Detecting single-target changes in multiple object tracking: The case of peripheral vision

In sports games, it is often necessary to perceive a large number of moving objects (e.g., the ball and players). In this context, the role of peripheral vision for processing motion information in the periphery is often discussed especially when motor responses are required. In an attempt to test the basal functionality of peripheral vision in those sports-games situations, a Multiple Object Tracking (MOT) task that requires to track a certain number of targets amidst distractors, was chosen.

Participants' primary task was to recall four targets (out of 10 rectangular stimuli) after six seconds of quasi-random motion. As a second task, a button had to be pressed if a target change occurred (Exp 1: stop vs. form change to a diamond for 0.5 s; Exp 2: stop vs. slowdown for 0.5 s). While eccentricities of changes (5-10° vs. 15-20°) were manipulated, decision accuracy (recall and button press correct), motor response time as well as saccadic reaction time were calculated as dependent variables.

Results show that participants indeed used peripheral vision to detect changes, because either no or very late saccades to the changed target were executed in correct trials. Moreover, a saccade was more often executed when eccentricities were small. Response accuracies were higher and response times were lower in the stop conditions of both experiments while larger eccentricities led to higher response times in all conditions.

Summing up, it could be shown that monitoring targets and detecting changes can be processed by peripheral vision only and that a monitoring strategy on the basis of peripheral vision may be the optimal one as saccades may be afflicted with certain costs. Further research is planned to address the question whether this functionality is also evident in sports tasks.