Observational Practice and Central Line Insertion
The Role of Errors in Motor Learning

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How Did You Learn to DO a Central Line?
Outline

• Why study central line insertion?
• Motor skill learning
• Motor skill learning and errors
• Motor skill learning and central line insertion
Why Are We Here

- Reduced working hours
- Increased focus on patient safety
- Increasing production pressures
- Central line insertion is a relatively common high-stakes procedure where errors have consequences
  - Pneumothorax
  - Infection
  - Vascular injury
Evidence-based consensus on the insertion of central venous access devices: definition of minimal requirements for training

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The Fiscal Reality

• Comprehensive programs are expensive
  – In terms of
    • People
    • Resources
    • Time
    • Space

• There is a need to balance the cost of training with the quality of training
  • Optimizing the value of each training moment
Psychomotor Skill learning

• **Classic**
  – *motor program* – An organized sequence responsible for carrying out an action in an open-loop fashion with only a minimal role for the sensory information. Schmidt, 1975

• **Revised**
  – The **Representation of Action**: A cortical and/or subcortical representation that contains information about the sequence of impulses required to carry out a movement **AND** the sensory information that is expected to accompany the movement...
Central Representation of Action
Optimizing Psychomotor Skill learning

• How can we most cost effectively teach procedural skills to a high standard
  – What types of experiences provide benefit?
    • Physical practice
      – Simulated or actual
        » Resource intensive and costly
    • Mental practice
      – Difficult to regulate and quantify
    • Didactic sessions
      – Minimal benefit
Optimizing Psychomotor Skill learning
Motor Learning by Observing

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Effect of Trial Order and Error Magnitude on Motor Learning by Observing

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Observational Practice

The role of collaborative interactivity in the observational practice of clinical skills

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Optimizing Psychomotor Skill learning

• Fitts and Posner (1967)
  – Cognitive stage (novice)
    • Learning subtasks High cognitive burden
  – Integrative stage (advanced novice/trainee)
    • Fluidity emerges but still cognitively engaged
  – Autonomous stage (competent)
    • Minimal cognitive burden Adaptable
For e.g., Guadagnoli, Weber & Holcomb, 1995
1 = not fulfilled at all, 5 = totally fulfilled

1. Is the patient encouraged to cooperate?
   - Yes ☐ No ☐

2. Is enough space prepared for the transfer?
   - Yes ☐ No ☐

3. Wheelchair, and other objects that the patient is transferred between, position and locked in a correct way?
   - Yes ☐ No ☐

4. Is the height of the bed correct?
   - Yes ☐ No ☐

5. Are there enough health care practitioners?
   - Yes ☐ No ☐

6. Good balance
   - 1 2 3 4 5

7. Good coordination
   - 1 2 3 4 5

8. Good movement economy
   - 1 2 3 4 5

9. How is the load on the back and the shoulders
   - 1 2 3 4 5

10. To what extent are the criteria in communication and interaction with the patient fulfilled?
    - 1 2 3 4 5

11. Is the patient allowed to participate according to his/her ability to perform voluntary movements?
    - 1 2 3 4 5

12. Does the transfer technique chosen by the student occupational therapist cause any Pain to the patient?
    - Yes ☐ No ☐

13. Does the transfer technique chosen by the student occupational therapist cause any feelings of fear or uncertainty in the patient?
    - Yes ☐ No ☐

14. Is the patient in a functional position at the end of the transfer?
    - Yes ☐ No ☐

Comments:
- Asked pt. to scooch forward, shift weight
- Brakes put on right at the beginning
- Feet were on the floor
- No one mentioned pain in the video.
- Patient did not express or show pain or
Hypothesis

• The formation of internal representations of skilled movements involves not only amplitude and directional information about the necessary neural impulses but also information regarding the potential variability that surrounds these impulses.

• *Observational practice may be more beneficial if a learner has the opportunity to view performances that have errors*
What do you think will happen?
A man’s errors are his portals of discovery

-James Joyce
The Challenge Point

• The optimum task “challenge” to force adaptation and future skill performance.
• The concept of “desirable difficulties” in practice.
• The right tools in the right context, with a learner at the right level ... can lead to an optimal learning moment and improved skill performance
Optimizing Psychomotor Skill learning

• How can we most cost effectively teach procedural skills to a high standard
  – What is the most cost effective means to delivery learning content?
Optimizing Psychomotor Skill learning

• How can we most cost effectively teach procedural skills to a high standard
  – What training resources are useful at each stage?
  – What types of experiences provide benefit?
  – What is the most cost effective means to delivery learning content?