McMaster University

SCIENCE

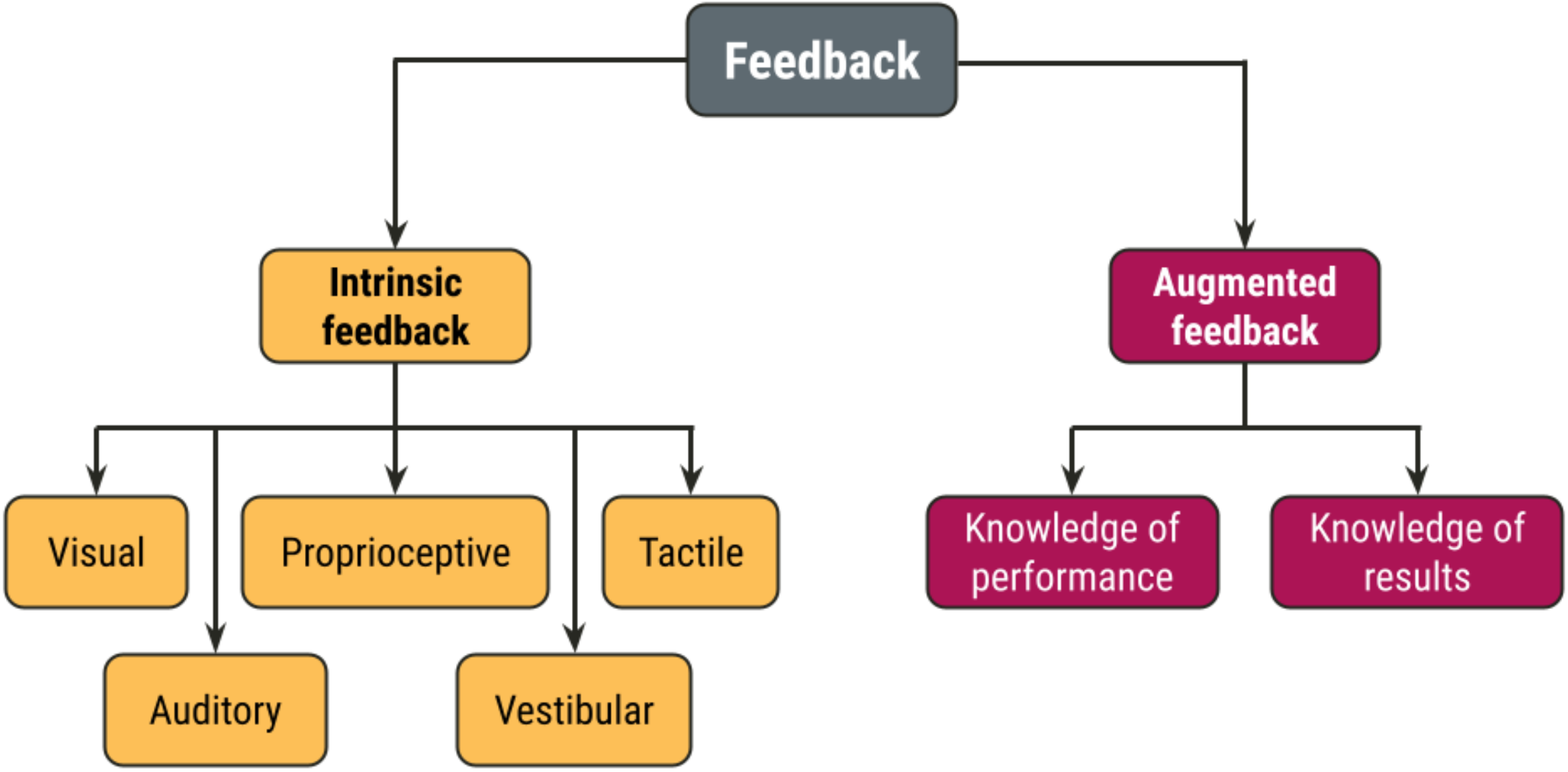
Department of Kinesiology

Feedback: Scheduling techniques

KINESIOL 1E03 - Motor control and learning

Laura St. Germain
Fall 2022 Week 8
Lecture 16

Review from last lecture



Adapted from Magill and Anderson 2017

Augmented feedback: Similarities and differences

Knowledge of results	Knowledge of performance
Similarities	
Verbal (or verbalizable)	Verbal (or verbalizable)
Augmented	Augmented
Provided after movement (usually)	Provided after movement (usually)
Differences	
Information about goal outcome	Information about movement pattern
Often redundant with intrinsic feedback	Usually distinct from intrinsic feedback
Usually provided as a score	Usually kinematic information
Often used in laboratory research	Often provided in everyday activities

Paradoxical properties of augmented feedback

- Augmented feedback **can be essential** for motor learning

BUT...

- Augmented feedback **may not be essential** for motor learning

- Augmented feedback **can enhance** motor learning

BUT...

- Augmented feedback **can hinder** motor learning

The roles of augmented feedback in motor learning

Informational role

- **Guide** the learner to an appropriate movement solution
- Facilitate **achievement** the action goal of the skill
- Emphasized in the **Guidance** hypothesis[1]
    - Feedback is both a **performance** and **learning** variable

Motivational role

- **Encourage** the learner to continue striving toward a goal through continued practice
- Secondary or a **by-product** of informational role
- Emphasized in the **"OPTIMAL"** theory[2]
    - Practice context can put learners into a **virtuous** or a **vicious** cycle

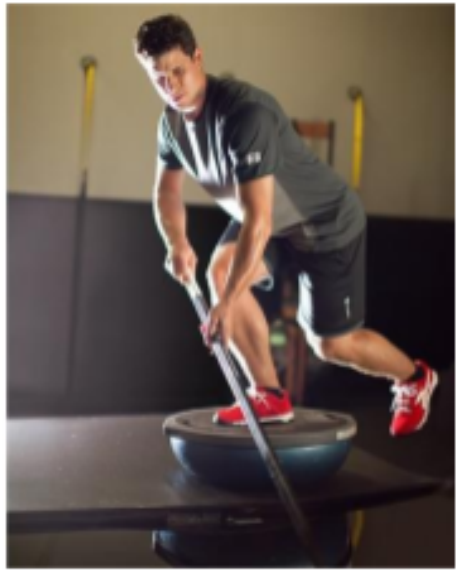
[1]Salmoni et al 1984 (https://doi.org/10.1037/0033-2909.95.3.355); [2]Wulf and Lewthwaite 2016 (https://doi.org/10.3758/s13423-015-0999-9)

Any questions?

Strength

Game Performance

Balance/Agility



Practice

Augmented feedback

Health

Learning objectives

1. Identify and describe scheduling techniques based on the **content** of the feedback.
2. Identify and describe scheduling techniques based on the **frequency** of the feedback.
3. Identify and describe scheduling techniques that encourage specific **cognitive** processes.

Take-home message:

(Augmented) feedback plays a vital role in motor learning, but the effectiveness of a scheduling technique will depend on the task, individual, and environment.

Things to keep in mind when providing feedback

1. What type of feedback should I provide?
2. How much feedback should I give?
3. What cognitive processes should be encouraged?

Source: https://i.redd.it/i9ef5seywxj21.jpg

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What type of feedback should I provide?

- Prescriptive versus descriptive feedback
- Relatively *"good"* versus relatively *"poor"* trials

Source: https://i.redd.it/i9ef5seywxj21.jpg

Prescriptive versus descriptive feedback

Prescriptive feedback

Example: "You need to rotate your shoulders more to extend your follow through"

Function: Point out a **specific alteration** or **correction** for the action

Application: Most useful for **inexperienced** learners

Source: https://golfbetter.ca/wp-content/uploads/2018/02/CIMG3955-1.jpg

Prescriptive versus descriptive feedback

Descriptive feedback

Example: "You released your wrists too soon"

Function: Direct the learner's attention to a **specific aspect** that needs **correction** by **stating the error** made

Application: Most useful for **experienced** learners

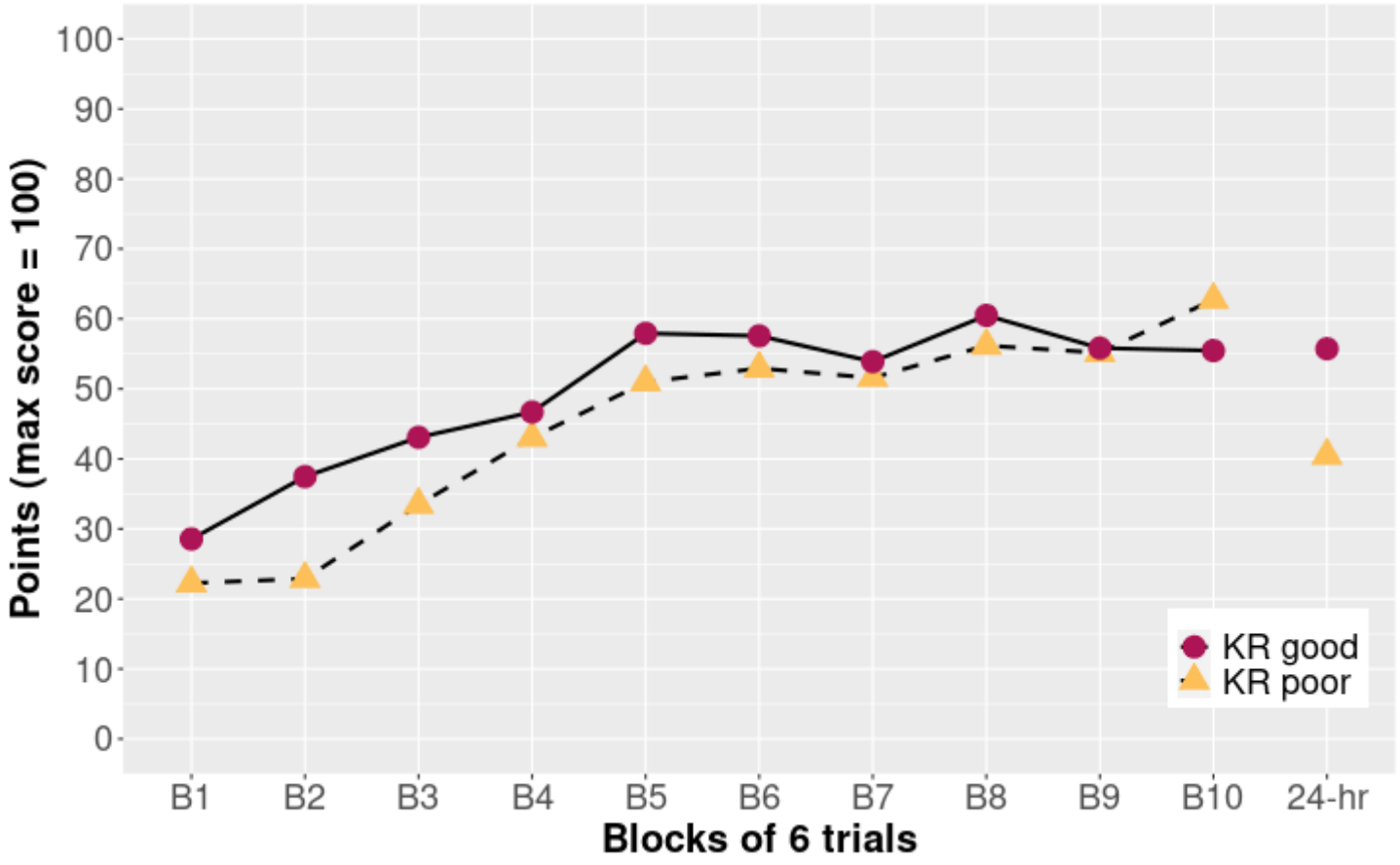
Source: https://golfbetter.ca/wp-content/uploads/2018/02/CIMG3955-1.jpg

Relatively "good" versus relatively "poor" trials

Task: Underhand bean bag toss to a floor target while blindfolded

Groups:

- **KR good** - feedback reflected their 3 *best* trials in a 6 trial block
- **KR poor** - feedback reflected their 3 *worst* trials in a 6 trial block



Approximate data of Chiviacowsky and Wulf 2007 (https://doi.org/10.1080/02701367.2007.10599402) through plot digitization

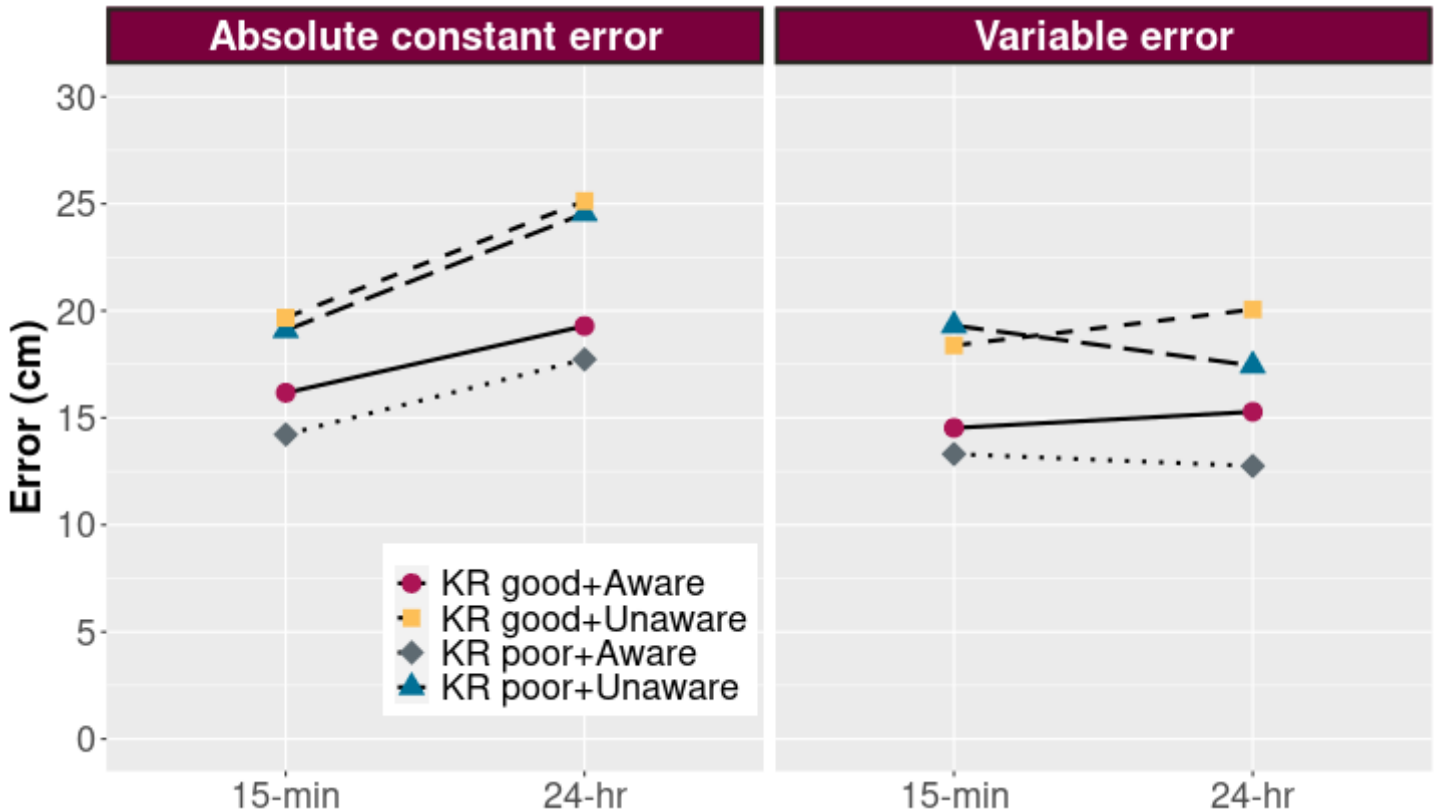
But awareness of feedback type is more important than whether it reflects good or poor trials

Task: Targeted force production task

Groups:

- KR good+Unaware
- KR poor+Unaware
- **KR good+Aware**
- **KR poor+Aware**

Aware groups: Explicitly told their feedback reflected their 3 *best* or *worst* trials out of the 6



Adapted and approximate data of Patterson and Azizieh (https://doi.org/10.1016/j.humov.2012.04.004) through plot digitization

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How much feedback should I give?

- Higher versus lower frequencies
  - Fading techniques
  - Summary techniques

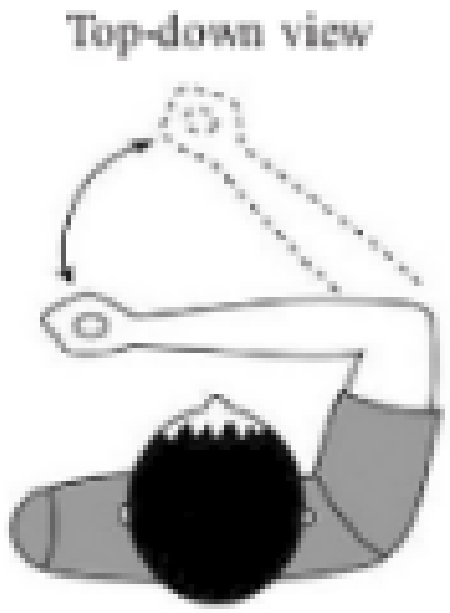
Source: https://i.redd.it/i9ef5seywxj21.jpg

Giving too much feedback can reduce retention

Task: Waveform matching task

Groups:

- **100% feedback** or after every trial
- **50% feedback** through a tapered or faded schedule (high amount early but low amount late)



Winstein and Schmidt 1990, Experiment 2 (https://doi.org/10.1037/0278-7393.16.4.677)

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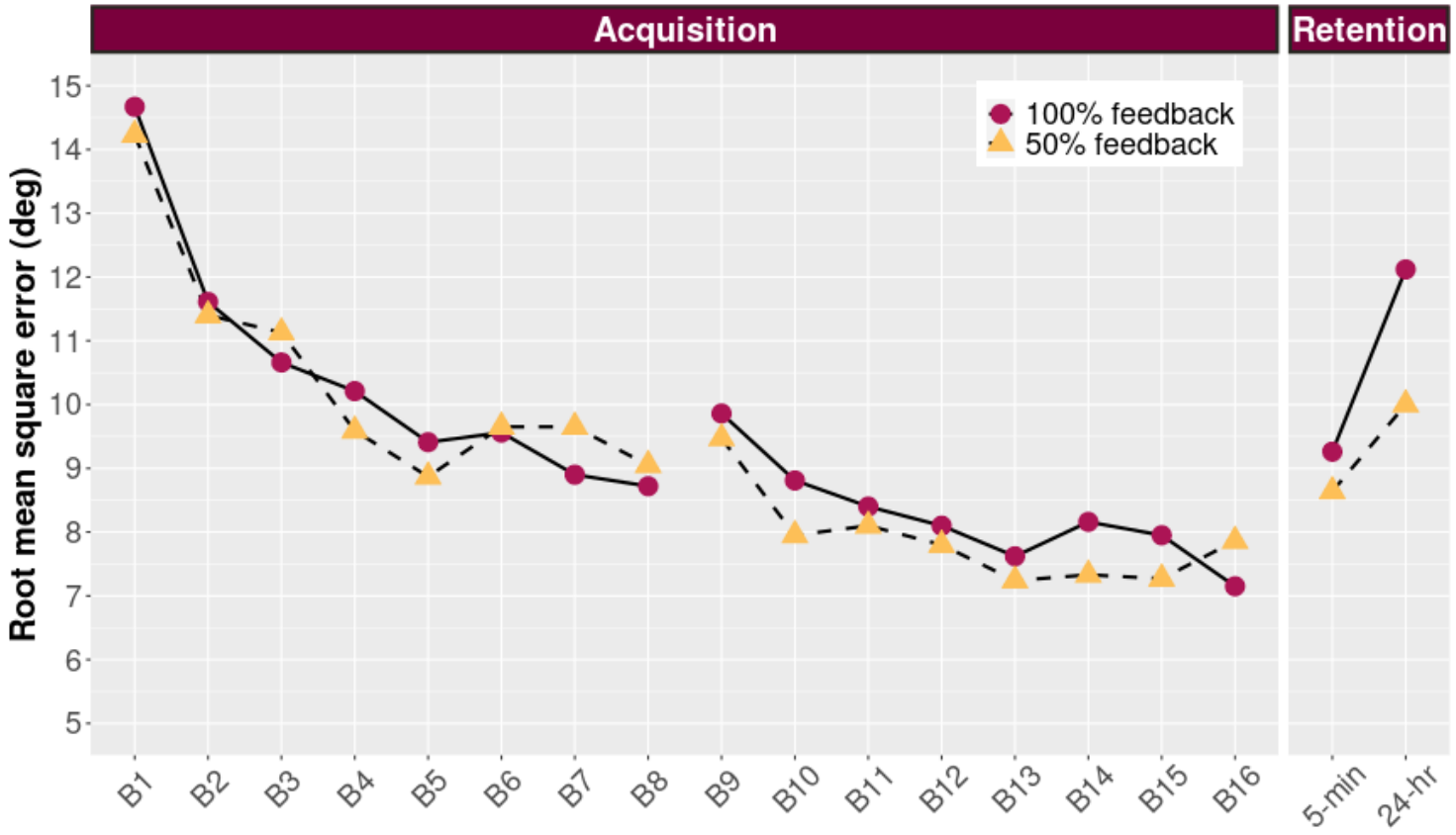

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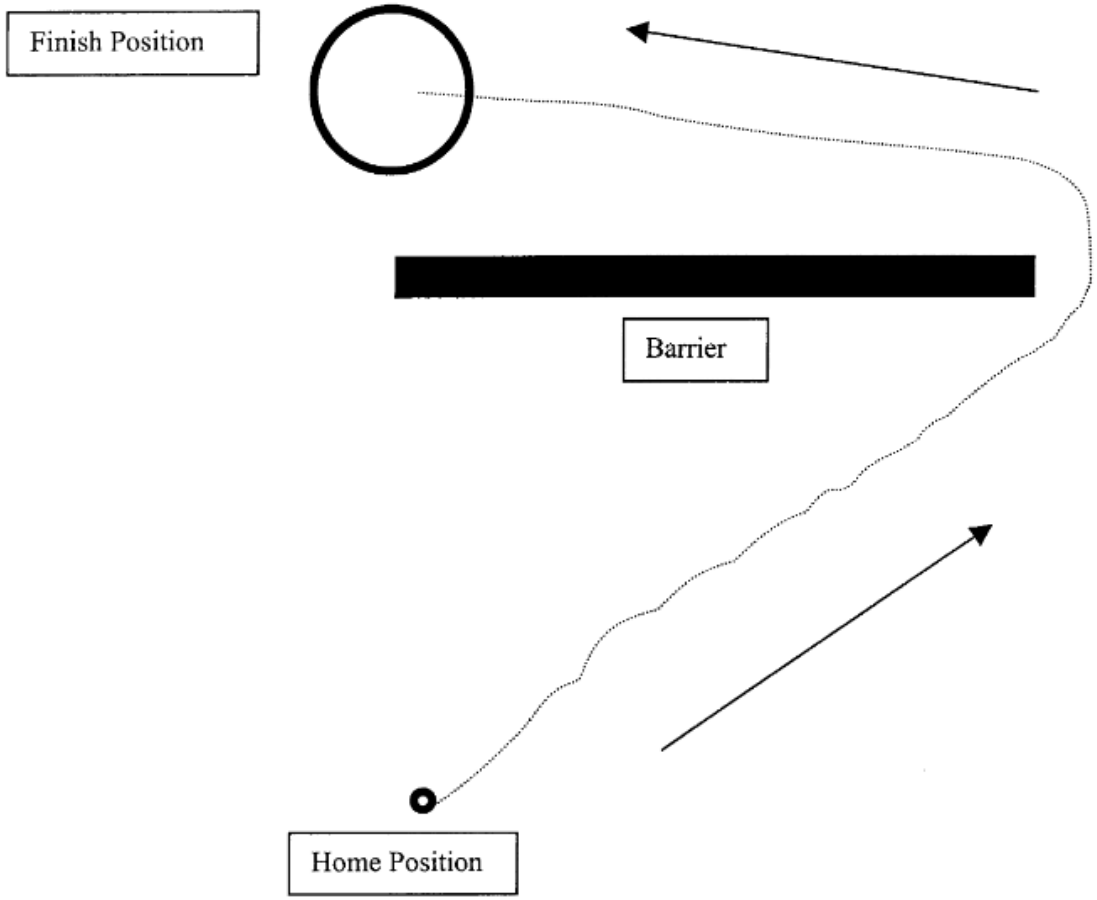
But need to consider the who you are working with

Task: Reaching task with a 65% movement time goal of personal maximum speed

Population: Healthy **older** adults and **Parkinson's** disease patients

Feedback:

- **100% feedback** or after every trial
- **20% feedback** or after every 5th trial



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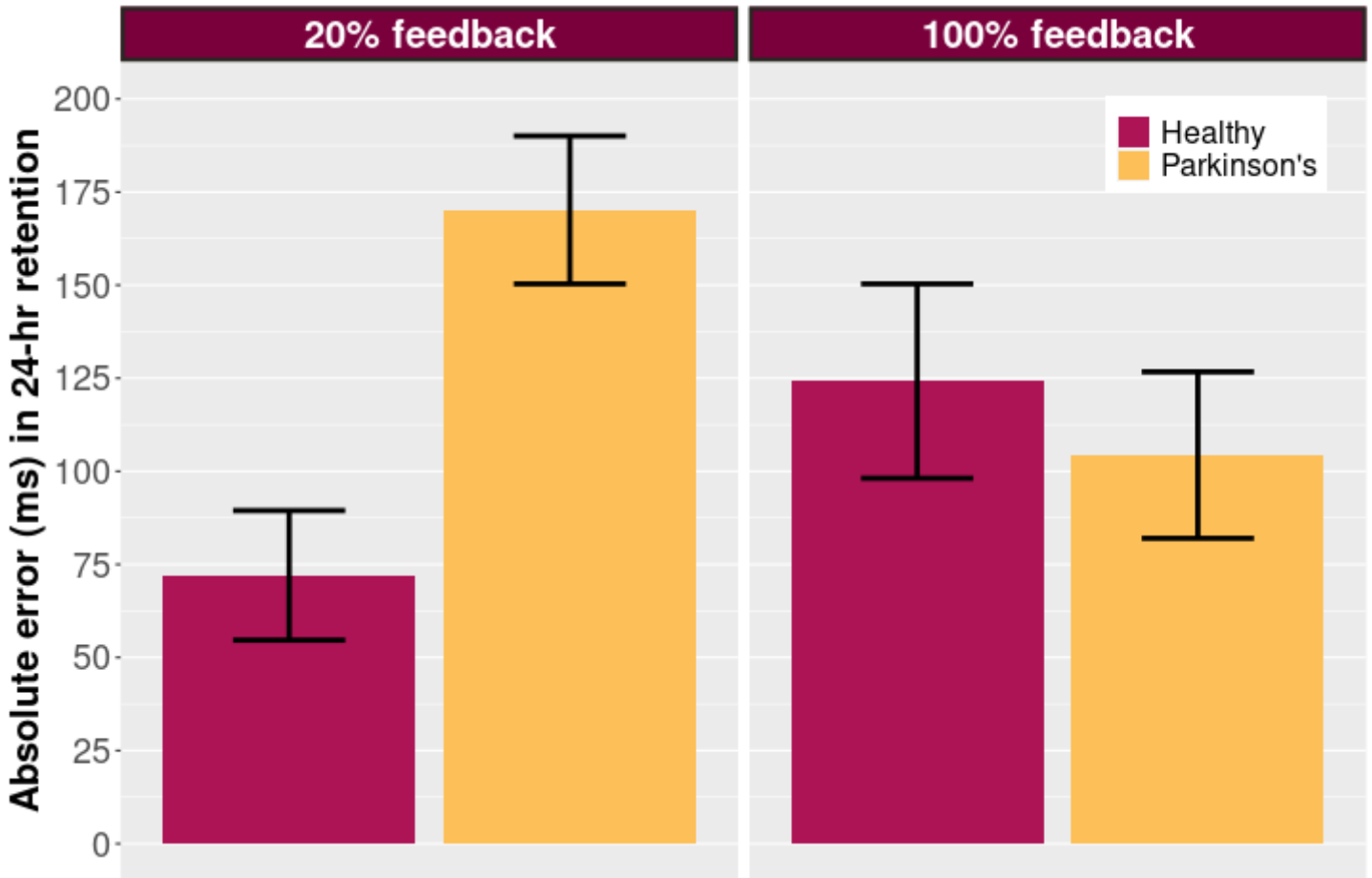


Approximate data from Shadmehr et al. 2002 (https://doi.org/10.1016/S1353-8020(02)00007-X) through plot digitization

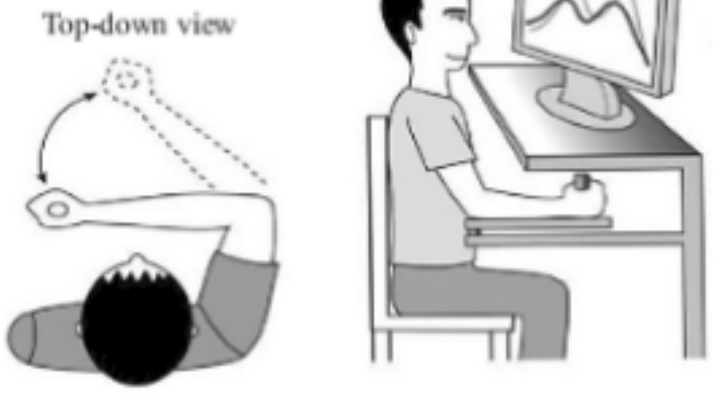
Providing feedback with a summary display can prevent becoming dependent on feedback

Task: Waveform matching

Groups:

- Summary **1**
- Summary **5**
- Summary **10**
- Summary **15**

Protocol: Feedback is given for all trials in the summary length



Your feedback

Trial 1: 100 ms
Trial 2: -88 ms
Trial 3: -45 ms
Trial 4: -100 ms
Trial 5: -21 ms

Schmidt et al 1989 (https://doi.org/10.1037/0278-7393.15.2.352)

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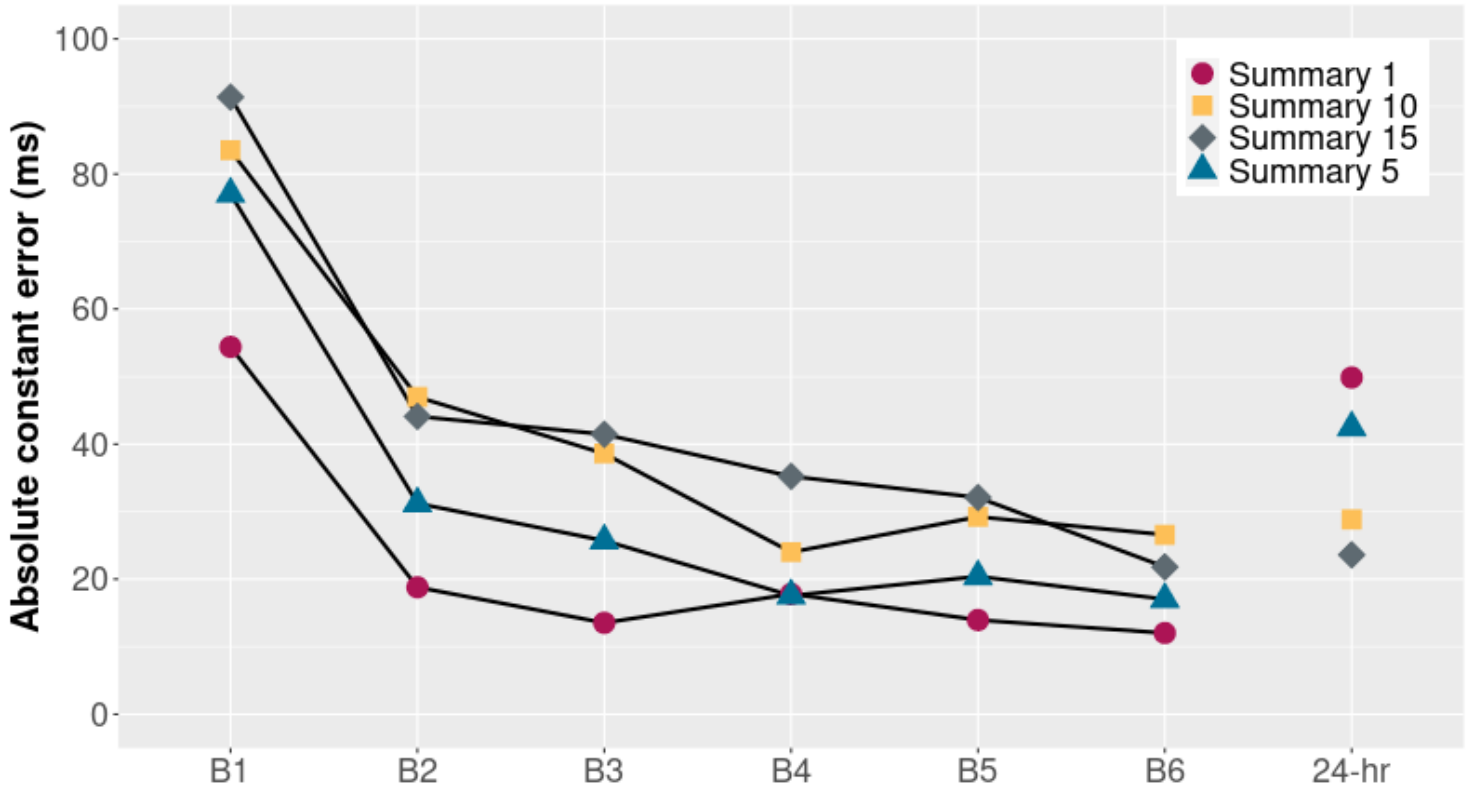

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What cognitive processes should be encouraged?

- Error estimation

Source: https://i.redd.it/i9ef5seywxj21.jpg

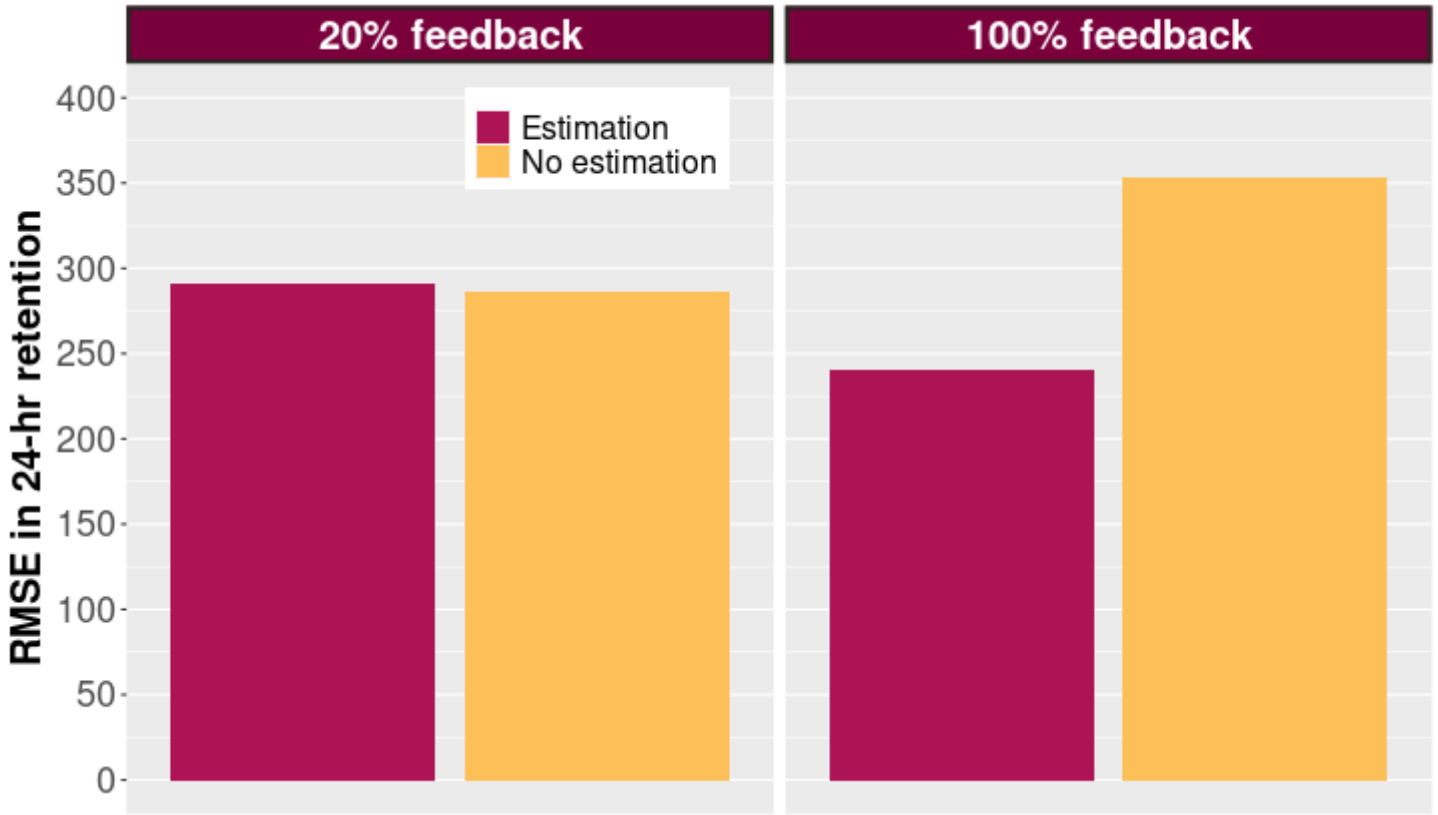
Error estimation during practice with different relative feedback frequencies

Task: Strike a padded with a exact amount of force (19.5 N)

Feedback: **100%** or **20%** of trials

Error estimation: **100%** or **20%** of trials

This resulted in **four** experimental groups



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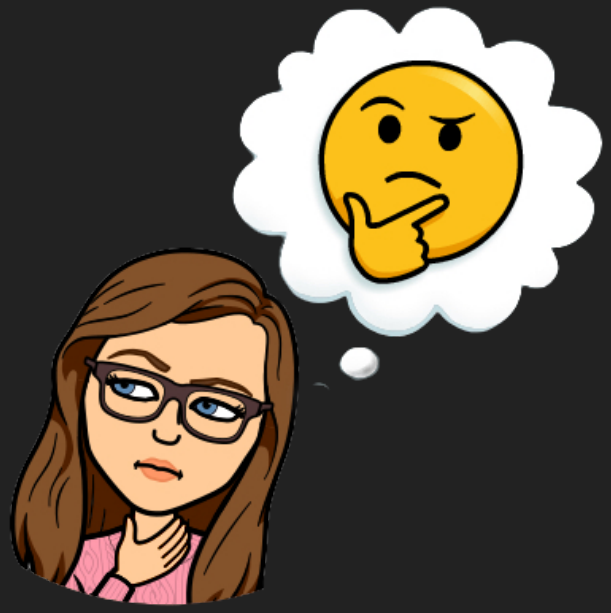

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