Offside decision making in football: A further test of the flash-lag hypothesis

Helsen Werner, Gillis Bart, Catteeuw Peter and Vaneelslander Tom
Kinesiology Department, Katholieke Universiteit Leuven, Belgium

Introduction
One of the most debated rules of football is the offside law. Oudejans et al. (2000) investigated why it is so difficult for assistant referees to assess offside. They have concluded that incorrect decisions are mainly due to the position of the assistant referees relative to the offside line. Baldo et al. (2002) have reanalysed these data and suggested the flash-lag effect (FLE) to explain these errors. The FLE is defined as a moving object that is perceived as spatially leading its real position at an instant defined by a time marker. This marker is usually a briefly flashed stimulus but in the case of an offside situation it refers to the moment the ball is passed. To test both hypotheses with a different data set than the one of Oudejans et al. (2000), Helsen et al. (JSS) have analysed 337 offside decisions from the FIFA 2002 World Cup. The mean error percentage was 26.2%. The data have shown an overall bias toward flag errors (FE) (i.e. no offside but the flag has been raised) in comparison with non-flag errors (NFE) (i.e. offside but the flag has been kept down). These results are in line with the FLE hypothesis as proposed by Baldo et al. (2002). To further examine this hypothesis, the present study examined if the FLE also appears for video- and computer-based offside situations. In addition we were also interested to know to what extent these animations allow to discriminate between 3 different expert groups involved in football.

Methods
Three panels (26 assistant referees (ASR), 16 referees (REF) and 26 elite youth football players (PLA)) assessed 3 sets of 40 offside situations that were all presented on a big video screen. In the first set, participants were exposed to computer-animated isolated offside simulations (ISO) (3 attackers versus 2 defenders plus a goalkeeper). The second set consisted of computer-animated structured game offside simulations (GAM) that were all based on real match situations from the FIFA 2002 World Cup. In the third set, the participants were exposed to video clips of offside situations (VID) that were played by elite football players and recorded from the viewpoint of the assistant referee on the sideline. Each set of 40 was divided into 5 different categories as we experimentally manipulated the position of the attacker at the moment the ball was passed. In position A and B, the attacker was 20 pixels and 10 pixels in front of the offside line when the ball was passed, respectively. In position C the attacker was exactly on the line with the second-to-last defender. For the offside situations the attacker was 10 pixels (position D) and 20 pixels (position E) behind the offside line, respectively. The error percentage was analysed using a 3 Panel by 3 Set by 5 Position repeated measures ANOVA. Significant main effects were examined using Tukey post-hoc procedures.

Results
The overall error percentage across all participants (n=68) and all offside situations (n=120) was 41.32%. Significant main effects were found for Panel (P<0.0001), Set (P=0.0001) and Position (P<0.0001). ASR made fewer errors than REF, and REF, in turn, made significantly fewer errors than PLA (see Fig. 1). For the Set categories, ISO were more difficult than GAM, and GAM more difficult than VID. Structured game situations that allowed the participants to read the game resulted in better performances compared to the situations without game structure. The video clips finally were most comparable with real game offside situations. Post-hoc analysis for Position showed significant differences for all comparisons, except for position B (10 pixels in front of the offside line) and position C (on the offside line). These 2 categories were the most difficult to judge. As expected, all 3 panels made most mistakes for position B and C. Overall, the panels made significantly more errors in onside situations (FE) than in offside situations (NFE). All together, there was an overall bias toward FE in comparison to NFE.

Discussion/Conclusion
To explain the errors by assistant referees when judging offside situations, Baldo et al. (2002) and Helsen et al. (JSS) have confirmed the FLE hypothesis. This assumption was based on real life offside situations during matches. In the present study, video- and computer-based animations were used to further investigate the FLE hypothesis. First, the panels made more errors in onside situations (FE) than in offside situations (NFE). In addition, more errors were committed in those positions that were predicted by the FLE hypothesis, in particular position B and position C. These results clearly support the FLE hypothesis. The observations also showed a significant difference between the 3 panels in the way that the panel with the most experience assessing offside situations were significantly better than both other panels. This indicated the validity of the experimental task. Given the error percentage in offside decision-making, future research is needed to examine if these video- and computer-animations can be used as an effective training tool and to what extent these may transfer to the more appropriate offside judgements in real matches.

References
Helsen W, Gillis B, Weston M. Submitted for publication to Journal of Sport Sciences