

Teaching and Practicing Clinical Skills: Evidence-Based Recommendations

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Teaching Motor Skills

Common practices do not take full advantage of how the brain learns motor skills and may even be disadvantageous. These are the most important 5 things to remember when designing a skills training program:

1. Create how-to videos and discuss procedures

Videos are much “stickier” than lectures. Videos are so memorable that you need to create or find videos showing it the way you prefer the skill to be performed or risk students learning it the way shown in the video. Discussions improve understanding and retention due to encouraging elaboration or information processing.. For complex skills, have students watch the videos and then discuss potential pitfalls and complications.

2. Teach one skill per day for one hour per group

The brain consolidates and improves motor skill performance with sleep. However, this benefit applies to only the last skill learned. Trying to teach more than one skill a day generally means wasted effort. Complex skills are chunked by the brain and can be used to maximize time spent in lab. Teach iv catheterization and students will also learn venipuncture. Variations are also useful and don't interfere with consolidation (e.g. im injections in both small and large animal patients).

3. Use near peers to teach skills

Near peers (within a year or two of the learner) are often more effective than faculty at teaching motor skills. Social and cognitive congruence help them interpret instructions and remember particular steps. Faculty tend to skip multiple steps and teach “what” to do versus “how” to do it. Generalists are usually more comfortable than specialists at teaching foundational skills.

4. Ensure every student gets feedback

Feedback is essential for motor skill learning. Without feedback, students do not gain or retain skills. Positive feedback enhances long term gains more than neutral or negative feedback. Ensure each student gets feedback on what they are doing well and one or two things to work on.

5. Supervise practice

Once learned, motor skills are retained for very long periods of time (e.g. riding a bike). If learned incorrectly, motor skills are very hard to “unlearn”. Students are poor at assessing their own performance and can become confident without competence. Supervised practice ensures skills are practiced appropriately and provides feedback opportunities.

Practicing Motor Skills

Students do not generally know how to practice skills or do not apply what they do know from sports or music training. We can help them become proficient faster by following these 5 recommendations:

1. Practice weekly until proficient

Proficiency is key for motor skills learning. Once proficient, the skill is retained for long periods of time. However, procedural learning is much slower than declarative learning. Supervised, distributed (spaced) practice on a regular basis improves acquisition and retention and is more effective than intensive blocked practice. Mental rehearsal is effective and can be used when actual supervised practice is not possible.

2. Practice deliberately, focusing on one skill/one hour/ one day

Deliberate practice, focusing on identified weak areas or an appropriately challenging skill, leads to the most gains, particularly when students define their own goals. A single of hour of practice is generally sufficient. Practicing too long risks consolidating the errors associated with fatigue Until a student is proficient in a skill, practicing multiple skills interferes with brain consolidation due to retrograde inhibition.

3. Practice in pairs, with supervision

Students working in dyads naturally practice good learning habits that result in more effective learning: talking aloud, mental rehearsal, identifying mistakes and missteps, and supporting each other. Supervision allows for feedback and further improvement through assessment-related retrieval practice.

4. Self-assess, ask for feedback, repeat feedback aloud

Self assessment prior to receiving feedback improves accuracy, skill acquisition and retention. Self-assessment is not an innate skill and tends to be poor with motor skills. Practice against a standard (expert feedback) can improve self-assessment skills as well as improving performance. Verbalization helps learning.

5. Exercise after learning or practicing a new skill

Aerobic exercise (~15 minutes) directly after skill learning or skill practice improves blood flow to the hippocampus, stimulates the production of BDNF (brain-derived neurotrophic factor) and leads to improved neuronal cell growth, connections, and retention. The more intense the exercise and the closer to the learning, the better the skill performance and retention.

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