Tracking expertise in visual information pickup when throwing basketball using virtual reality

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Introduction

The basketball court offers multiple sources of visual information for players to perceive the basket's distance. *Elevation angle* of the basket in the field of view would be of larger importance than *stereoscopy* and *motion parallax* (de Oliveira et al., 2009). Other sources of visual information should be considered to complete the picture such as the ratio between the optical height and width of the basket (i.e., *form-ratio).* The perceptual superiority of experts over novices in picking up those information sources for regulating their throw should be established.

Method

Ten experienced and thirteen novice basketball players threw naturally a basketball in a realistic simulator. Ball trajectory was captured by two CX1 Codamotion Units and extrapolated online to render onto a large stereoscopical screen it's landing on a basket embedded in a virtual gymnasium. The perception of the virtual basket's distance with respect to free-throw was manipulated by independently decorrelating from the actual throwing distance *form-ratio*, *stereoscopy*, *motion parallax*, and *elevation angle* while keeping the other sources of information specifying the basket's distance unchanged. We tracked changes in ball trajectory in response to the modified source of information.

Results

When decorrelating *form-ratio* and *stereoscopy*, induced perception of a near basket resulted in a shorter ball trajectory while far basket perception resulted in a longer trajectory. Decorrelation of the *Form-ratio* induced larger changes in ball trajectory than decorrelation of the *stereoscopy*, especially for the far basket. Novices responded less to decorrelation of *form-ratio* than experienced players. Novice responded more to decorrelation of *stereoscopy* than experienced players.

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When decorrelating *motion parallax* and *elevation angle*, ball trajectory suggested that both novices and experienced did not perceive a near or far but rather an elevated or lowered basket. Overall, the influence of *Elevation angle* was stronger than those of *Motion Parallax. C*hanges in trajectories were stronger for novice than for experienced players.

Discussion & Conclusions

Large changes in ball trajectory in the direction of a biased perception of basket's distance resulted from the decorrelation of Form-ratio. *Form-ratio* would therefore be as important for basketball players as it is for airplane pilots who use it to perceive the distance from a runway to land (Galanis et al., 1998). Smaller changes in trajectory induced by the decorrelation of *Stereoscopy*, especially for the far basket, are consistent with the usefulness of *Stereoscopy* for longer distances. Unexpected changes in trajectory when decorrelating *motion parallax* and *elevation angle* contradict de Oliveira's results (2009) and suggest that experienced would be greater calibrated to the basket height than novice players. Basketball throwing performance can thus be examinated with virtual reality without impoverishing the visual scene and without equipping basketball players with bulky eye-tracking systems.

References

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Keywords: Depth perception, Optical information, Expertise, Basketball throwing, Virtual reality