McMaster University

SCIENCE

Department of Kinesiology

Distribution and variability of practice

KINESIOL 1E03 - Motor control and learning

Laura St. Germain

Fall 2022 Week 9

Lecture 17

Test review

- Wednesday 11:30-12:30
- Thursday 10:30-11:30
- IWC 220

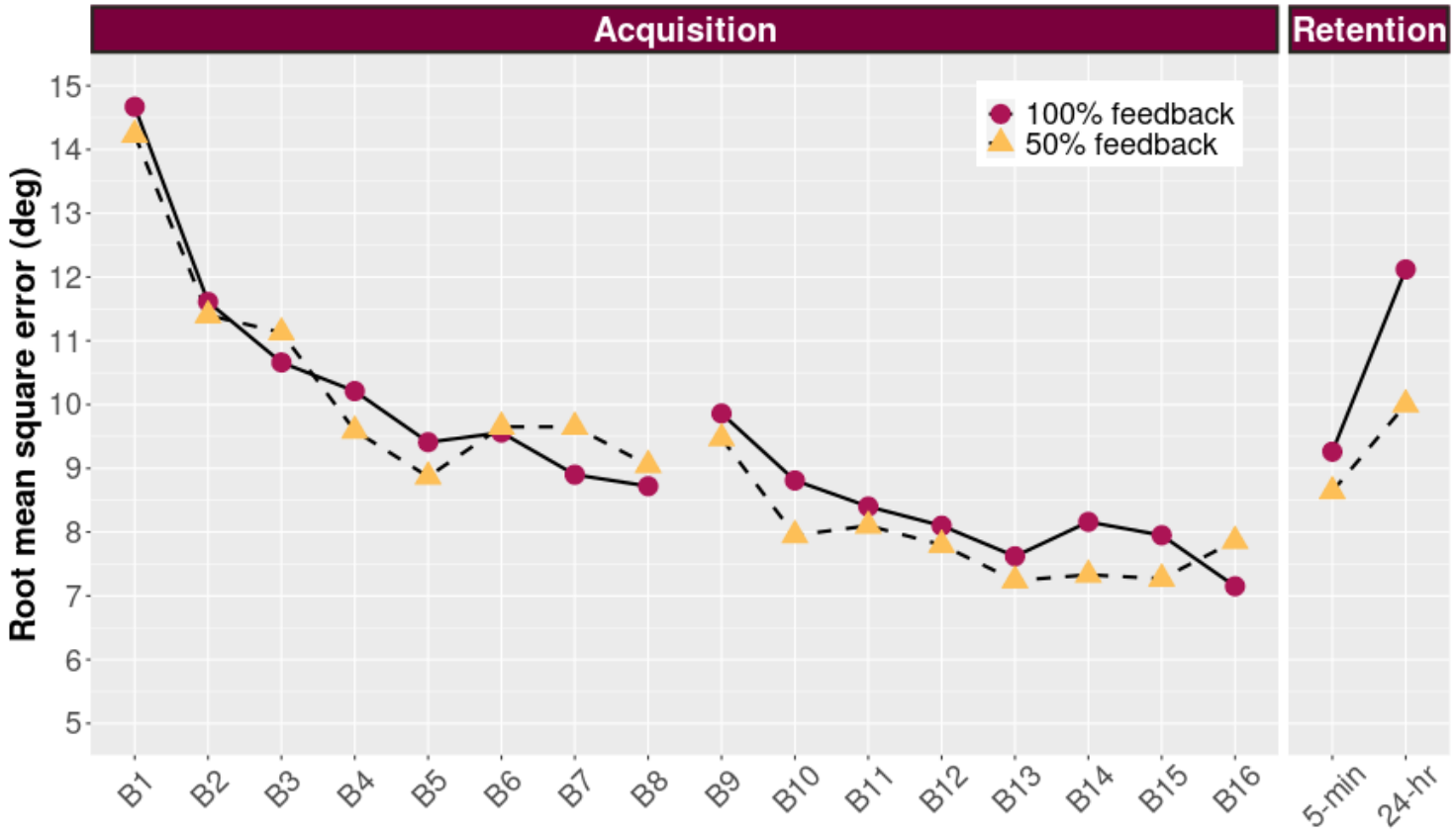
Review from last lecture

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)

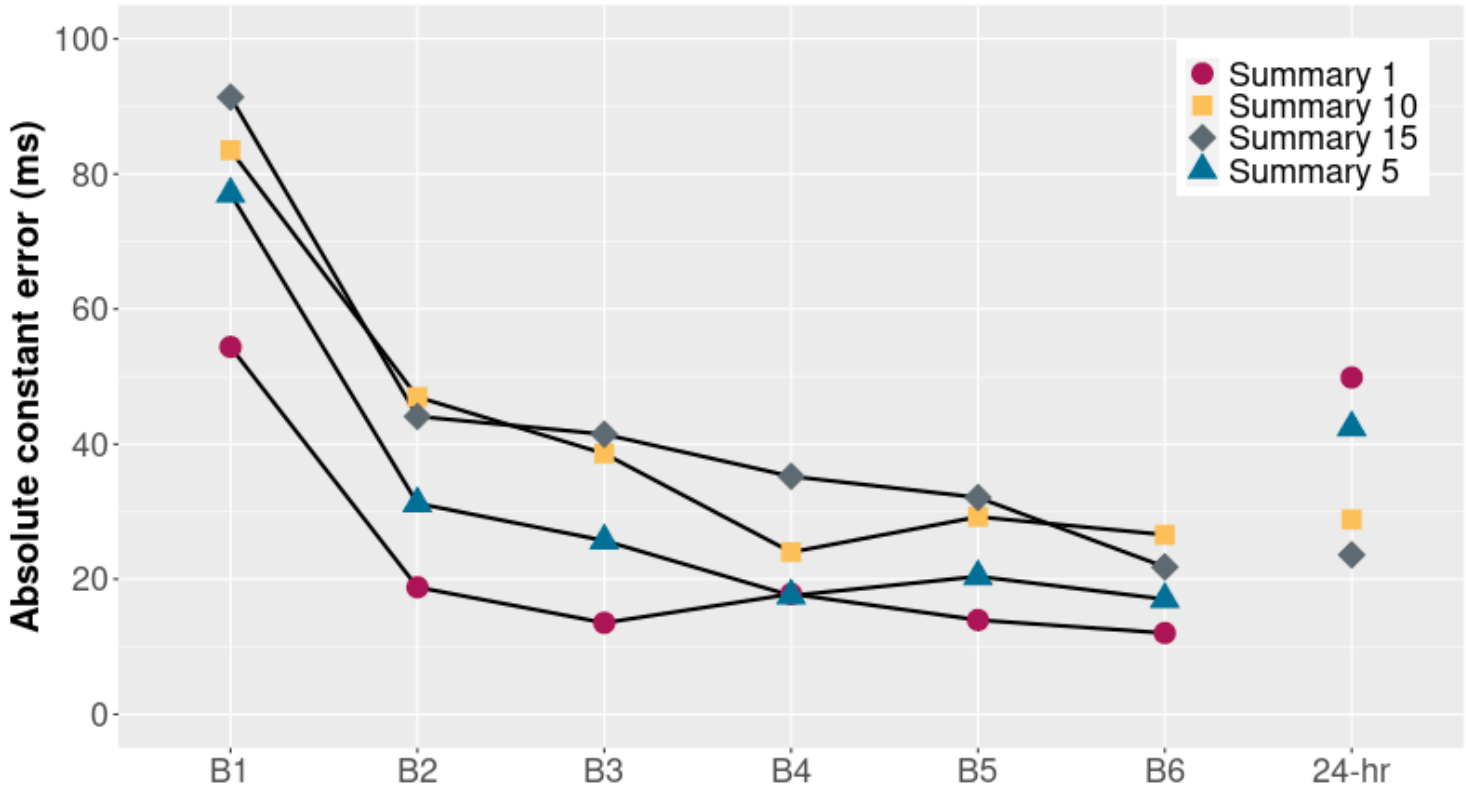
Providing feedback with a summary display can prevent becoming dependent on feedback

Task: Waveform matching

Groups:

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

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



Adapted and approximate data from Schmidt et al 1989 (https://doi.org/10.1037/0278-7393.15.2.352) through plot digitization

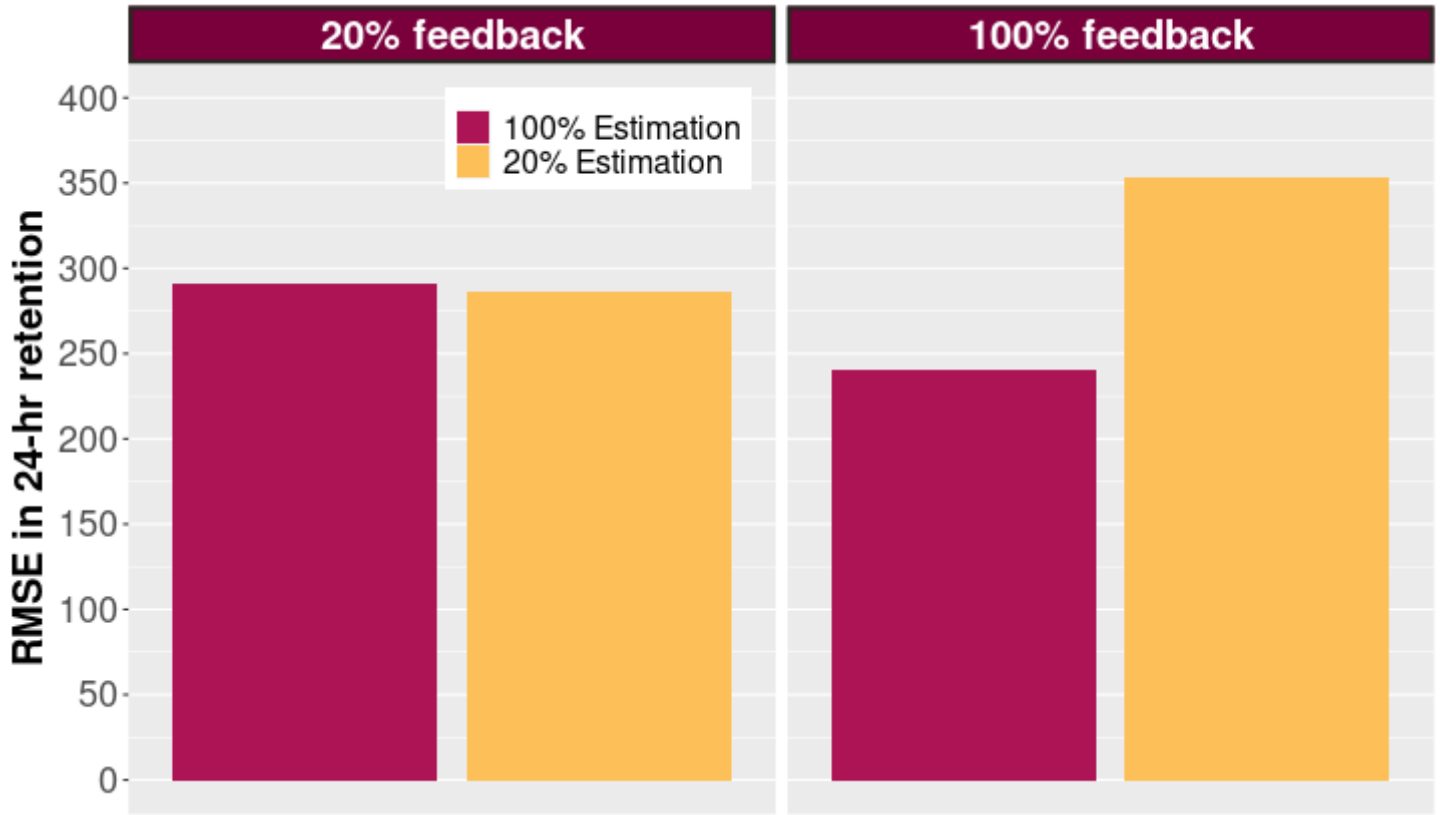
Error estimation during practice with different relative feedback frequencies

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



Adapted and approximate data from Guadagnoli and Kohl 2001 (https://doi.org/10.1080/00222890109603152) through plot digitization

Any questions?


1001
2
NADA
Goldline

Learning objectives

1. Compare and contrast **different methods** of **structuring** practice.
2. Describe the relative **strengths** and **weaknesses** of different **conditions** of practice.
3. Discuss the role and importance of **variability** and the **distribution** of practice for motor learning.

Take-home message:

The organization of one's practice session can have profound and often paradoxical effects of motor learning.

How should we balance practice and rest intervals?

Q's: How many days a week should learners practice? How long should each practice session be?

MASSED PRACTICE: a **practice schedule** in which the amount of rest **between** practice sessions or trials is **relatively short**

DISTRIBUTED PRACTICE: a **practice schedule** in which the amount of rest **between** practice sessions or trials is **relatively long**

Source: https://st1.latestly.com/wp-content/uploads/2021/07/FotoJet-31-784x441.jpg

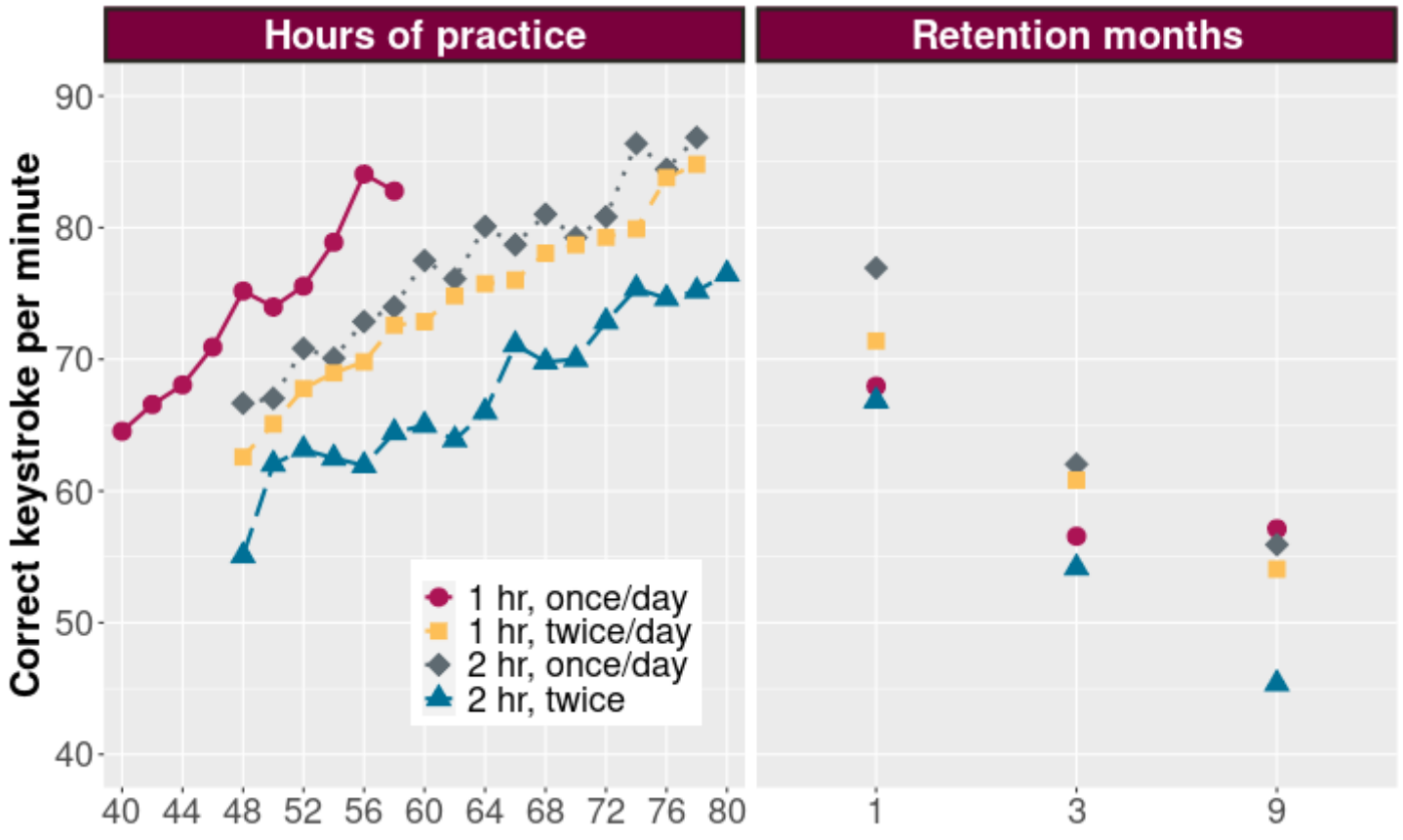
The benefits of more and shorter practice sessions

Task: Keyboard mail sorting machine

Training: Alloted 60 hrs and 5 days each week

Groups:

- **1 hr, once/day** = 12 weeks
- **2 hr, once/day** = 6 weeks
- **1 hr, twice/day** = 6 weeks
- **2 hr, twice/day** = 3 weeks



Approximate data adapted from Baddely and Longman 1978 (https://doi.org/10.1080/00140137808931764) as presented in Schmidt and Lee 2011

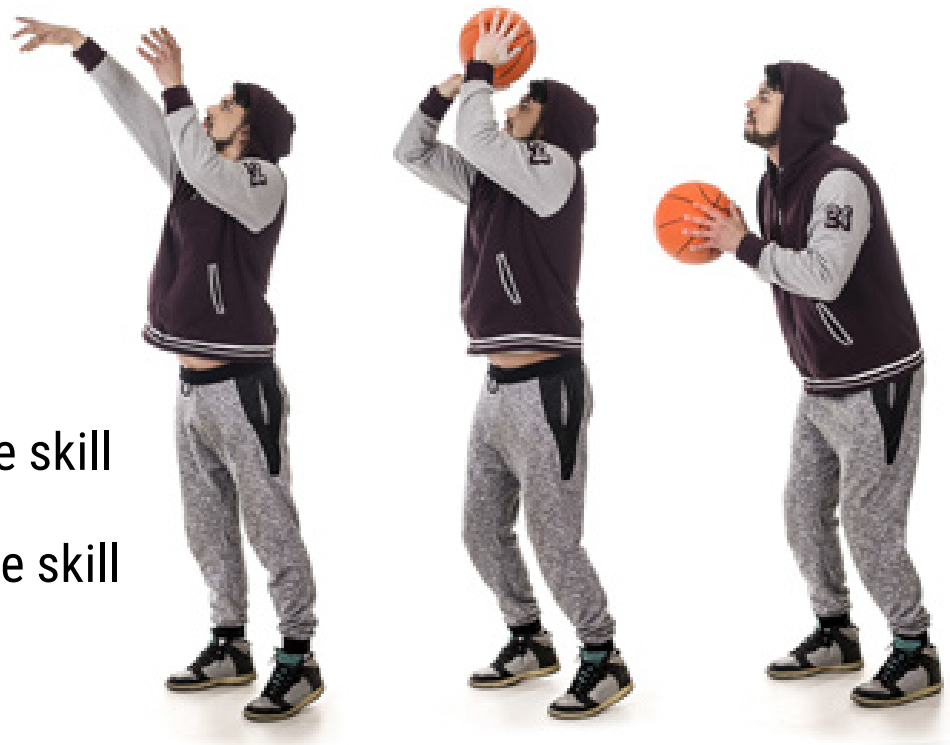
Practice distribution and total practice time involves a trade-off

- **Distributed practice** results in more learning per time in training, but requires the most total time to complete

- **Massed practice** results in reduced benefits per time in training, but requires less total time

What is the trade-off?

Q: How should you practice basketball free throws?

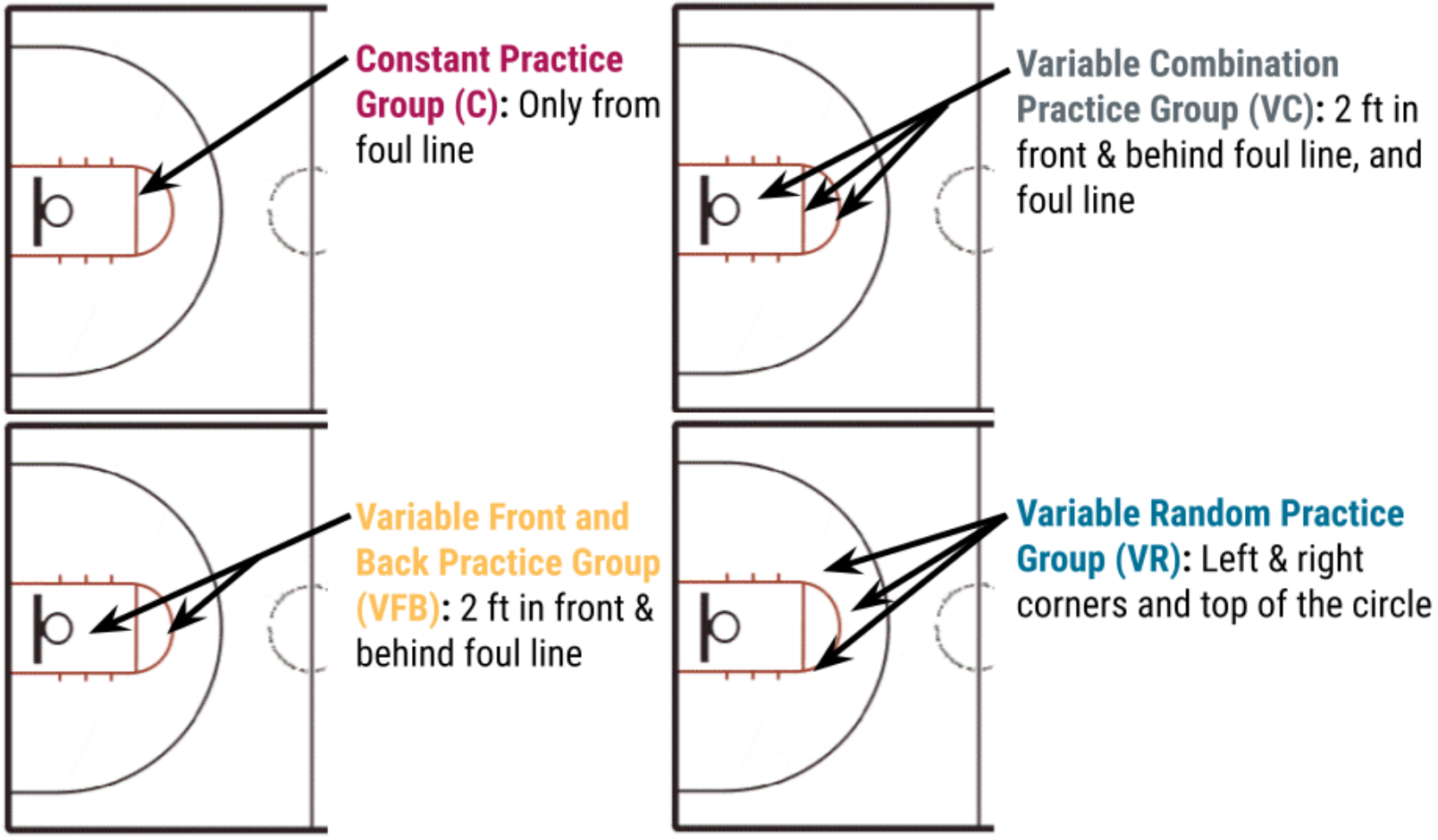


CONSTANT PRACTICE: Practice a **single variation** of the same skill

VARIABLE PRACTICE: Practice **multiple variations** of the same skill

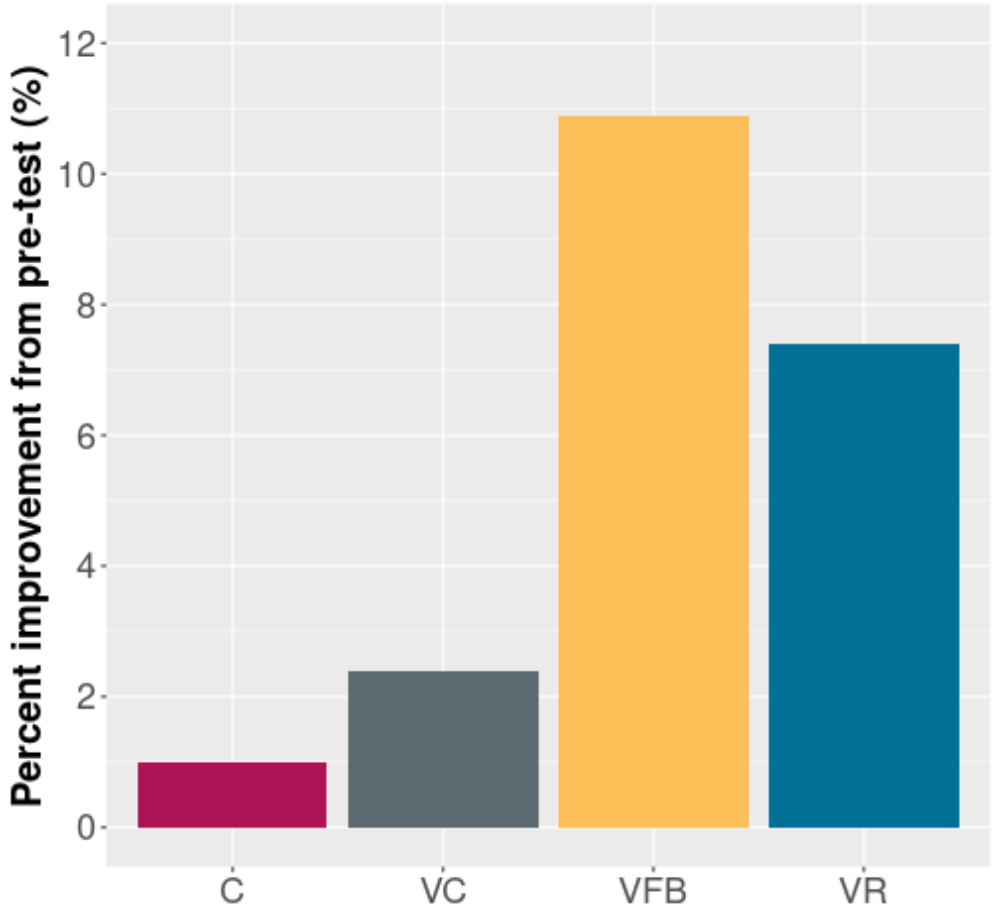
Source: https://www.aubreydaniels.com/sites/default/files/Dr.%20Ericsson%20and%20deliberate%20practice.jpg

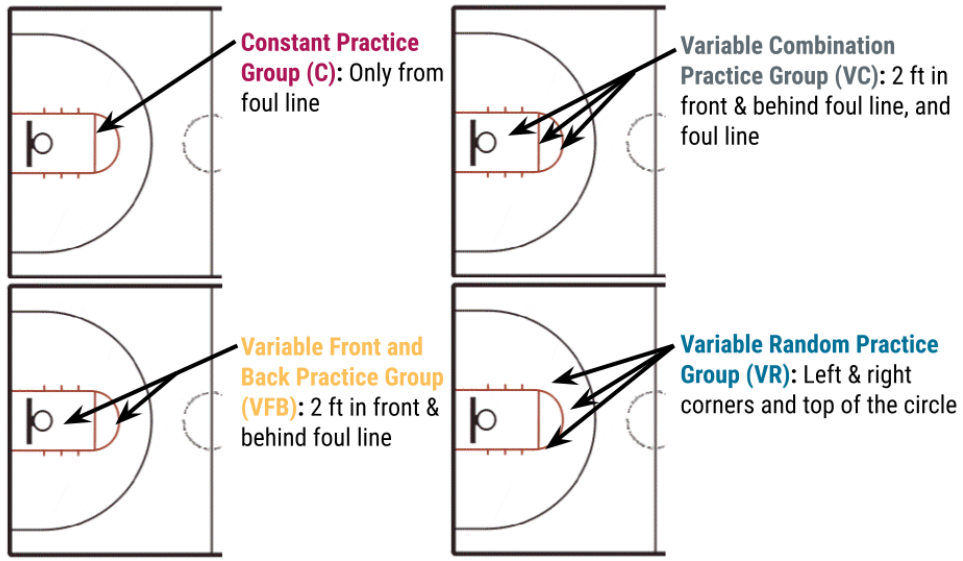
Constant versus variable practice for free throws



Shoenfelt et al. 2002 (https://doi.org/10.2466/pms.2002.94.3c.1113)

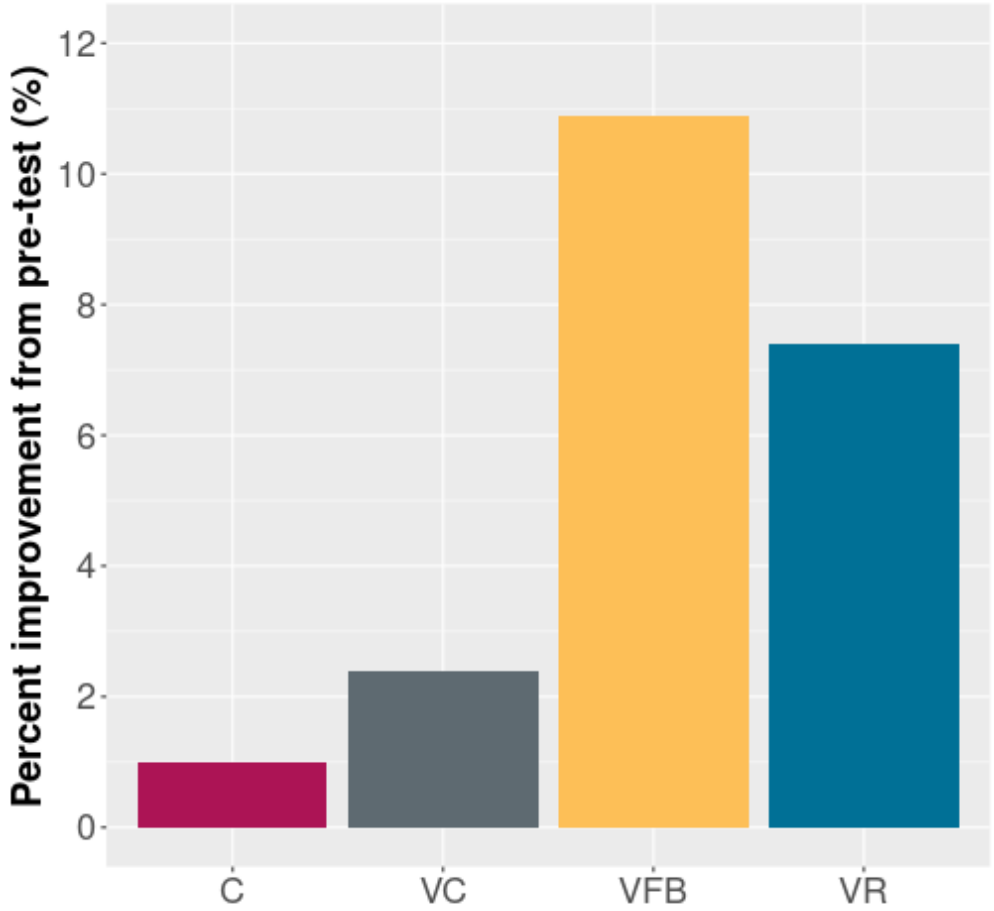
Constant versus variable practice for free throws



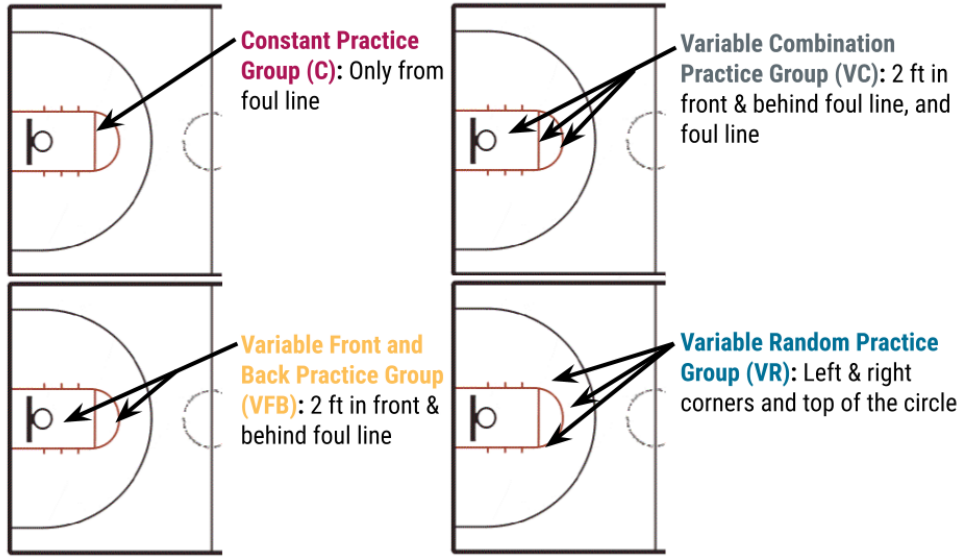


Shoenfelt et al. 2002 (https://doi.org/10.2466/pms.2002.94.3c.1113)

Constant versus variable practice for free throws



Shoenfelt et al. 2002 (https://doi.org/10.2466/pms.2002.94.3c.1113)

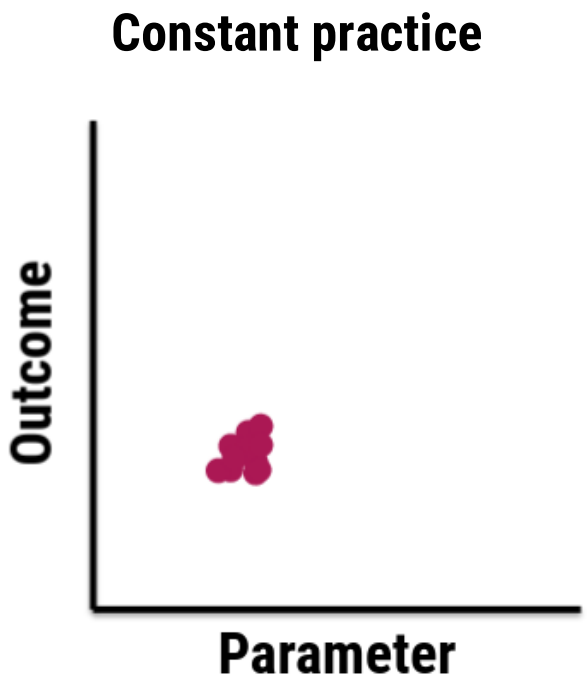


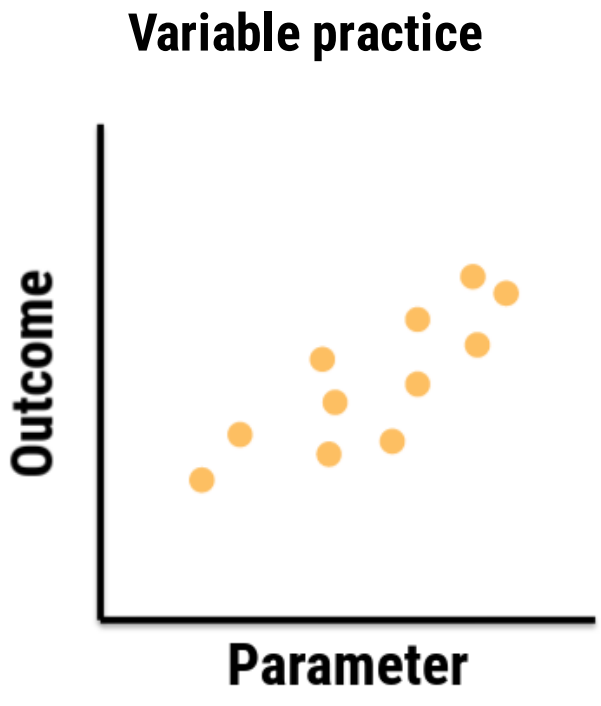
Q1: *What can you conclude based on this figure showing percent improvement from pre-test to 2-week retention test?*

Q2: *What is the most surprising finding from this data?*

Variable practice facilitates the acquisition of motor schema

- **Schema** allow us to learn the basic **mapping** between a **parameter** (e.g., force) and resulting **action** (e.g., distance)

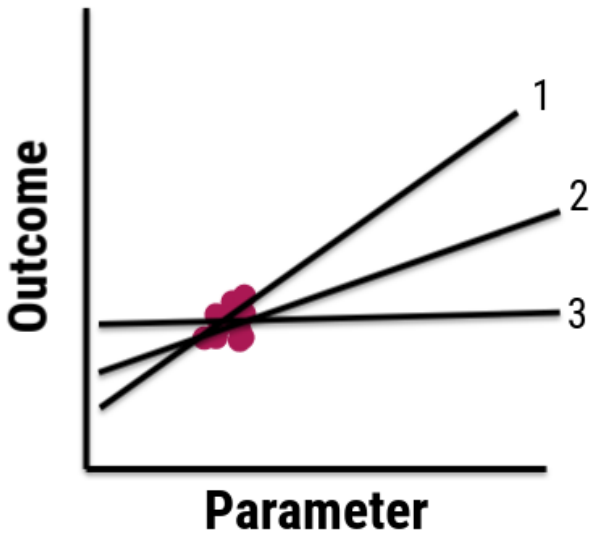




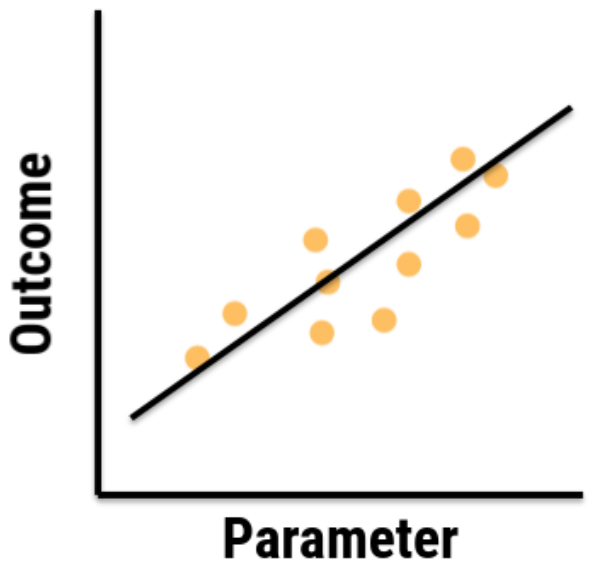
Variable practice facilitates the acquisition of motor schema

- **Schema** allow us to learn the basic **mapping** between a **parameter** (e.g., force) and resulting **action** (e.g., distance)

Constant practice



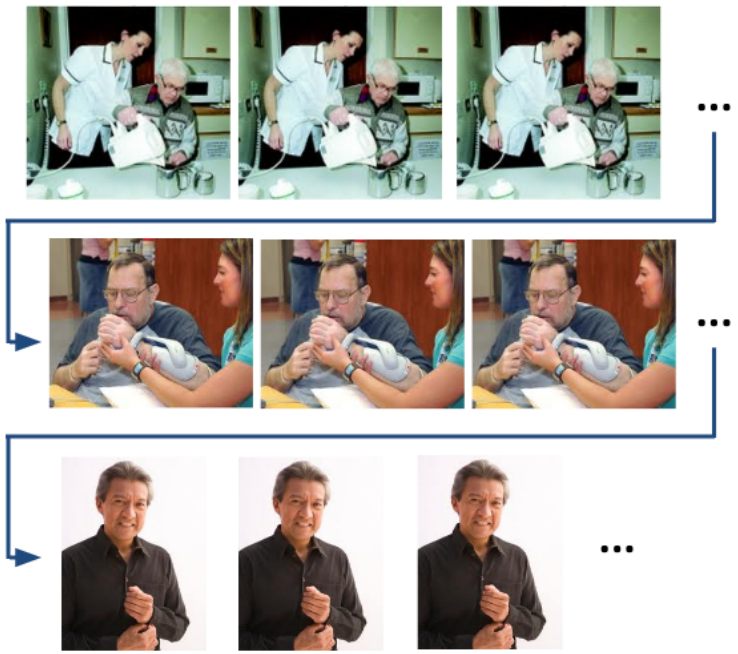
Variable practice



Consider the following scenario...

You are an **occupational therapist** working with a stroke patient. They want to **regain** some of their **independence** with 3 specific activities of daily living: 1) **brushing teeth**, 2) **pouring water into a glass**, and 3) **buttoning a shirt**. ***How should you structure the practice (and why)?***

Blocked practice



Random practice

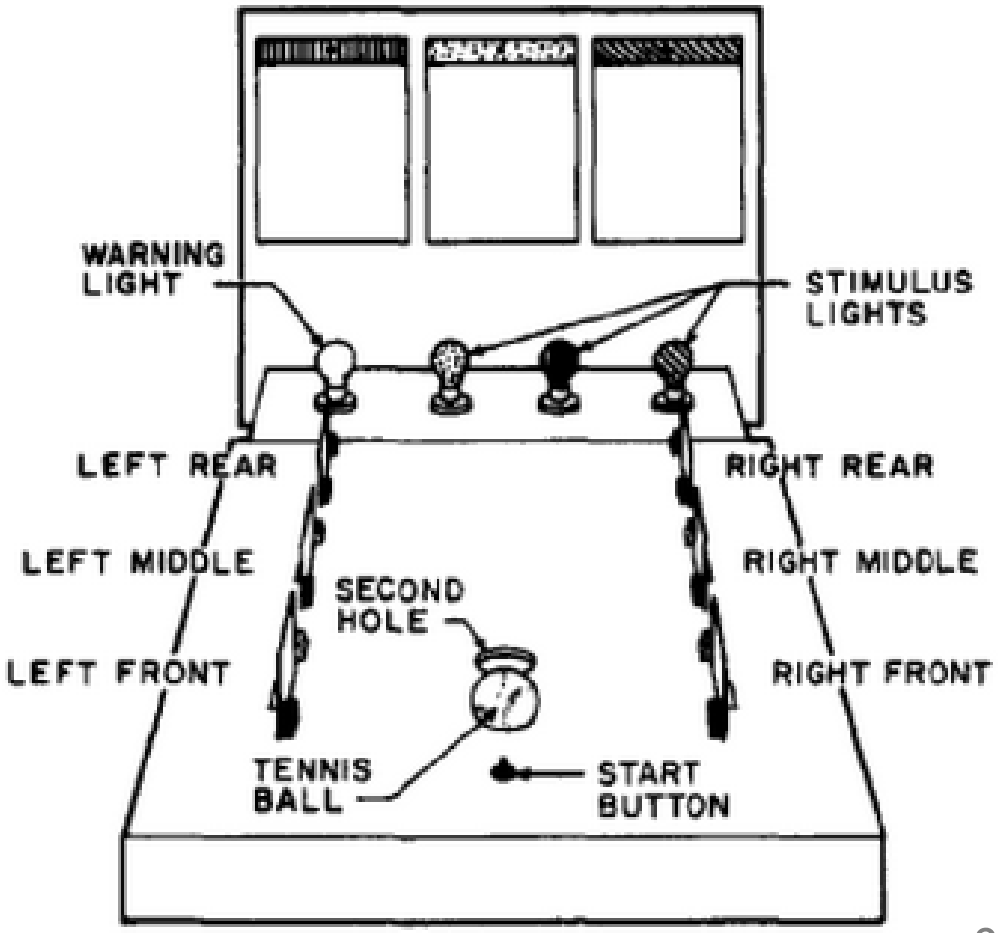
Is blocked or random practice more effective?

Task: Knock-down barrier (3 sequences and 18 trials of each) as fast and accurate as possible

Groups: **Random** (unpredictable order) versus **Blocked** (predictable order)

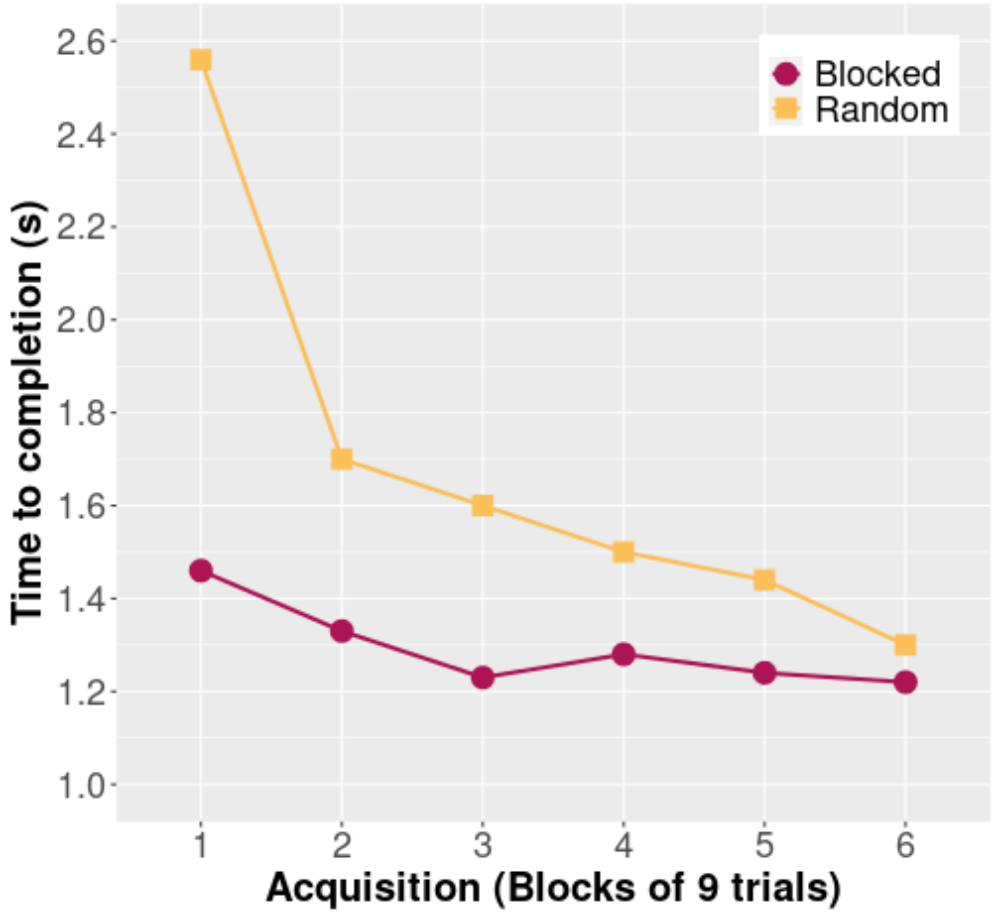
Design:

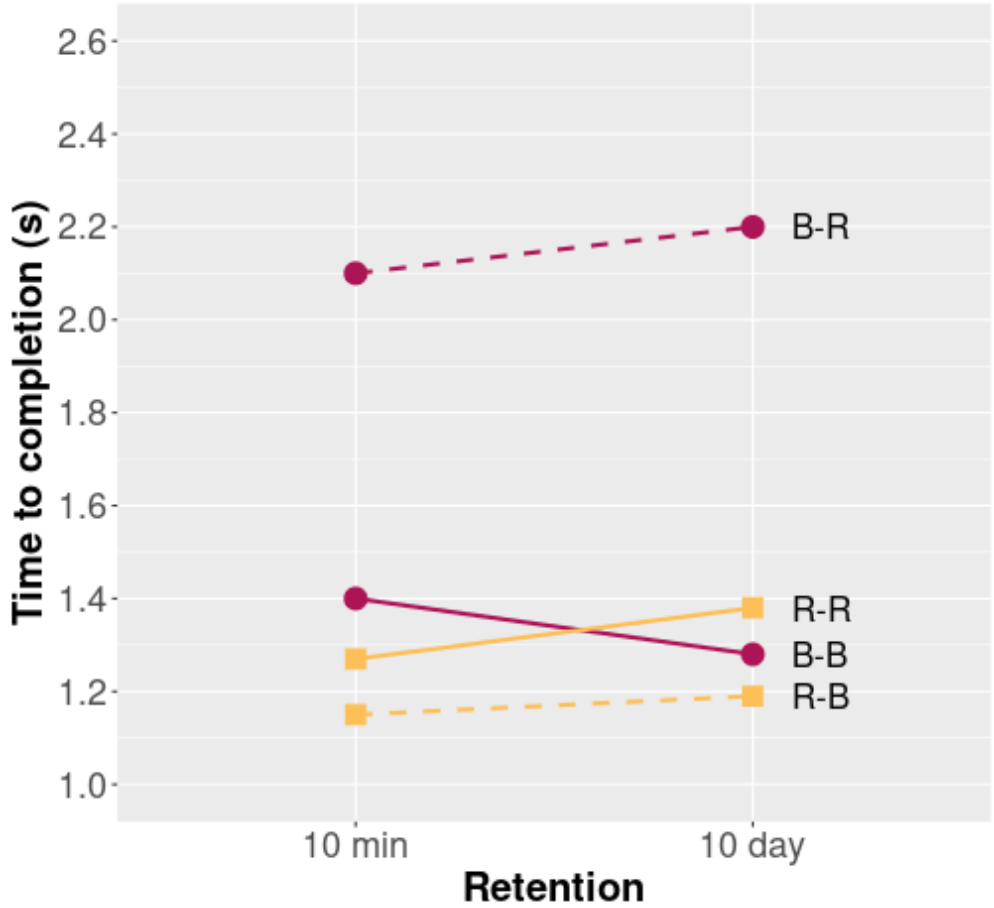
- **Acquisition** - 6 blocks of trials
- **Retention** - Half completed their retention test with the **same order** from practice and the other half experienced the **opposite order** from practice



Shea and Morgan 1979 (https://doi.org/10.1037/0278-7393.5.2.179)

Is blocked or random practice more effective?





Approximate data of Shea and Morgan 1979 (https://doi.org/10.1037/0278-7393.5.2.179) through plot digitization

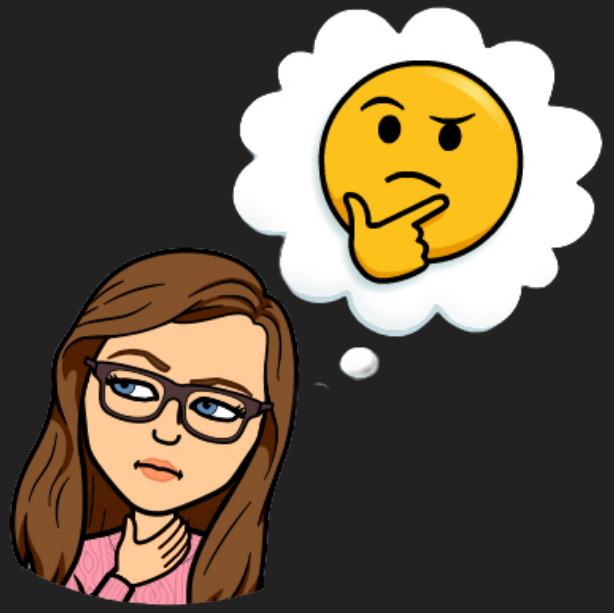
Learning objectives

1. Compare and contrast **different methods** of **structuring** practice.
2. Describe the relative **strengths** and **weaknesses** of different **conditions** of practice.
3. Discuss the role and importance of **variability** and the **distribution** of practice for motor learning.

Take-home message:

The organization of one's practice session can have profound and often paradoxical effects of motor learning.

What questions do you have?



@_LauraStGermain
@LauraStGermain
www.cartermaclab.org