin J. (Ed.), *Cognitive neuroscience the biology of the mind* (3rd ed.). New York, NY: W. W. Norton & Company.
- Jackson, P. L., Meltzoff, A. N., & Decety, J. (2006). Neural circuits involved in imitations and perspective taking. *NeuroImage, 31*, 429-439.
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