



# QUIET EYE IN BASKETBALL DEPENDS ON SHOT LOCATION

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## PURPOSE

To determine if a closer shot location influences gaze fixation length indexed via quiet eye

## HYPOTHESIS

Quiet eye duration will be longer at closer distance shot locations than farther locations

## FINDINGS

Quiet eye duration was longest at the closest shot location (i.e., block)

## INTRODUCTION

- Quiet eye (QE) is the amount of time gaze fixation is maintained on a target (ex. basketball net) before a critical movement (ex. arm extension) begins
- Expert shooters have early fixation offset and longer fixation duration in shot phase<sup>1</sup>
- QE duration can be the difference between performance success of experts and near experts (around 500 millisecond difference)
- Ideal shooting routine is a longer fixation duration earlier in the shooting motion

## METHODS

### Participants (N=12; age = 19.9 ± 0.9 y; 5 females)

- UNC club basketball players with normal/corrected-to-normal vision
- A subset of total data (N=7; 3 females) were used in this analysis

### Basketball Shooting Task

- 200 shots from 6 locations on a standard collegiate court (all from experimenter-initiated pass)
  - Free throw, 3-point (top of key), elbow, wing, corner, block
- Divided into 20 blocks of 10 shots
  - 1<sup>st</sup> 2 shots of each block from free throw or 3-point
  - Subsequent locations randomized (2 shots per location)
- Block randomized for location and side of court (i.e., left or right)

### Equipment (Vision-in-Action Approach)

- Mobile eye tracker (Tobii Pro Glasses 3) recorded eye gaze position (50Hz) and 1<sup>st</sup> person video (25Hz)
- External video of player's body position (60 Hz) recorded with 2-D RGB sideline camera (Logitech Brio)

## DATA REDUCTION AND ANALYSIS

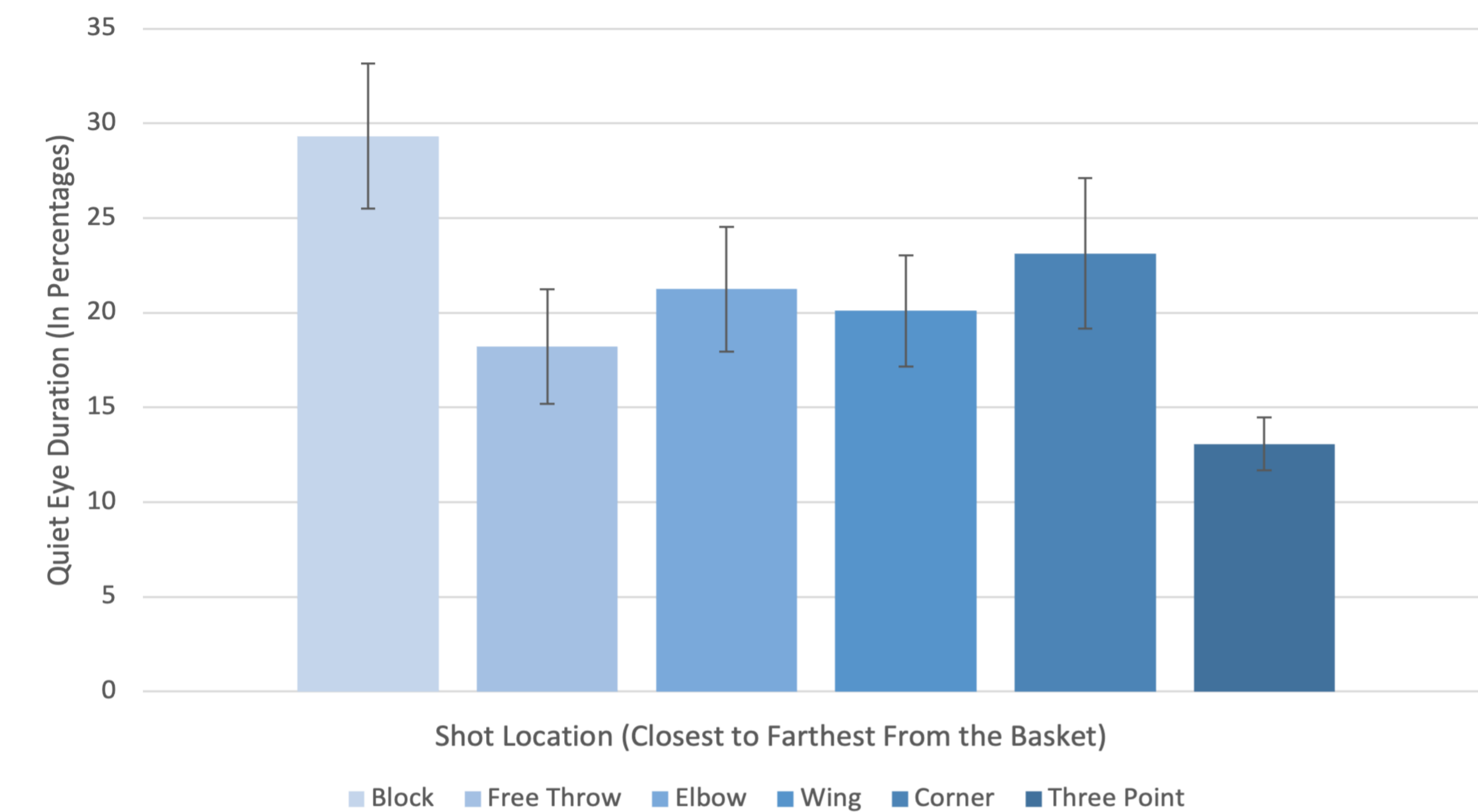


- Gaze and external camera videos manually synchronized
- 3 sequential motor phases were hand-coded
  - Shot onset: 1<sup>st</sup> frame ball contacted hands of player
  - Extension: 1<sup>st</sup> frame sagittal angle of forearm and arm increased
  - Ball release: 1<sup>st</sup> frame ball left shooting hand of player
- QE duration was calculated from onset – offset
  - Onset: gaze stable on target within 3° visual angle for ≥ 3 frames before arm extension
  - Offset: deviation of gaze off location for ≥ 3 frames
  - Relative Duration (%): QE offset – QE onset, relative to shot duration (ball release – shot onset)
- Data analyzed with 1-way repeated measures ANOVA (p < .05)

## RESULTS

- QE was significantly different across shot locations
  - F (5,30)= 7.245, p < 0.001, η<sup>2</sup>= 0.547
- Free throw QE (16.2 ± 6.9%) was less than block QE (26.2 ± 6.9%)
- Three-point QE (13.1 ± 3.7%) was less than block QE (26.2 ± 6.9%)
- Wing QE (18.3 ± 7.1%) was less than block QE (26.2 ± 6.9%)
- Elbow QE (18.7 ± 6.5%) was less than block QE (26.2 ± 6.9%)

Shot Locations as a function of Quiet Eye Duration



## DISCUSSION & SIGNIFICANCE

- Shot location closest to the basket (block) had longest QE duration
  - Possibly fewer distractions in the environment
  - Possibly due to the task demands as athletes feel more confident that they are within their capable shooting range
  - ↑ environmental distractions could contribute to ↓ QE duration
- The eta square value of 0.547 indicates a large effect size, related to the meaningful percentage differences observed
- Our study utilized modern technology and the information we have collected on QE duration can be used to train future athletes on how to increase their made basket percentages by increasing QE duration at farther shot locations

### Key References

<sup>1</sup>Vickers, J. (1996) Control of visual attention during the basketball free throw.