

# How High-Level Athletes Use Peripheral Vision In Martial Arts

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Given the high spatio-temporal demands in martial arts, anchoring gaze on so called “pivot points” may help to distribute attention to the periphery and to make use of the motion sensitivity of peripheral vision (Williams & Elliott, 1999). Therefore, it can be expected that gaze is anchored close to relevant attacking locations in martial arts. As these locations differ in Qwan Ki Do (QKD, attacks with arms and legs) and Tae Kwon Do (TKD, attacks mostly with legs), it was predicted that gaze is anchored higher at the opponent’s body in QKD than in TKD when attacks have to be defended in-situ.

10 QKD and 10 TKD experts (all male,  $28 \pm 5.8$  years), all members of a national team, had to react in situ on 24 martial art specific attacks (2 sessions with 12 trials each) with 3 complexity levels (1, 2 or 3 techniques in a row) performed by another QKD or TKD expert. Eye movements were recorded with an EyeSeeCam (ESC). For the gaze analysis, a saccade detection algorithm was used to identify the anchoring height on the opponent’s main body axis after each saccade in 4 phases of the attack (Start, T1, T2, T3).

The analysis of gaze anchoring height presented a significant main effect for the phase of the attack ( $p < .01$ ,  $\eta_p^2 = .55$ ), and an interaction between phase and martial art ( $p < .01$ ,  $\eta_p^2 = .31$ ). Post-hoc tests revealed that QKD athletes anchor gaze higher than TKD athletes immediately before the attack and during the first defensive movement ( $p < .05$ ;  $d \geq 1.03$ ).

The results show that martial arts experts initially anchor their gaze higher, if attacks are expected from arms and legs (QKD) compared with attacks from legs only (TKD). One reason for this initially higher anchoring could be that attacks with arms can be executed faster than attacks with legs and that arms are often used to initiate an attack sequence which affords gaze to be close to these (higher) locations in QKD. Further, since the gaze vector moves down over longer attacking sequences, the visual pivot point might be dynamically adjusted. Thus, an anchoring strategy seems to facilitate the distribution of attention and to make optimal use of the motion sensitivity of peripheral vision. Future studies should aim at the identification of cost functions underlying the determination of an optimal pivot point.