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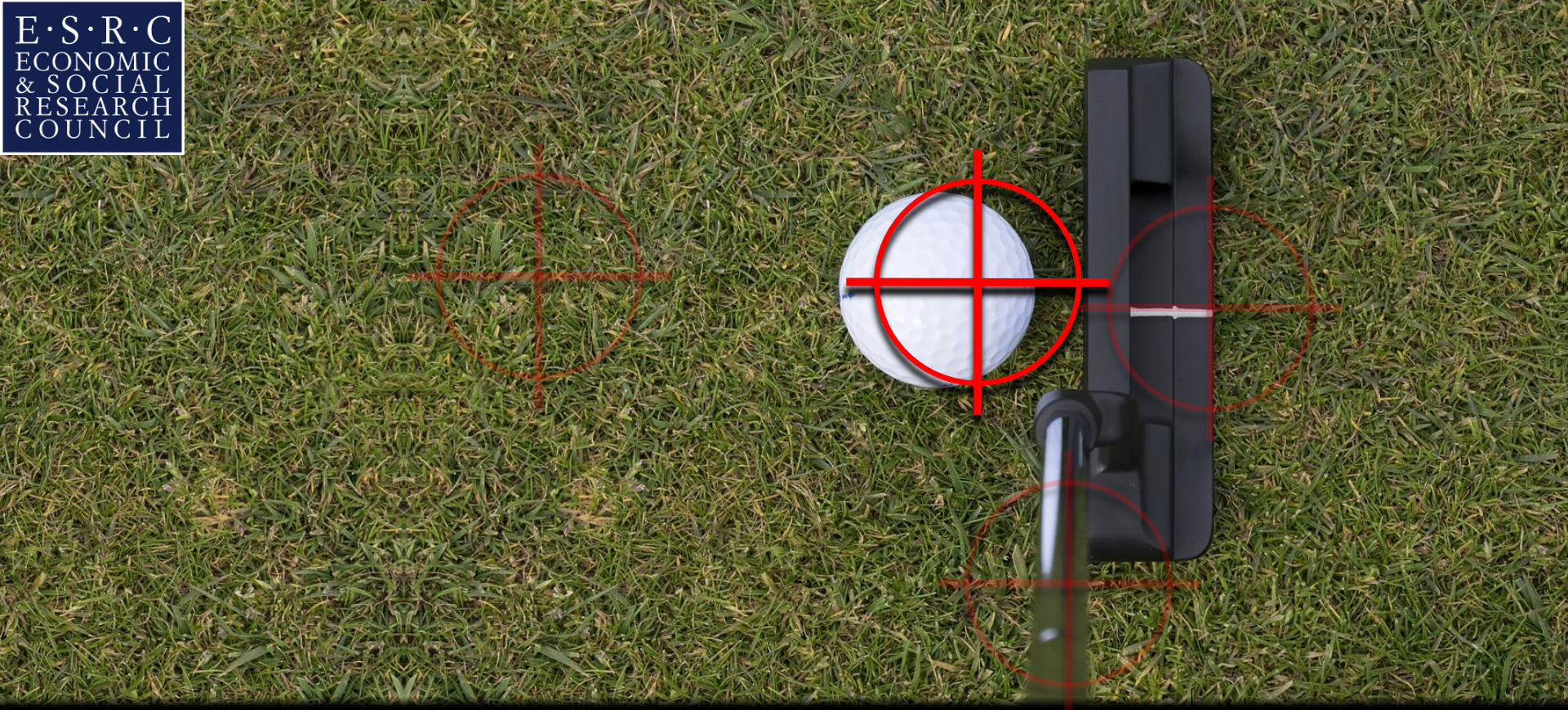

A psychophysiological account of the quiet eye phenomenon: Novel methods and insights

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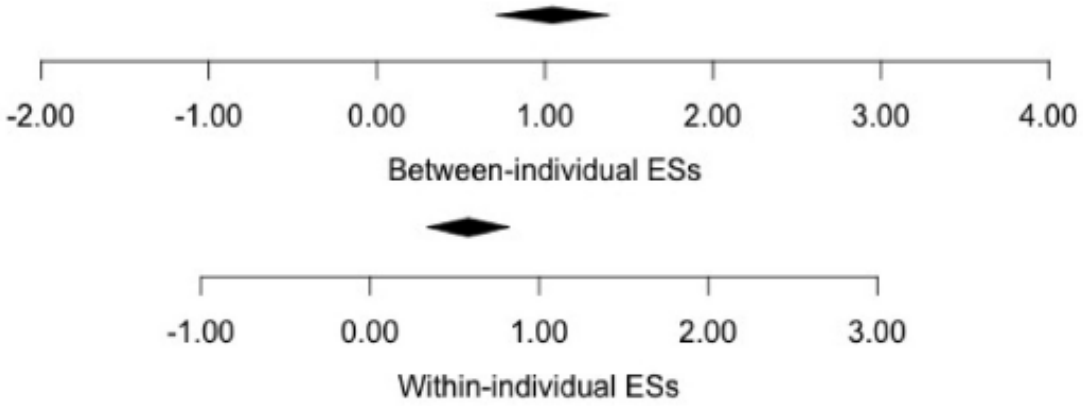
The “Quiet Eye” phenomenon

- Performance advantage conferred by a **steady ocular fixation** on a critical target of an action

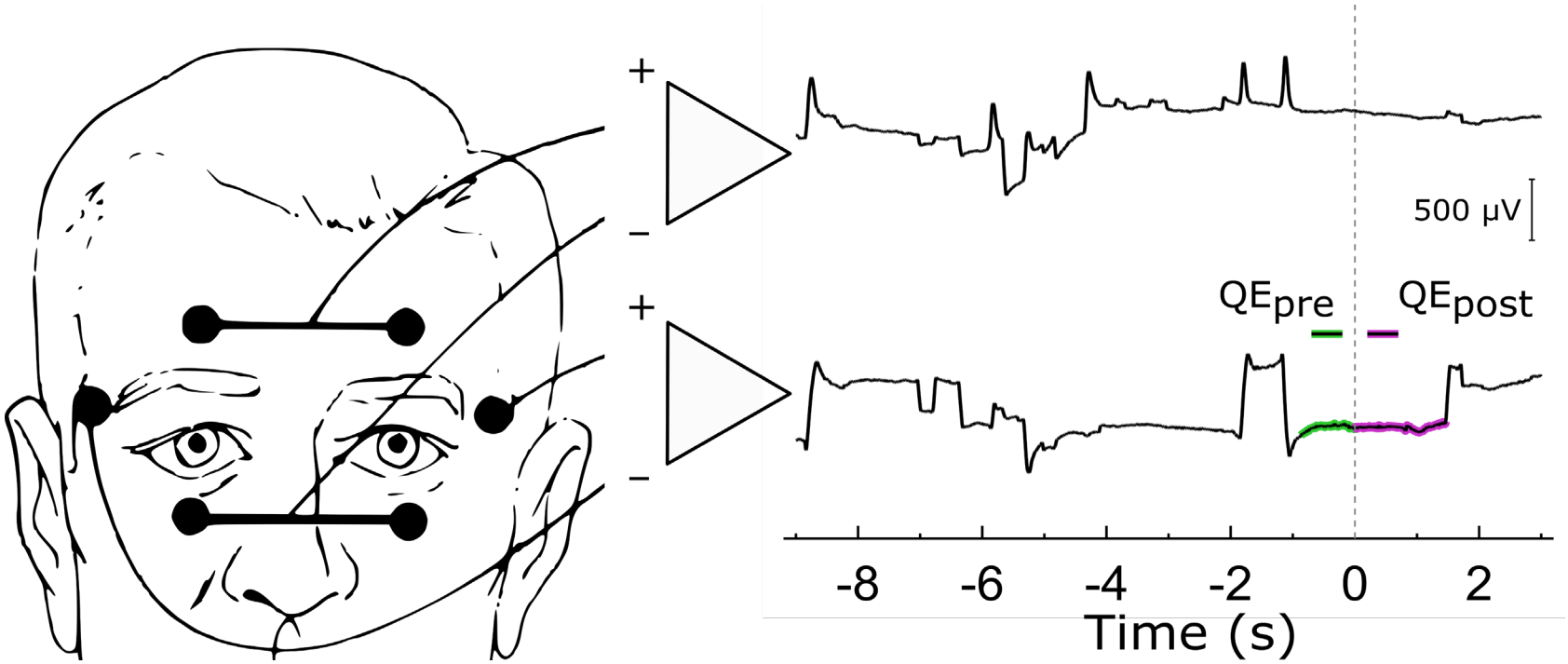
Vickers, 1992, *Perception*



Lebeau et al., 2016, *JSEP*

Definition of Quiet Eye period
a) Eyes on critical target (e.g., golf ball) b) Onset prior to movement initiation c) Offset when gaze deviates from target **of a certain amount*

Electrooculography (EOG)



Advantages

- High temporal resolution
- Distinguish movement phases (pre v. post movement initiation)
- Parameters can be varied programmatically

Gallicchio *et al.* (2018, *Psychophys*)

Participants

Experts N = 10

Novices N = 10

Task

60 putts to a 2.4-m distant hole

"get each ball ideally in the hole, but if unsuccessful, make it finish as close to the hole as possible"

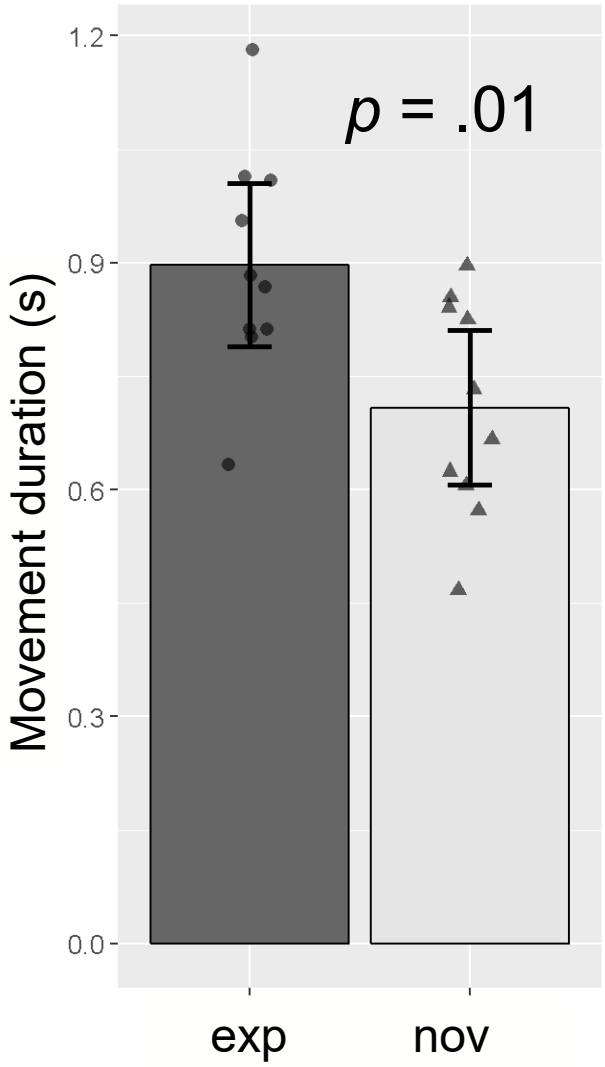
Measures

- Putting performance (photo camera systems)
- Movement duration (motion sensors)
- Quiet Eye duration (EOG)

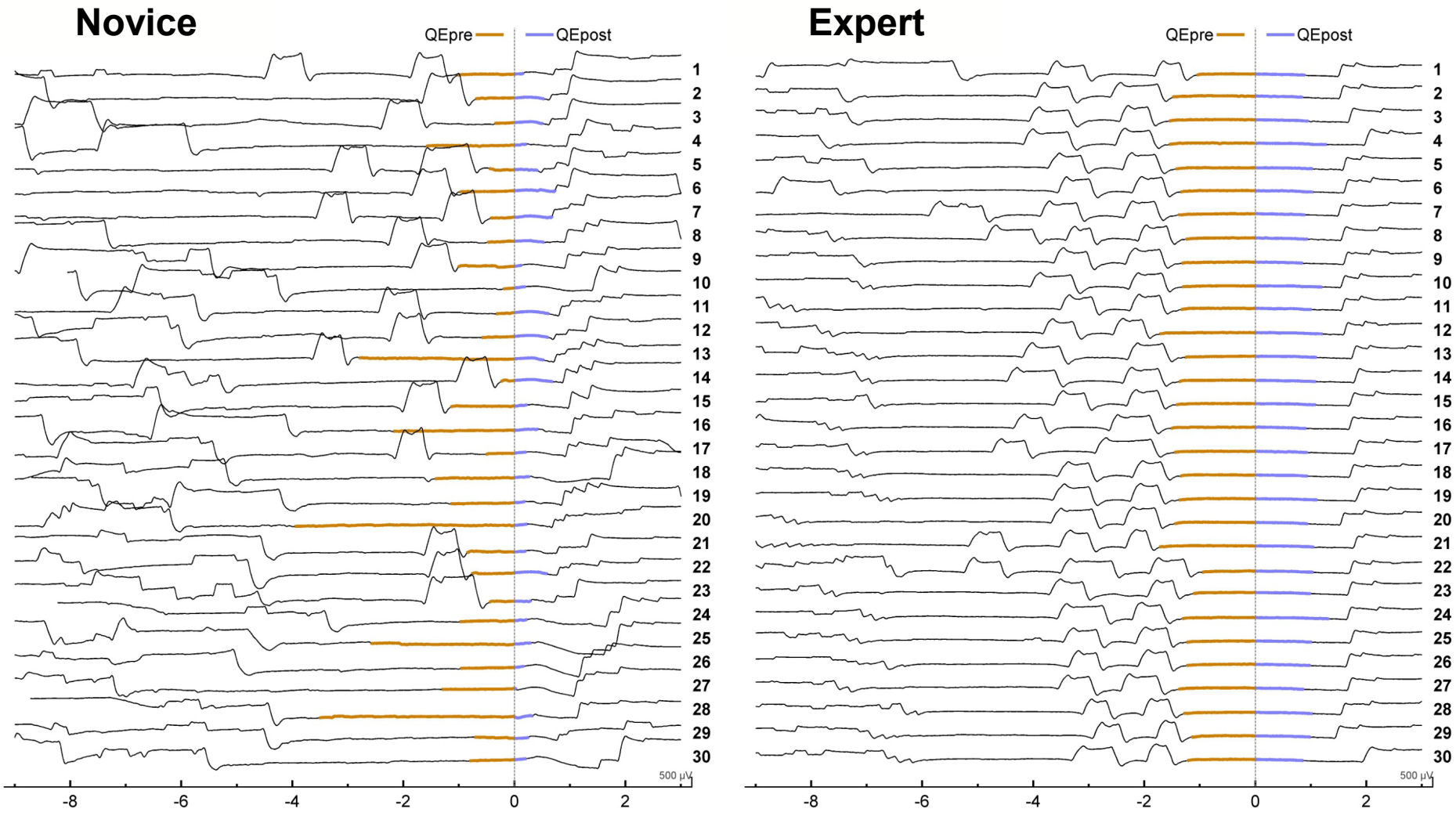
Gallicchio *et al.* (2018, *Psychophys*)

Movement duration

Experts putted more slowly than novices



Gallicchio *et al.* (2018, *Psychophys*)

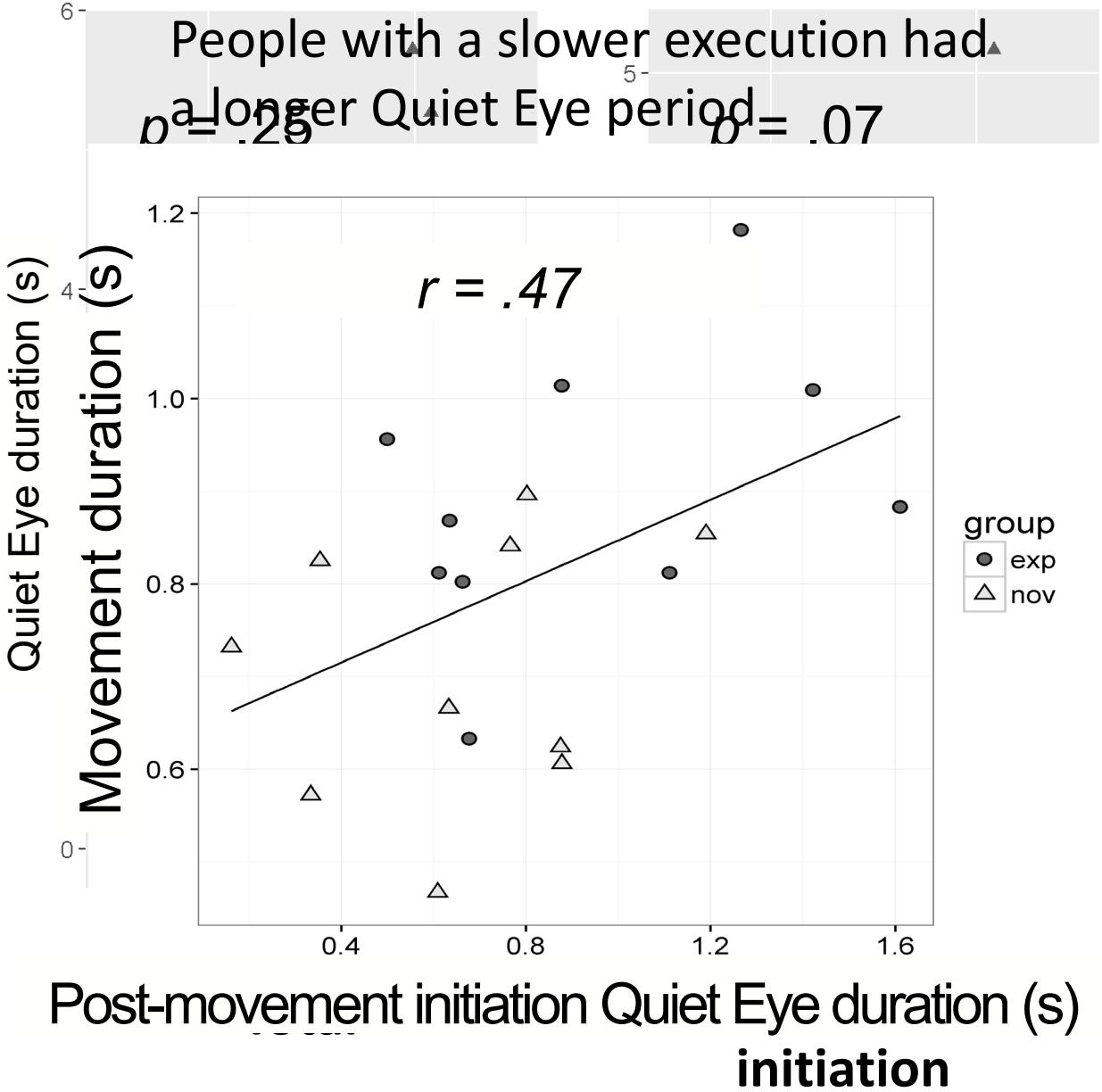


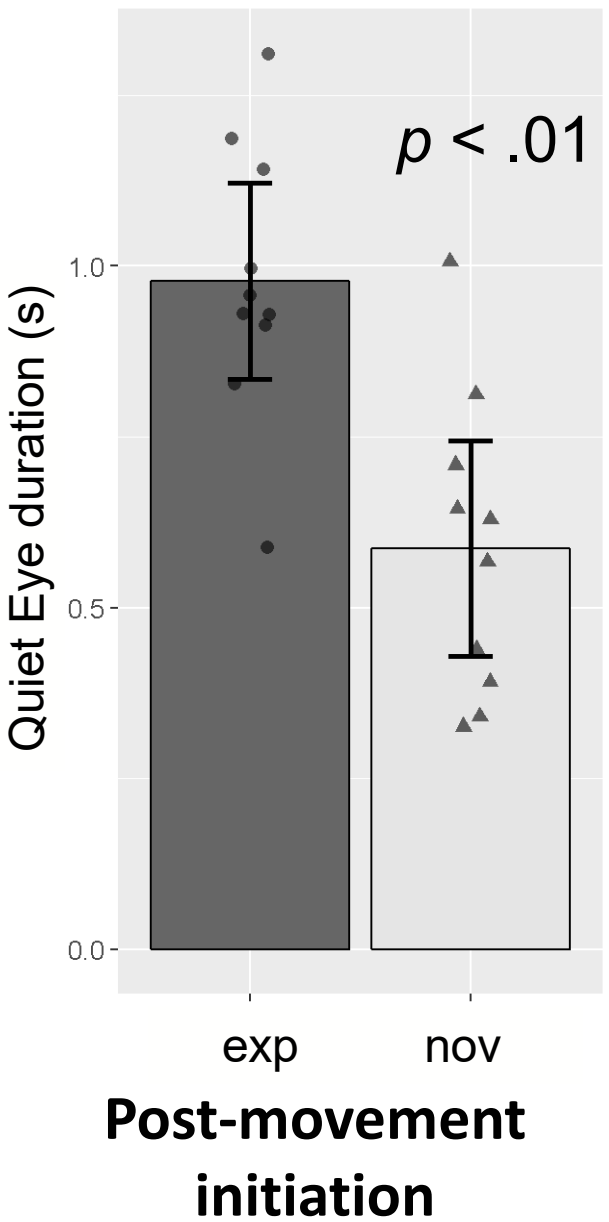
time (s)

*Threshold = 3° / 60µV

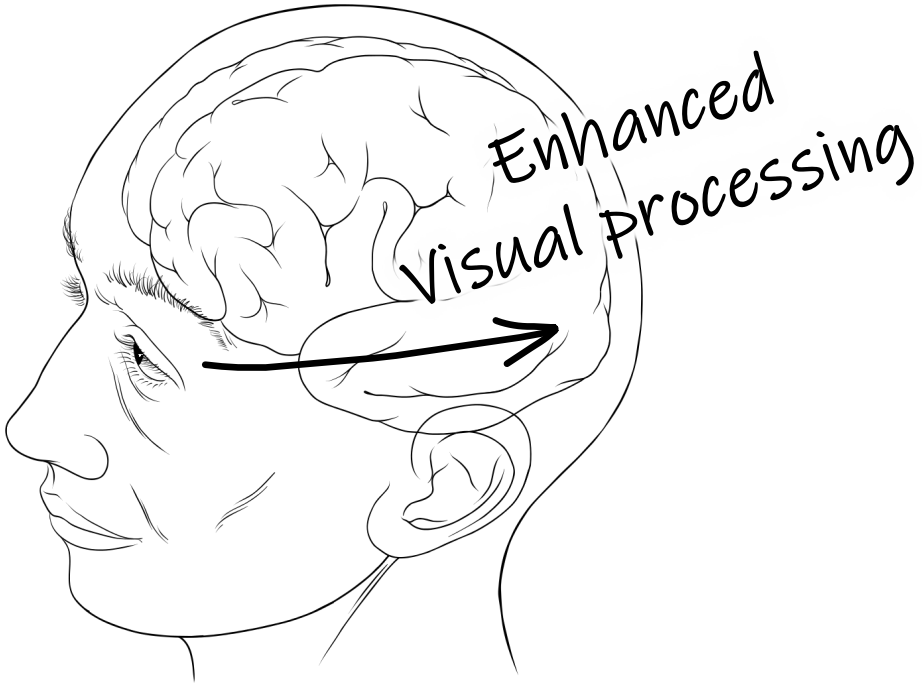
Gallicchio *et al.* (2018, *Psychophys*)

People with a slower execution had a longer Quiet Eye period



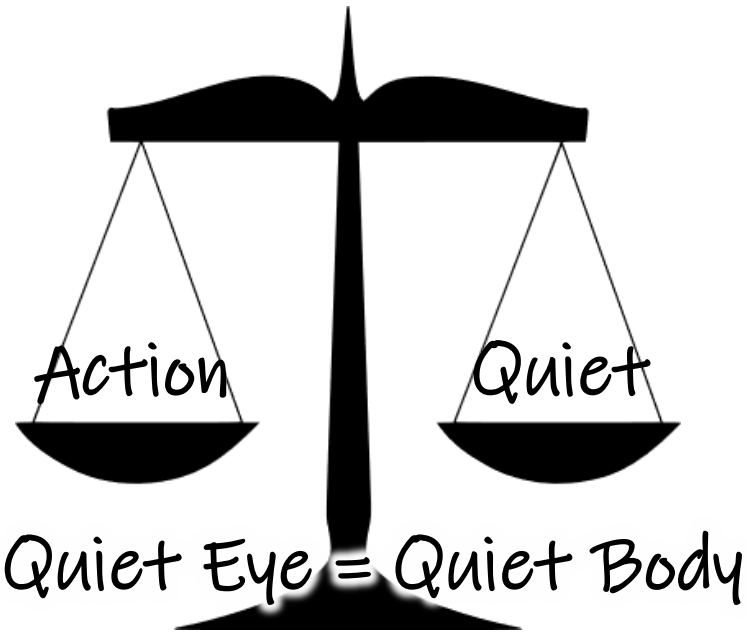


Visual hypothesis



- Visual information is actively extracted and processed
- Activation of neural networks in occipital regions
- Electroencephalographic (EEG) occipital alpha as *inverse* index of visual processing

Postural-kinematic hypothesis



- Postural stability is one of the strongest determinants of performance in target sports (e.g., *Sim & Kim, 2010, HMS*)
- Two components:
  a) Movement duration
  b) Movement stability

Gallicchio & Ring (2019, *SEPP*)

Participants

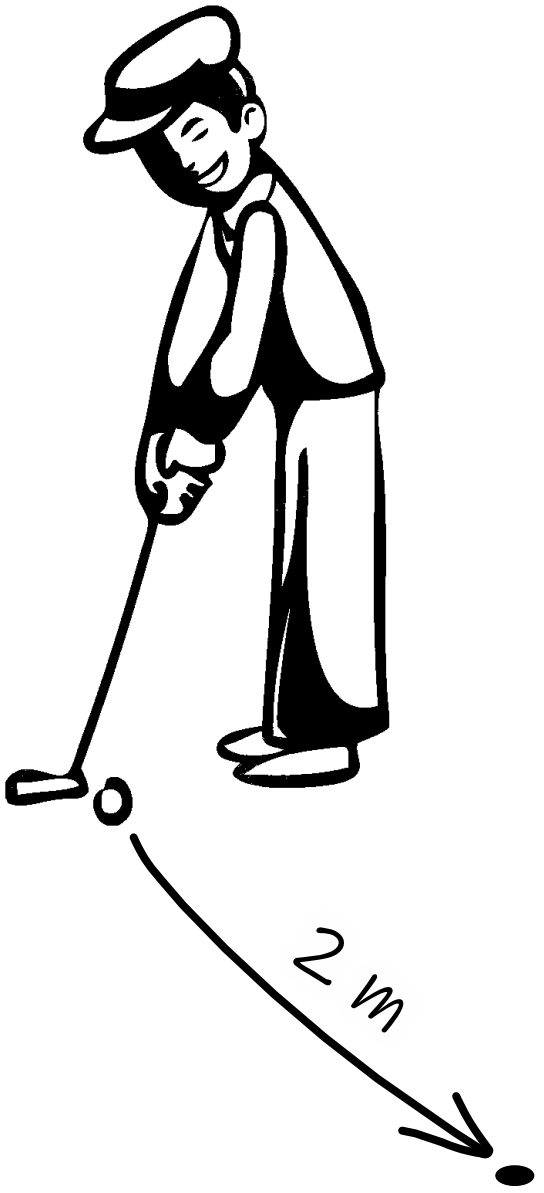
Recreational golfers

N = 32

Task

20 putts to a 2-m distant target

"get the final position of the ball as close as possible to the target"

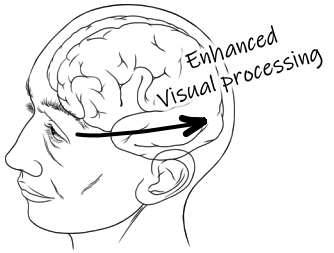


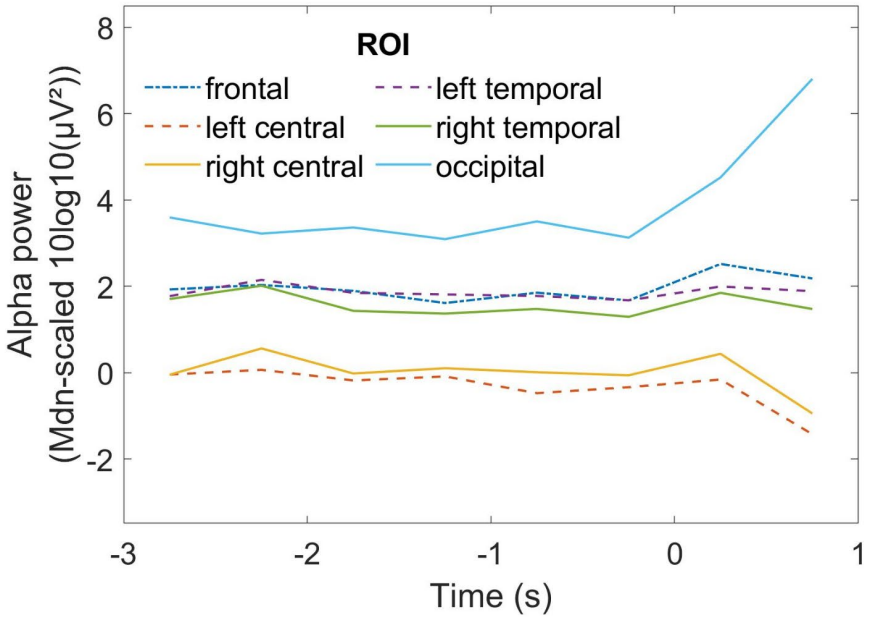
Measures

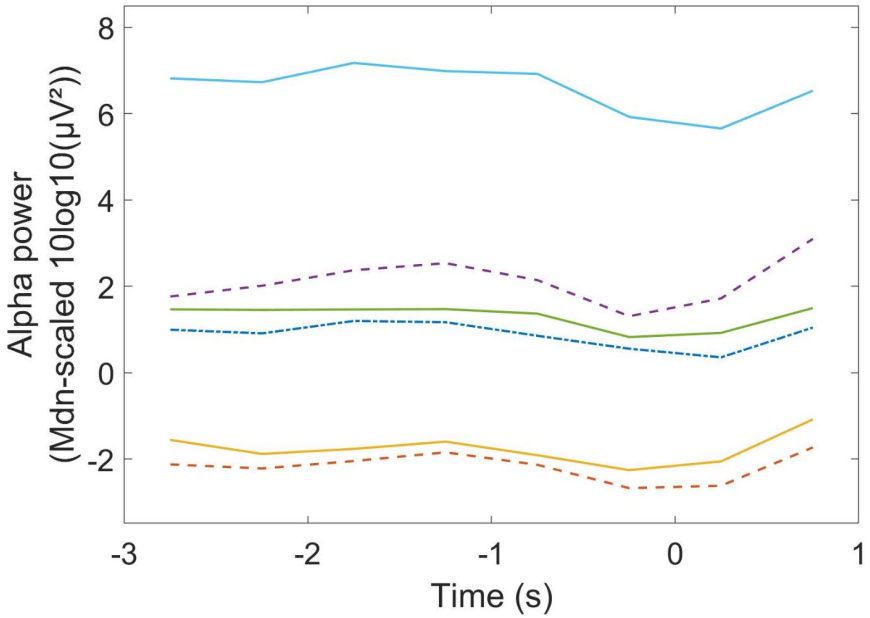
- Quiet Eye duration (EOG)
- Visual Processing (EEG)
- Movement duration (motion sensors)

Gallicchio & Ring (2019, *SEPP*)

Visual hypothesis







Greater occipital alpha power during the Quiet Eye period

Postural-kinematic hypothesis

Quiet Eye duration

pre: *M* = 928 ms (*SD* = 501)

post: *M* = 819 ms (*SD* = 219)

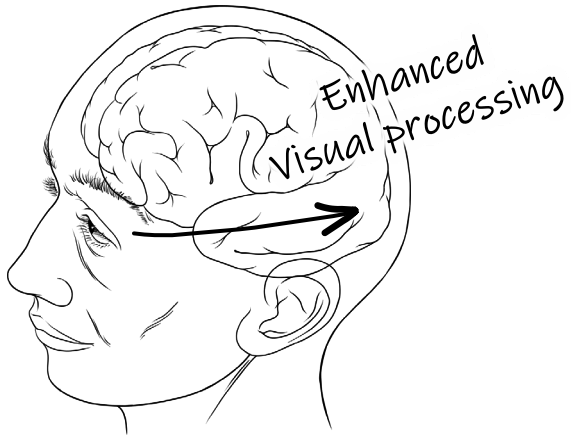
Movement duration

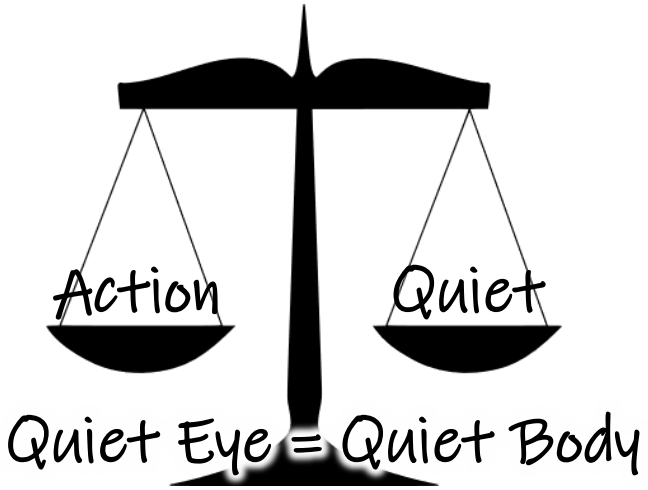
M = 719 ms (*SD* = 174)

Putts with a slower execution had a longer Quiet Eye period

$t(31) = 4.19$, $p < .001$, $\rho_M(18) = .32$

Gallicchio & Ring (2019, *SEPP*)





Visual hypothesis

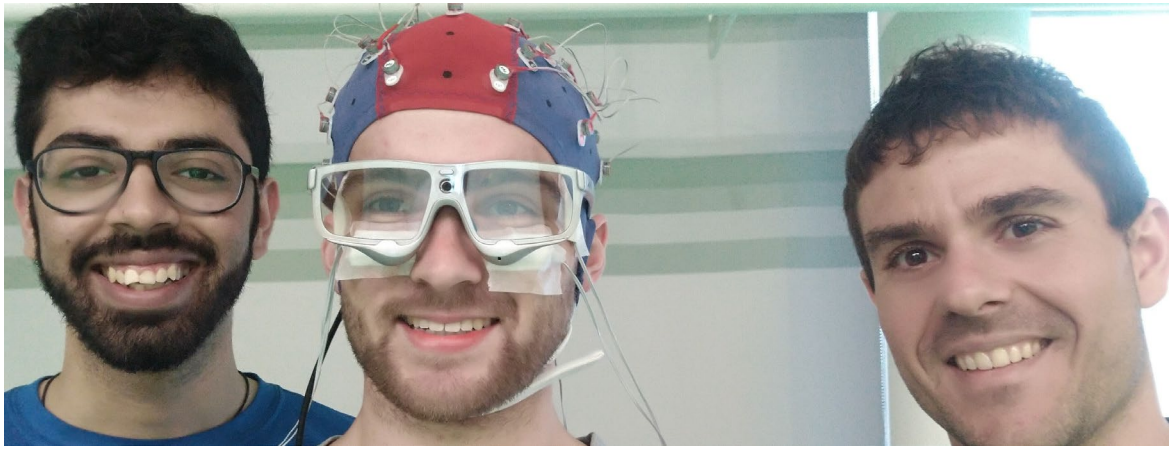
- Mostly contrary
- Withdraw of resources away from visual processing
  (e.g., Loze et al., 2001, *JSS*)

Postural-kinematic hypothesis

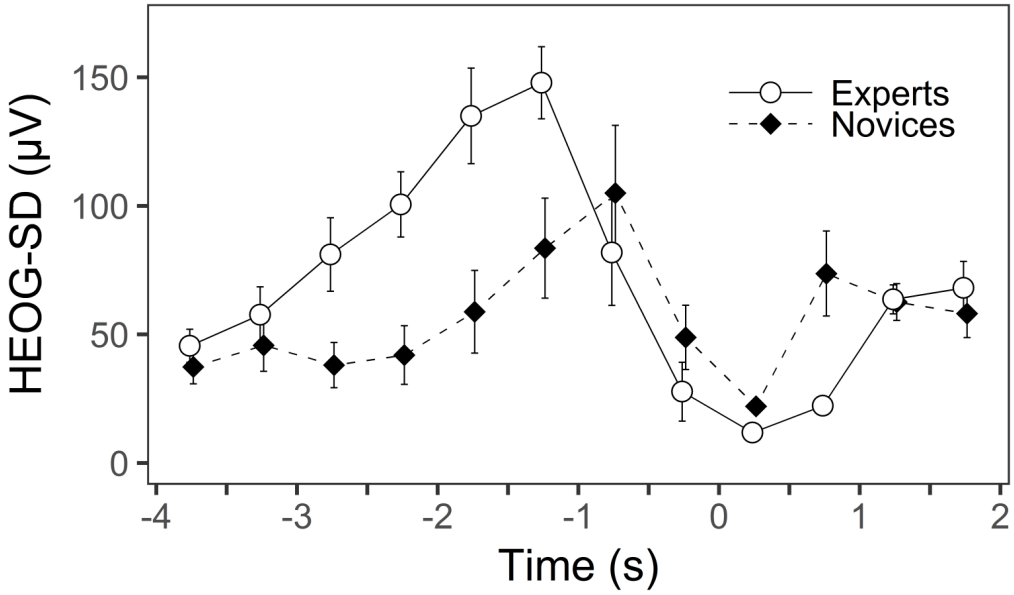
- Strong support
- Extends previous findings
  (Gallicchio, Cooke, & Ring, 2018, *Psychophys*)
- Not exhaustive: we did not examine movement stability

Future directions

How well can we measure the QE using EOG?

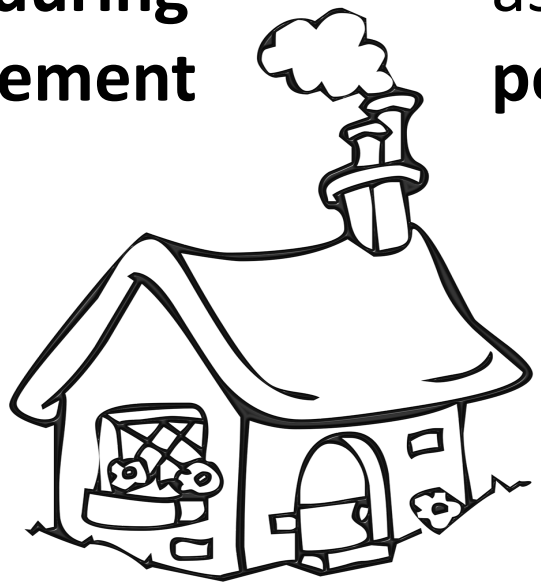


Eye Quietness Biofeedback



Take-home message

1. Quiet Eye seems to be more important **during** than before **movement** execution

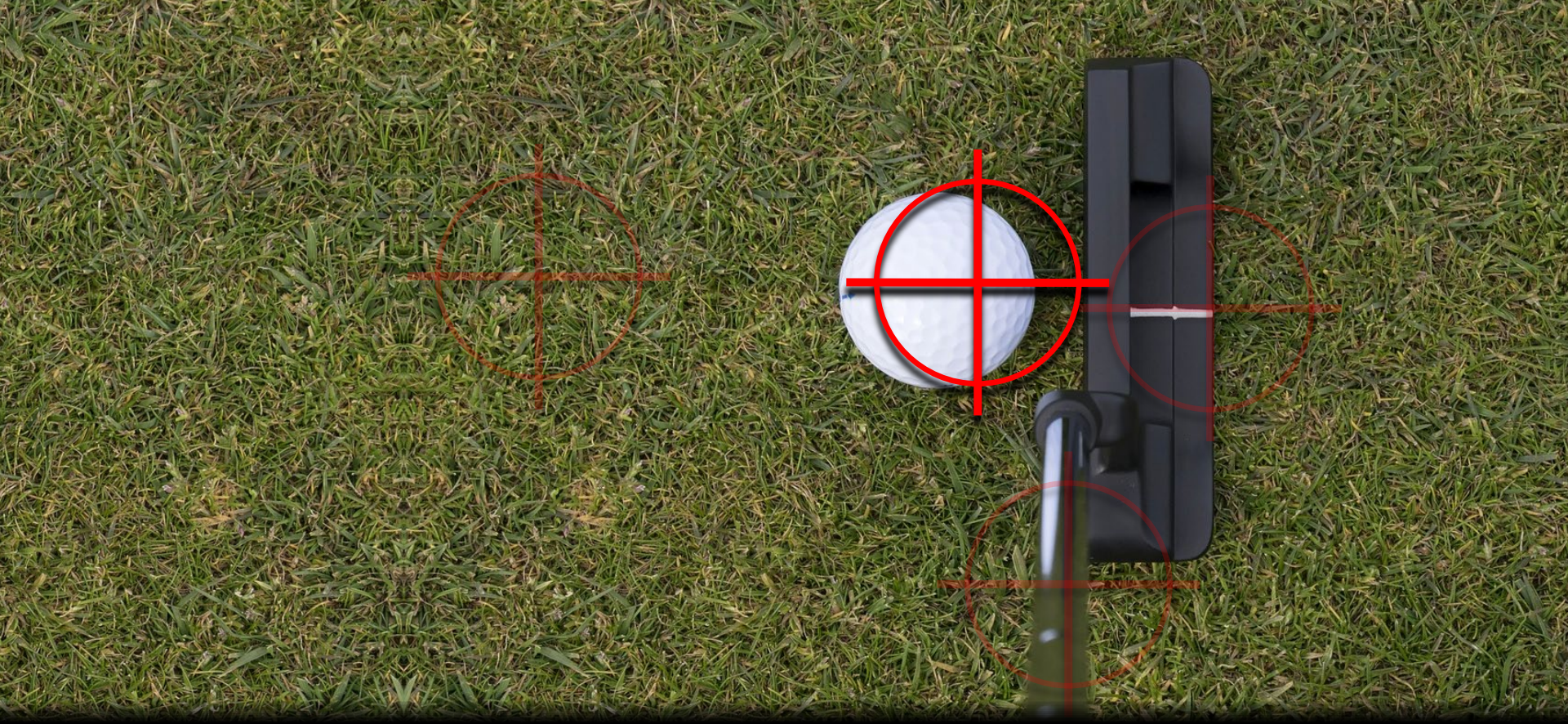


2. During the Quiet Eye **visual processing** is suppressed

3. Quiet Eye duration is associated with **postural quietness**

4. Psychophysiology can be used as framework to test **mechanisms**

* For closed-loop actions



Additional reading

- Gallicchio, G., Cooke, A., & Ring, C. (2018). Assessing ocular activity during performance of motor skills using electrooculography. *Psychophysiology, 55*(7), e13070. https://doi.org/10.1111/psyp.13070

- Gallicchio, G., & Ring, C. (2019). The quiet eye effect: A test of the visual and postural-kinematic hypotheses. *Sport, Exercise & Performance Psychology.* http://dx.doi.org/10.1037/spy0000162

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