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**SCIENCE**

Department of  
Kinesiology

# Attentional focus

**KINESIOL 1E03 - Motor control and learning**

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Fall 2022 Week 8  
Lecture 14

# Review from last lecture

# How to design a motor learning experiment

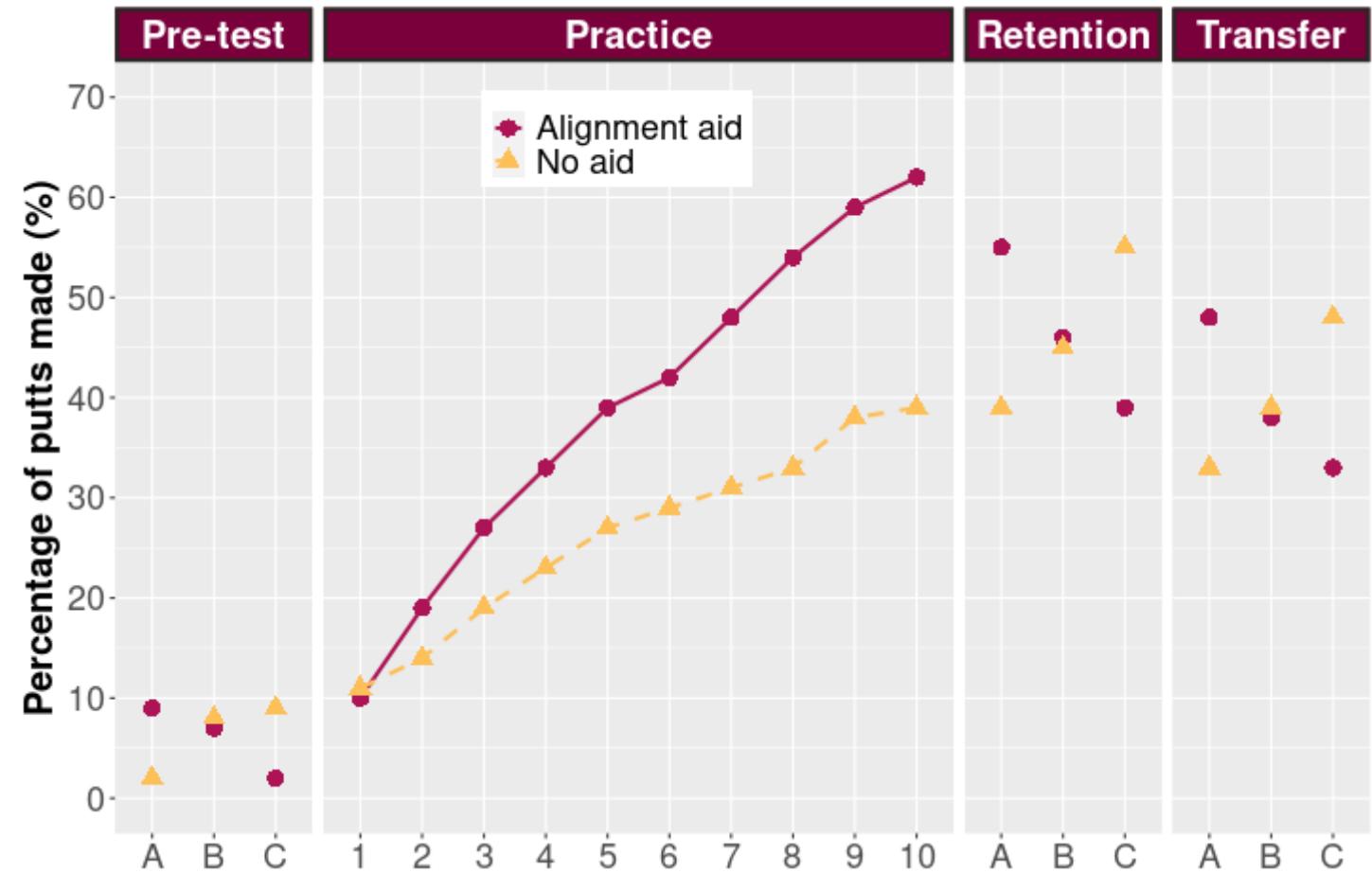
**Group 1: Alignment aid**



**Group 2: No aid**



Adapted from Schmidt & Lee 2011



Any questions?



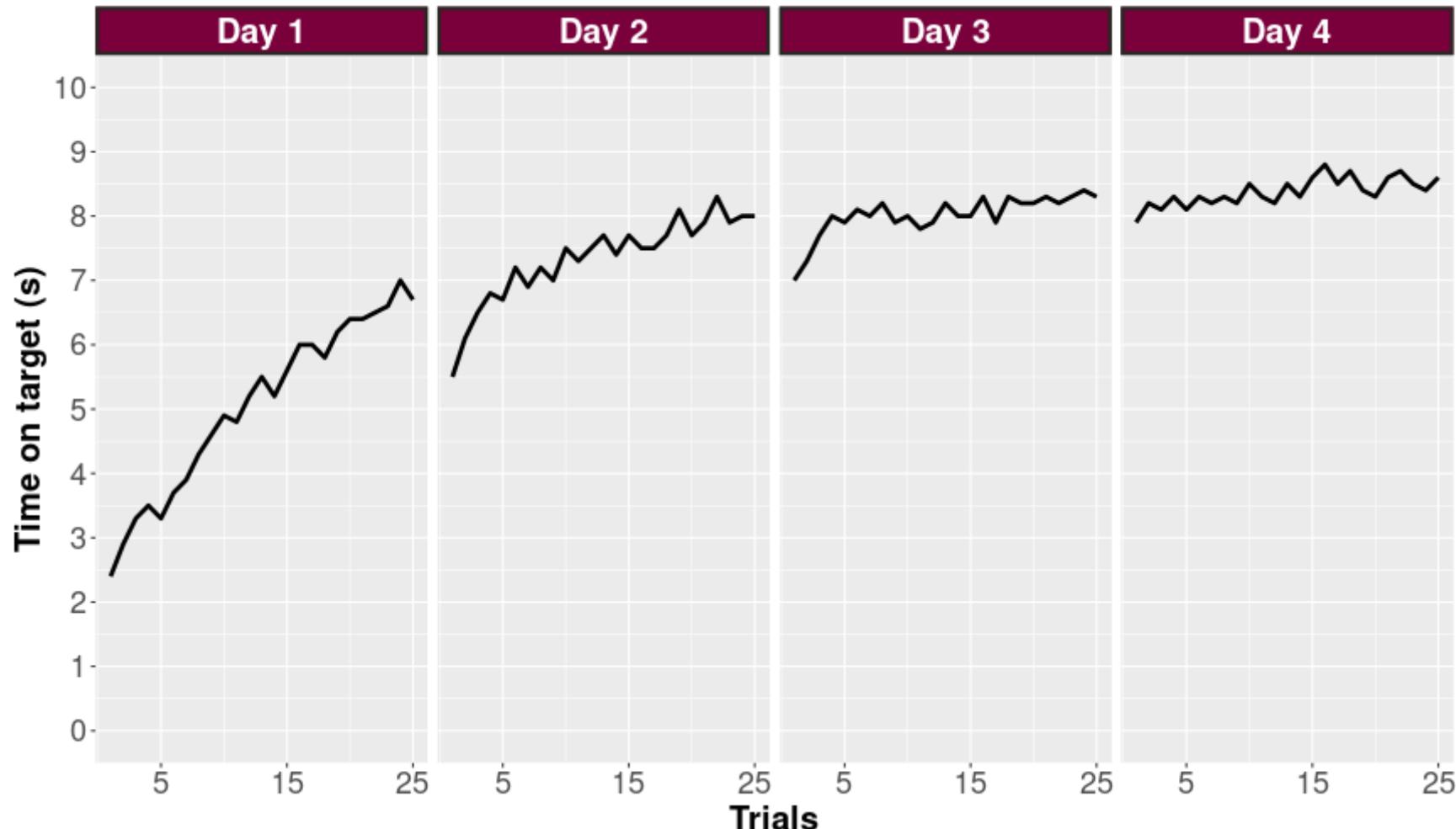
# Learning objectives

1. Discuss the phenomenon known as **warm-up decrement** and one strategy to **minimize** its impact on performance.
2. Differentiate between an **internal** and **external** focus of attention.
3. Explain why an external focus of attention may be **more effective** for performance and learning.
4. Describe **two techniques** that have been used to support the **constrained action hypothesis**.

Take-home message:

**Our choice of words when providing instructions can have a considerable impact on the learner's planning processes and subsequent performance.**

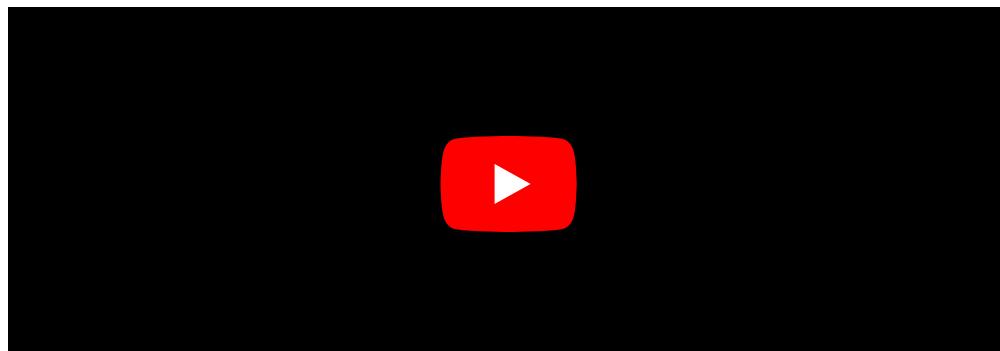
# Recall this performance curve...



# How can we minimize the impact of warm-up decrement?

**WARM-UP DECREMENT:** A **reduction** in performance seen after a **period of no practice** or **time away** from the task

- it is a **psychological** phenomenon rather than a physiological one and it **dissipates** after a few trials or attempts



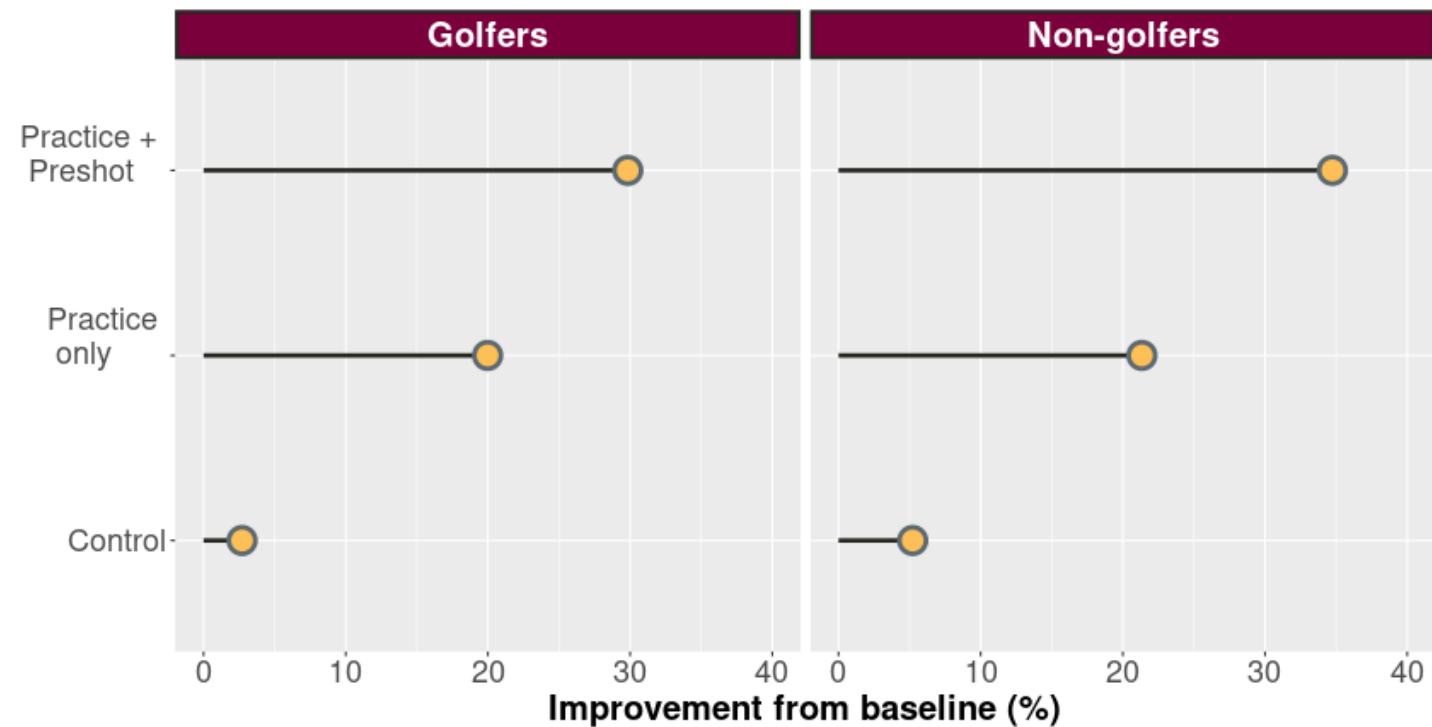
1. Establish **pre-shot** routines
2. Develop ways to "re-set" after the period of inactivity
3. Minimize periods of inactivity with interspersed practice (especially with discrete skills)

# Establishing and using a pre-shot routine is advantageous for novice and experienced golfers

**Task:** Wedge shots from  
**43.75, 54.68, and 65.62**  
yards

## Groups:

1. **Control** - no practice
2. **Practice** - 3-week training program
3. **Practice+Preshot** - same as Practice plus a 13 step preshot routine



# Preshot routines may be advantageous for multiple reasons



- Psychological explanations such as **increased confidence, self-efficacy, positive outlook**, etc
- **Attentional focus** on **external** factors important to successful performance



# Focus of attention can be based on specific instructions or be self-adopted

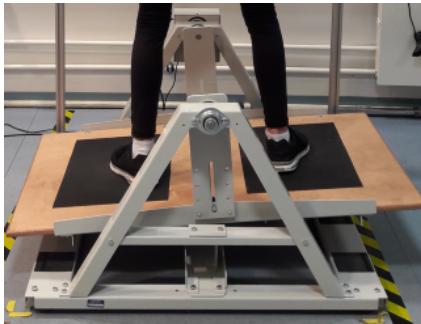
**ATTENTIONAL FOCUS:** The information that a performer's attention (or consciousness) is directed at

- **Internal** focus of attention: Focus on information associated with the performer's **body**
  - e.g., "*Think about the timing of your hip rotation*"
- **External** focus of attention: Focus on information that is **external** to the performer's body
  - e.g., "*Think about the tennis racquet hitting the ball*"

THIS IS NOT A VISUAL FOCUS...IT IS A **MENTAL FOCUS**

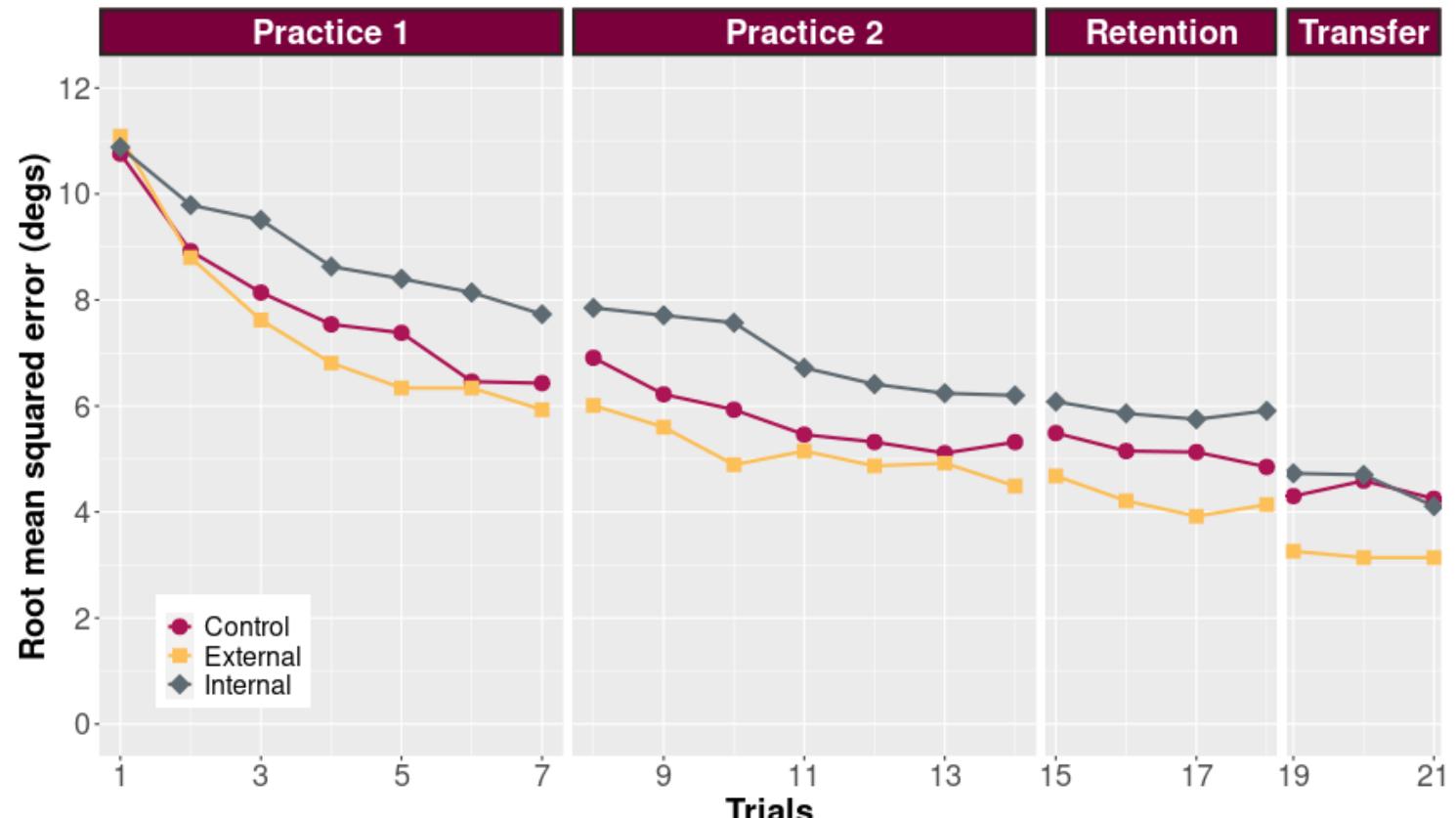
# An external focus is more effective than an internal

Task: Stabilometer



Groups:

- **Internal** focus = feet
- **External** focus = markers on platform
- **Control** = no instructions given



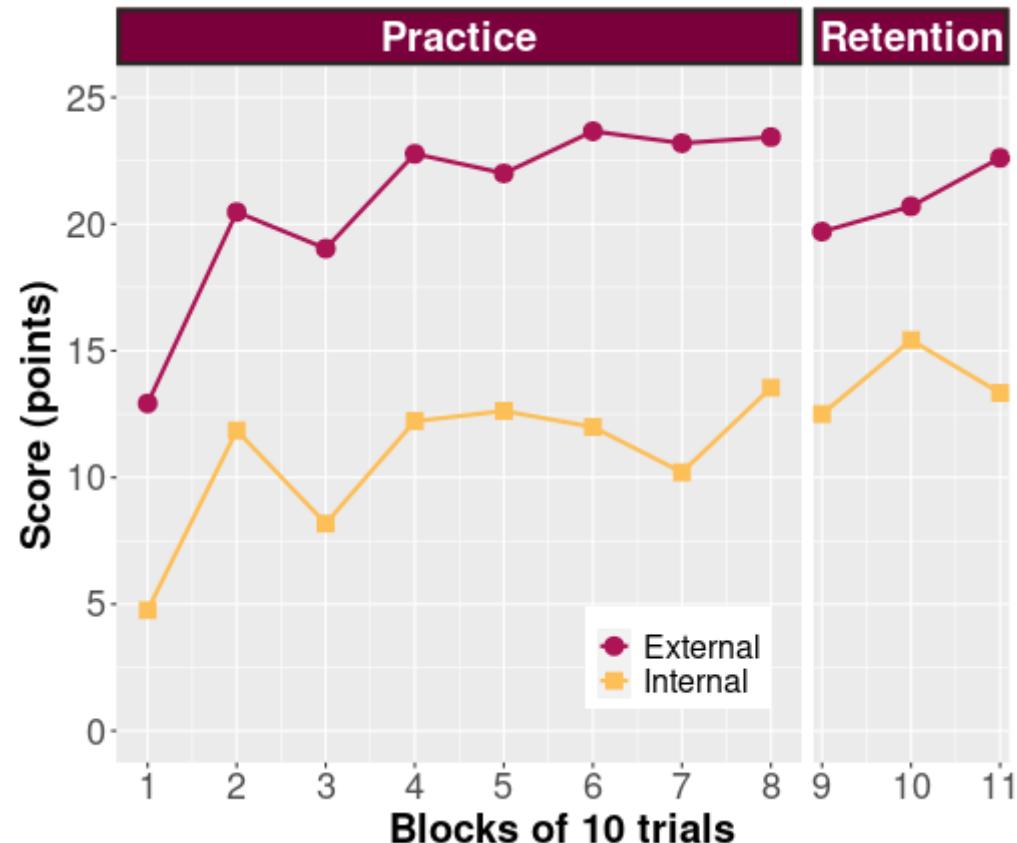
Approximate data from Wulf et al 2003 Experiment 2 (<https://doi.org/10.1080/02724980343000062>) through plot digitization

# The external focus benefit extends to sport skills

**Task:** Golf pitch shot

**Groups:**

- **Internal** focus = arm swing
- **External** focus = club swing
- **Control** = no instructions given



**Why is directing attention away from the body  
superior for performance compared to directing  
attention towards one's body?**

# Explaining the external focus advantage

**CONSTRAINED ACTION HYPOTHESIS:** **Consciously** controlling one's movements **constrains** the motor system, which **interferes** with **automatic** control process

- Focusing on the **movement effect** via an **external** focus allows the motor system to more **naturally self-organize**

**Q: How could we test the predictions of the constrained action hypothesis?**

- "Consciously controlling..."
- "...constrains the motor system...interferes with automatic control processes"

(**Hint:** Think back to the Attention lecture and some techniques we learned about)

# Testing the constrained action hypothesis: Probe reaction time

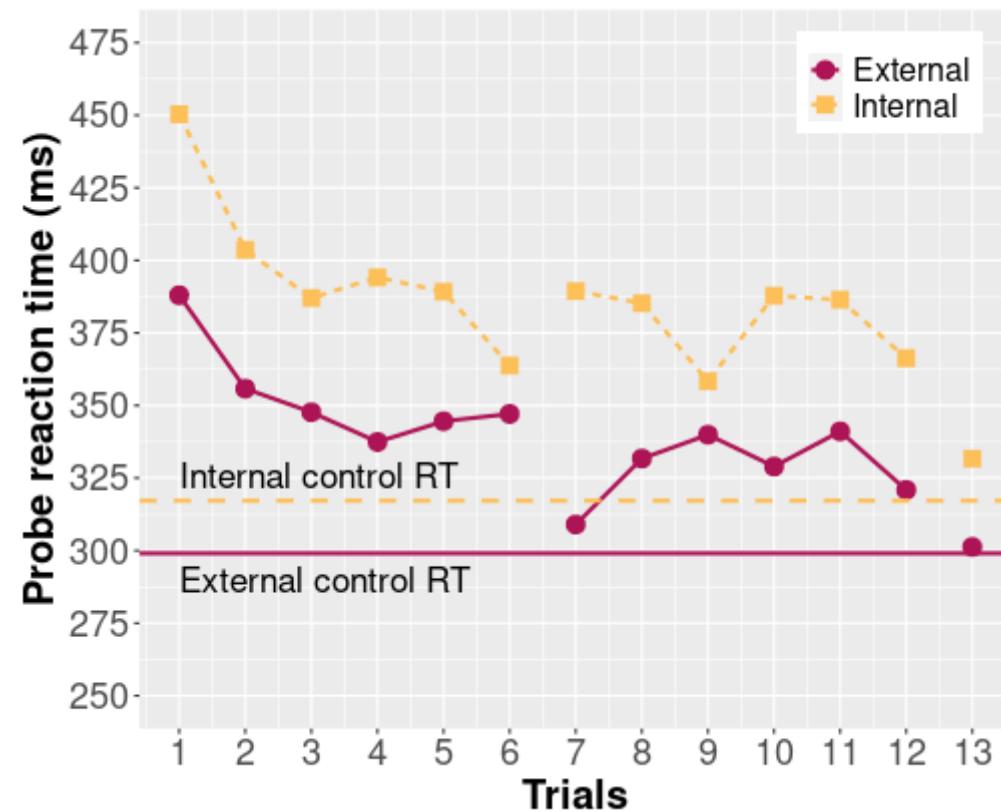
**Task:** Stabilometer

**Secondary task:** Simple reaction time button press

**Groups:**

- **Internal** focus = feet
- **External** focus = markers on platform

**Probes:** randomly 8 times during a trial



Adapted and approximate data from Wulf et al 2001 (<https://doi.org/10.1080/713756012>) through plot digitization

# Testing the constrained action hypothesis: EMG

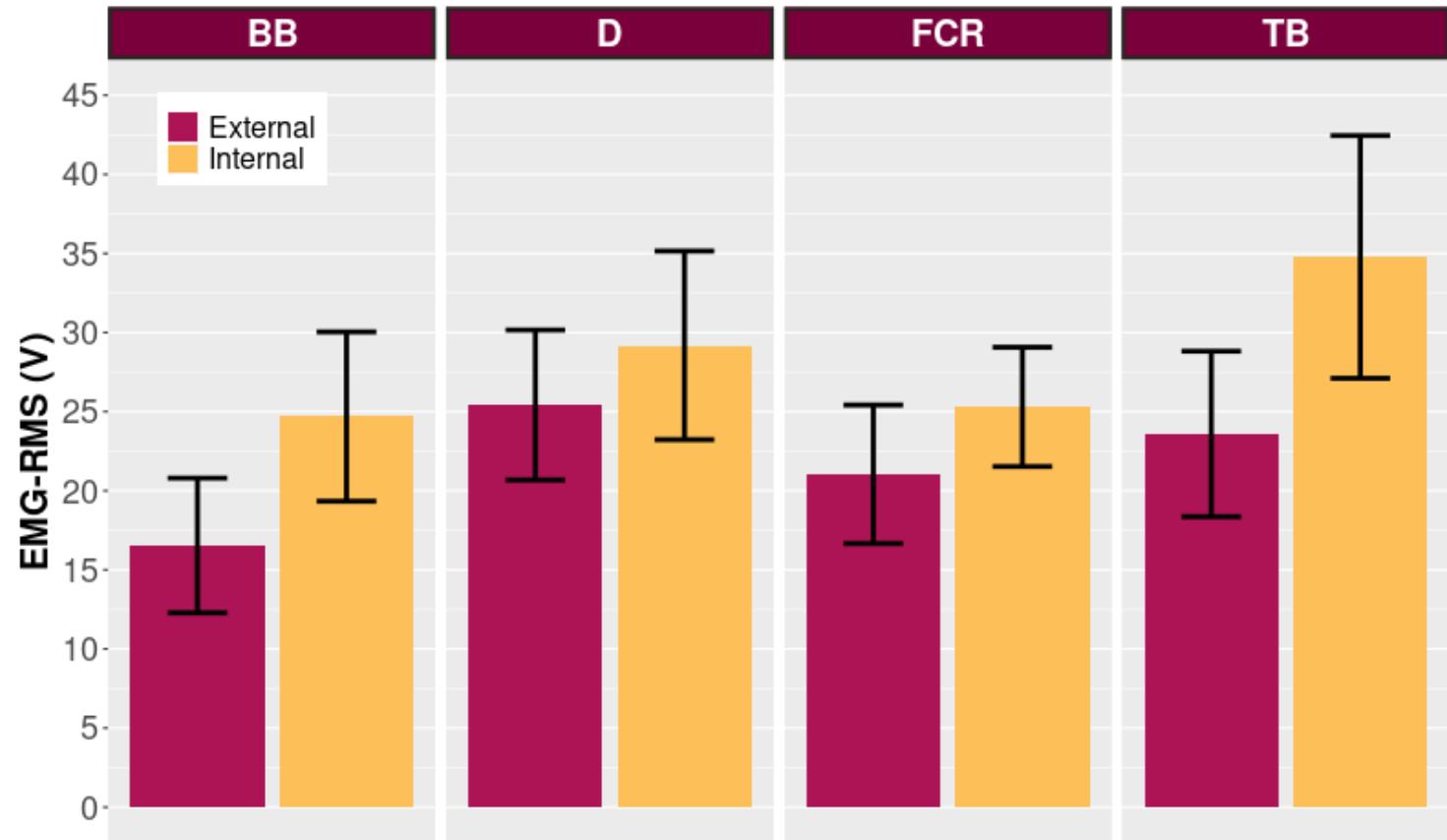
**Task:** Basketball free throw

**Groups:**

- **Internal** focus = wrist
- **External** focus = basket

**Electromyography:**

- Flexor carpi radialis (FCR)
- Biceps brachii (BB)
- Triceps brachii (TB)
- Deltoid (D)



Adapted and approximate data from Zachry et al 2005 (<https://doi.org/10.1016/j.brainresbull.2005.06.035>) through plot digitization

# Testing the constrained action hypothesis

## Probe reaction time experiment

- External focus group had superior balance in practice and retention
- External focus group had **faster** probe reaction times in practice and retention
- Suggesting **less conscious control** of movements...**why?**
- Suggesting **greater** automaticity...**why?**

## Electromyography (EMG) experiment

- External focus group was more accurate in basketball free throws in practice
- External focus group had **lower** muscle activity, especially in the key muscles involved in free throw
- Suggesting **enhanced** movement efficiency (i.e., naturally self-organize)...**why?**
- Suggesting **greater** motor "noise" interferes with automaticity...**why?**

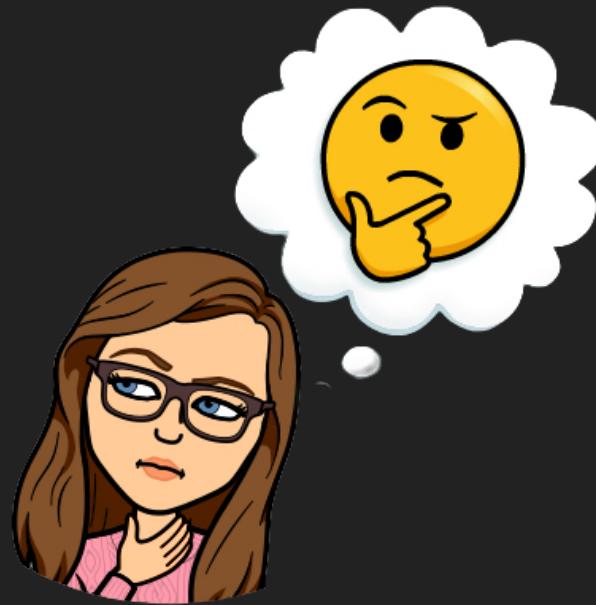
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# What questions do you have?



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