Title:
Peripheral perception in offside decision-making in football

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Abstract:

Introduction:

High error rates in offside decision-making in football (26.2%, Helsen et al., 2006) might be explained by the gaze behaviour of assistant referees (AR) who fixate the offside line at the moment of the pass and perceive the pass peripherally only (Catteeuw et al., 2009). This assumption was tested in a virtual reality setting by systematically manipulating the position of the passer regarding the distance and angle to the AR, respectively.

Methods:

55 sport science students were assigned to three experiments. In any case, they had to watch 80 virtual-reality scenes in 4 blocks which were back-projected on a large screen (3.02 m x 1.68 m). Scenes were manipulated regarding the eccentricity (3°, 10°, 17°, 24°, 31°, equal numbers per block) of the passer (Experiment 1; n = 18), distances (8m, 16m, 24m, 32m, 40m, equal numbers per block) of the passer (Experiment 2, n = 19), or the to-be-fixated player, i.e., the last defender vs. the passer (Experiment 3; n = 18). The task was to determine the moment of the pass by pressing a button and making a verbal offside decision. Manipulations were checked via eye tracking. It was predicted that (1) large eccentricities and (2) greater distances of the passer reduce the accuracy of pass detection and response accuracy, and that (3) the moment of the pass is detected more precisely accompanied by a higher decision accuracy when fixating the passer compared with fixating the last defender.

Results:

Results of Experiment 1 show a main effect for eccentricity in response accuracy, $F(4, 68)= 8.33$, $p < .01$, $\eta_p^2 = .33$, and pass detection accuracy, $F(4, 68)= 38.41$, $p < .01$, $\eta_p^2 = .69$. Response accuracy increased and detection accuracy decreased when the eccentricity of the passer was small compared with larger eccentricities. In Experiment 2, a main effect for distance on response accuracy, $F(4, 72)= 9.54$, $p < .01$ $\eta_p^2 = .35$, and pass detection $F(4, 72)= 25.49$, $p < .01$, $\eta_p^2 = .59$, was observed. Response accuracy was higher when the passer was 8 m or 32 m away from the AR compared with other distances (16m, 24m, 40m) while pass detection accuracy decreased linearly with increasing distances. In Experiment 3, a main effect of fixation location on the pass detection was found, $F(1, 17)= 8.69$, $p = .01$, $\eta_p^2 = .34$, but no significant effect for response accuracy, $F(1, 17)= .51$, $p = .49$, $\eta_p^2 = .03$. Participants' pass detection was more accurate when fixating the passer compared with fixating the last defender.

Discussion/Conclusion:

The assumption that peripheral perception has an influence on offside decision-making could be confirmed. Larger angles between the passer and the offside line led to more decision errors, which could be explained by a less precise detection of the moment of the pass in the periphery. In regards to the distance manipulation, as expected, detection accuracy was higher when the passer was fixated. Regarding response accuracy, however, mixed results emerged indicating more correct decisions at 8 and 32m. Since the retinal image of passer and ball is bigger when the situation is near to the AR it should be easier to perceive the moment of the pass peripherally at 8m. However, decision accuracies were again higher at 32m what could either indicate that there is no distance effect or that there are two superimposed mechanisms indicating a "beneficial" distance of the observer to the critical situation (Mallo et al., 2012). This result will require further investigations.

References:

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