QUIET EYE IN BASKETBALL DEPENDS ON SHOT LOCATION

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Introduction. Quiet eye (QE) is the amount of time that gaze fixation is maintained on a task-specific target before a critical movement begins. In basketball shooting, for example, this is the final fixation during arm extension. An ideal basketball shooting routine involves a longer gaze fixation duration and an early fixation offset in the shot phase. Additionally, QE duration can differentiate experts and near experts, with around a 500-ms difference in QE.

Purpose. The purpose of this study was to determine if a closer shot location influences gaze fixation length indexed via QE. We hypothesized QE duration would be longer at closer locations, like the block, compared to farther distances, such as the three-point location.

Methods. Twelve club basketball athletes completed the study (19.9±0.9y; 5 females) however a subset of data was used in this analysis (N=7). Each participant completed 200 shots from six locations on a standard collegiate court (I.e., free throw line, 3-point line, elbow, wing, corner, and block). Each shot was initiated by an experimenter pass. All shots were divided into 20 blocks of 10 shots. The first two shots of each block occurred from the free throw or three-point line with subsequent locations and side of court (left, right) randomized. Athletes always completed two shots per location. A mobile eye tracker (Tobii Pro Glasses 3) was used to record the eye gaze position (50Hz) and first-person video 25Hz). A 2-D RGB sideline camera (Logitech Brio; 60Hz) was used to record external video of each player's body position regardless of shot location. Both video streams were manually synchronized, and three motor phases were hand coded. Shot onset was the first frame the ball contacted the player's hands. Extension was the first frame the sagittal angle between the forearm and arm increased. Ball release was the first frame the ball left the player's hands. Relative QE duration was calculated from QE onset (gaze stable on location within 3° visual angle for ≥3 frames) and offset (gaze deviates off location for ≥3 frames). A one-way repeated measures ANOVA was conducted ($p < .05$) to analyze QE duration across shot locations.

Results. QE was significantly different across locations, $F(5,30)=7.25$, $p<0.001$, $\eta^2=0.55$. Free throw QE (16.2 ± 6.9%) was significantly less than block QE (26.2 ± 6.9%). Three-point QE (13.1 ± 3.7%) was significantly less than block QE (26.2 ± 6.9%). Wing QE (18.3 ± 7.1%) was significantly less than block QE (26.2 ± 6.9%). Elbow QE (18.7± 6.5%) was significantly less than block QE (26.2 ± 6.9%).

Conclusion. The shot location closest to the basket (i.e., block) had the longest QE duration. These results are supported by a large effect size, suggesting these results are meaningful with respect to the percentage differences observed across shot locations. This could be due to the satisfaction athletes feel knowing they are within range to make the basket or with fewer distractions in the environment, success could be more likely at shorter distances. It is possible that increased environmental distractions could contribute to shorter QE durations. Knowing QE duration is greatest at shorter distance could be used to train future athletes on how to increase their made basket percentages by increasing QE duration at farther shot locations.