Motor learning

C.2 · SL and HL

A model serve and a delayed response

> Compare defined times; do not treat the model as a universal athlete measurement.

- Invented: 30 m at constant 220 km/h takes about 0.491 s.
- A supplied 0.65 s whole response exceeds that flight time.
- Early cues may help; incorrect **anticipation** can send a player the wrong way.

Skill and ability

Skill

Learned, consistent, efficient.

A handstand.

Ability

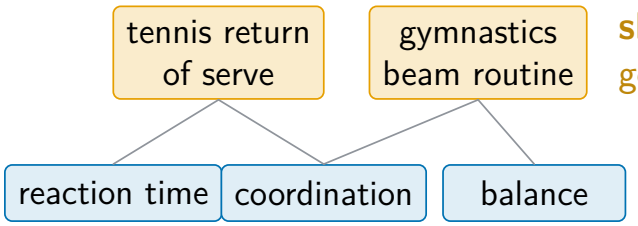
Supporting capacities, influenced by inheritance and experience.

Balance, strength; trainable and context dependent.

Classifying skills

Continuum	**Example ends**
Gross – fine	Shot put – dart throw
Closed – open	Vault – match pass
Discrete – continuous	Penalty – cycling
Self – externally paced	Golf drive – receiving a serve

Abilities underpin skills

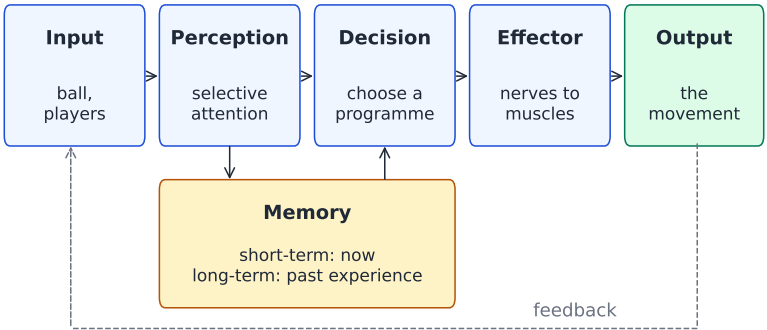


skill: learned, goal-directed

ability: more stable capacities that support it

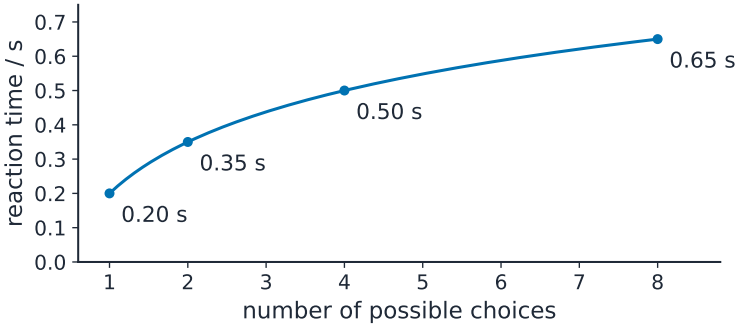
> Abilities are stable; skills are learned

Processing information



> A model organises an explanation; it is not a literal computer in the athlete.

Hick's law



Doubling N adds 0.15 s in this supplied model.

Saving a penalty

1. **Ball.** $11 \div 25 = 0.44$ s
2. **Keeper.** $0.35 + 0.45 = 0.80$ s
3. **Compare.** $0.80 \text{ s} > 0.44 \text{ s}$

Decision

For this supplied full-dive response, waiting until the kick is too slow.

The dummy pass

> A feint may exploit a response bottleneck; timing and interpretation matter.

- A first response can delay selection of a second.
- This does not mean all brain processing occurs one stimulus at a time.

Open and closed loop

Open loop

Pre-planned, no **feedback** during.

Golf swing.

Closed loop

Feedback corrects errors.

Balancing on a beam.

Types of feedback

Knowledge of results

Outcome: measured jump distance.

"The jump was 4.10 m."

Knowledge of performance

Movement feature: foot placement.

"Take-off was 20 cm behind the board."

Too much feedback

> **Feedback** after every attempt can harm learning.

- Learners come to depend on it.
- Use faded or bandwidth feedback.

Schemas and task-specific versions

General organisation

A generalized throwing pattern.

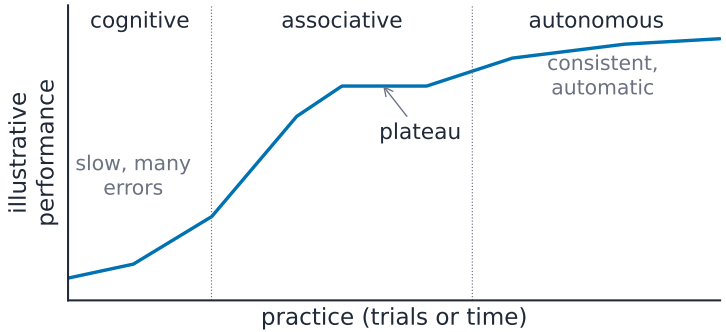
Relative organisation retained across variants.

Task-specific specification

Adapt force or duration to distance and implement.

Expected sensory **feedback** supports evaluation.

Stages of learning



A flat score does not prove a permanent **ability** ceiling.

The three stages

Stage	Learner
Cognitive	Slow, many errors, thinks about every part
Associative	Refining; fewer errors
Autonomous	Automatic; attention free for tactics

Learning or performance?

> Measure learning with retention and **transfer** tests.

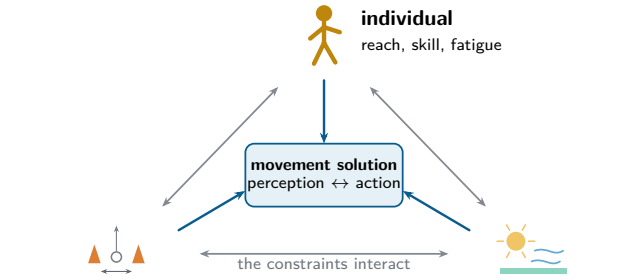
- Performance, one occasion.
- Learning, a relatively permanent change.

A live lane is an opportunity

> An affordance depends on both the environment and the performer.

- A gap may be passable for one player but not another.
- Perception guides movement; movement changes the information available.
- A static cone task can omit the defender information needed in a match.

Three interacting constraints



passing game: narrow the gate (a task constraint), observe how passes change, then judge whether the learning transfers to a match

Change one meaningful constraint; observe adaptation and **transfer**.

Coordination can self-organise

Many possibilities

Degrees of freedom include joints and timing relationships.

A novice may restrict motion initially.

Functional solutions

Coordination emerges within meaningful constraints.

Variability may be adaptive, error or measurement noise.

Compare teaching approaches fairly

Linear teaching

Demonstration, sequenced practice, explicit correction.

Can provide useful structure.

Non-linear teaching

Explore opportunities created by task constraints.

Progress need not be proportional to each change.

Attention has two dimensions

	Broad	Narrow
External	Scan players and spaces before choosing a pass	Attend to the target at release
Internal	Review tactical options during a stoppage	One breathing cue during a reset

Switch focus when the phase and task change

> Width and direction answer different questions.

A relevant sound is not automatically distraction

External

Irrelevant crowd noise can distract.

A teammate's useful call may be relevant.

Internal

Worry about an old error can distract.

A chosen process cue may help refocus.

Rehearse a safe refocusing strategy

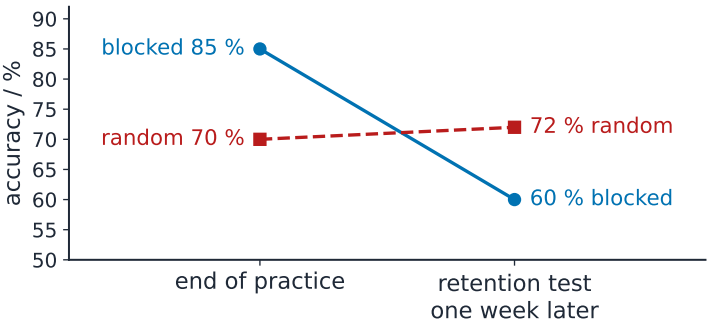
Practise returning attention to the task under manageable distraction.

- Agree mild cues and preserve safety communication; never induce distress.
- A process goal: scan the defender before passing.
- A self-talk cue: scan, choose, pass.
- Check delayed **transfer**; extra instructions can also overload.

Practice methods

Method	Best for
Whole	Fast or continuous skills
Part	Complex skills with separable parts
Whole–part–whole	Most skills
Progressive part	Serial skills, such as triple jump

Blocked or random?



This example favours random at retention; it does not prove a universal rule.

Check: which guidance?

Your turn

A coach holds a learner's hips through a handspring. Which guidance is this?

A. Visual
B. Verbal
C. Manual
D. Mechanical

Specify source and target of transfer

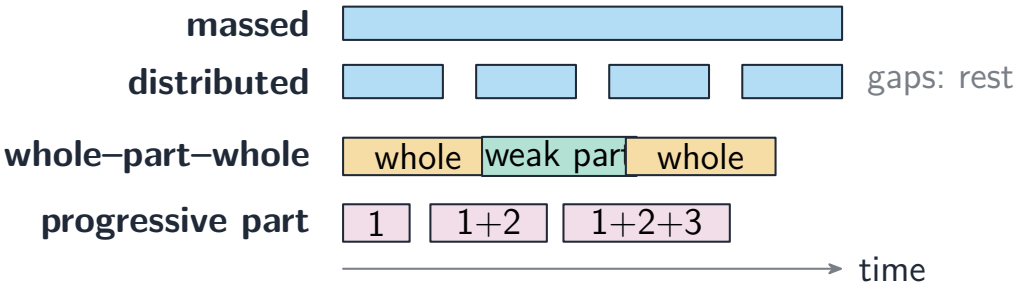
> Similarity alone does not establish that one sport helps or harms another.

- **Transfer** can support, hinder or have little effect on a target skill.
- Different timing, information or equipment can limit transfer.

Transfer takes several routes

Source → target	**Example**
Skill → skill	Throwing experience → a serve
Practice → performance	Live-decision drill → match
Ability → skill	Balance capacity → handstand learning
Bilateral / stage → stage	Experience across side / learning phase
Principle → skill	Create space → a new passing activity

Practice schedules



Match the schedule to the skill and the learner

Four kinds of guidance

visual
demonstration, video
+ clear picture
− must be accurate

verbal
instructions
+ key points
− too much detail overloads

manual
physically guided
+ safety, feel
− dependence

mechanical
harness, float
+ safe practice
− altered feel

> Each has a strength and a limit

Exam tips

> Match **feedback**, guidance and practice to the stage of learning.

- Justify each skill classification.
- Do not mix up results and performance feedback.
- Show learning with retention tests.

Calculate changes with the right denominator

1. **Blocked** $60 - 85 = -25$ percentage points
2. **Random** $72 - 70 = +2$ percentage points
3. **Relative decline** $25/85 \times 100 = 29.4118\ldots\%$

Decision

Percentage points and relative percentage change are different quantities.

Check yourself

Try these

Compare 7/30 s flight with a supplied 0.60 s whole response.

Explain why take-off foot placement is knowledge of performance.

Design one constraints-led change and test delayed transfer.