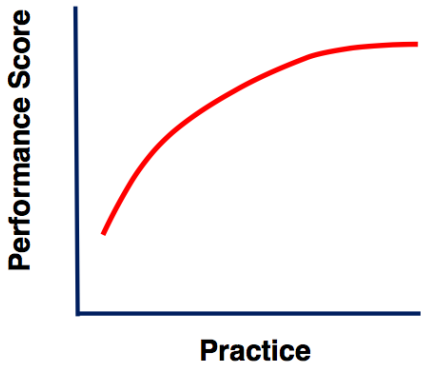
Practice schedules for motor learning:

- **Practice** is the *most* important factor in motor skill learning.

- **Diminishing returns:** performance continues to improve with practice, but at a slower rate (performance score negatively accelerates).



Overlearning:

- Where practice continues *beyond* the amount needed to achieve a certain performance criterion.
- This is done to *reinforce* the learning of a particular skill (as opposed to increasing performance levels).
- Generally, around 50 to 200% overlearning is effective to ensure a criterion level is retained.
- Complex/serial/discrete skills require higher levels of overlearning, as they have higher rates of forgetting. Simple/continuous skills require less overlearning.
- Overlearning can be used as a continuation of practice, or a refresher practice.

Practice distributions:

- Refers to the spacing of practice sessions/practice trials.
- **Massed practice** is where practice is bunched together, with less rest. There are fewer practice sessions, with each session requiring more and/or longer practice. The amount of rest between trials is very short, so practice is relatively continuous. More time is spent at work than at rest. For example, 2 x 4 hour sessions a week, for 2 weeks.
- **Distributed practice** is where practice is spread out, with more rest. The same amount of practice time is spread out, with each session being shorter. The amount of rest between trials is relatively large. For example, 2 x 1 hour sessions a week, for 8 weeks.

- *Distributed* practice sessions appear to be *most* effective for learning.
- Research on distribution *within* practice sessions provides less-clear cut evidence than research on distributing practice sessions.

Explanations behind why distributed practice sessions are most effective:

- **Fatigue** – massed practice sessions reduce the opportunities to recover from practice, causing fatigue.
- **Cognitive effort** – massed practice reduces the amount of cognitive effort the learner uses on each practice trial. Practice becomes monotonous & repetitive.
- **Memory consolidation –** neuro-biochemical processes must occur for memories to form. Distributed practice provides time for memory consolidation to occur.

Practice considerations:

- Distributed practice leads to better practice performance than massed performance (as it allows for some rest, reducing fatigue & boredom). Distributed practice has a greater effect on performance than the effect it has on learning.
- **For *continuous* skills, use *distributed* practice.**
- **For *discrete* skills, use more *massed* practice**, with shorter intervals between practice trials.
- Keep practice sessions short, sharp & more frequent.
- Introduce new/complex skills at the beginning of the session.
- Break up sessions into different activities using *practice variability*

Varying practice:

- **Practice variability:** where a variety of skills, skill variations, and practice conditions are experienced by the learner during practice.
    - Practice variability usually produces *poorer* performance during practice (compared to constant practice conditions), but *better* learning (retention & transfer).
    - Performance errors are actually beneficial to learning retention, and transfer of learning.

Practice variability can be introduced by:

- Varying the practice conditions or different variations of a skill **(intraskill)** – e.g. passing different distances, passing to moving or stationary objects.
- Practicing different skills **(interskill)** in the same practice session – e.g. passing, shooting, dribbling.

- According to Gentile's stages of learning model, introduce variability at the **fixation** (closed skills) **or diversification** (open skills-where the environment is constantly changing) stages of learning.

Types of practice schedules:

1. **Constant practice:** practicing one variation of a skill repetitively (limited variability).
2. **Variable practice:** practicing variations of a skill by varying conditions - for example distances or performance environment (time pressure, defenders etc.).
3. **Blocked practice:** practice of several skills where the learner repeats the same skill over and over again.

4. **Serial practice:** practice of several skills in a fixed order to minimize repetition of the same skill on the next practice trial.
5. **Random practice:** practice of several skills where learners do not practice the same skill 2 times in a row; with the learner constantly switching between skills.

Contextual interference:

- Interference from practicing different skills during practice.
- Blocked practice has *low* contextual interference. Blocked practice results in superior performance during practice (but inferior transfer/learning).
- Random practice has *high* contextual interference (for example, practicing dribbling and shooting in between passing drills can interfere with passing). Random practice results in superior performance during retention/transfer tests (learning), as well as having better transfer to competition/games.

Factors influencing the effect of contextual interference:

- **Age** – blocked practice is more appropriate than random practice for early learning with younger children.
- **Skill level** – in early stages use blocked practice, in later stages use random practice.
- **Serial practice** – combines the easier scheduling of blocked practice with the non-repetitiveness of random practice.
- **Learning goals of the session** – do we want immediate performance or learning to occur.

Explanations for the contextual interference effect:

- **Elaboration hypothesis:** Constantly comparing & contrasting different skills promotes rich, distinctive & elaborate memory of skills. Random practice forces learners to concentrate & pay more attention to the skill, storing a more elaborate memory representation.
- **Action plan reconstruction:** Having to perform random/different skills requires the learner to reconstruct an action plan on each practice attempt. This is in contrast to blocked practice, where the learner just uses the same action plan each time.

Theoretical support for varying practice conditions:

- **Generalised motor program & schema development:** varying practice helps develop schema (the set of rules that learners use to modify the GMP) to modify parameters. For example, having practiced kicking over 10m and 20m the learner can adjust these parameters in order to kick over 15m.
- **Dynamic systems & constraints-led perspective:** Variability emphasises the need for the learner to explore movement solutions to constraints. Varying practice helps learners to compensate for changing constraints on movement.
- **Stages of learning:** varying practice helps to fixate & diversify a movement pattern.
- **Motivation & attention:** repetitive practice causes boredom, and a lack of attention on skill. Varying practice encourages learners to invest more cognitive effort.