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Rowing novices can only partly profit from acoustic and visual display of a reference movement of an oar blade

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A trainer of complex sports can hardly provide valuable real-time feedback since he cannot focus on multiple aspects of the movement at one time and may evaluate performance of the training subject inaccurately. We are therefore developing technologies that automatically provide real-time feedback during sports training. To explore the capabilities of acoustic and visual augmented real-time feedback, we have used our rowing simulator. This simulator processes the athlete's actual performance to drive three feedback modalities. These modalities realistically present a virtual environment visually, e.g. passing scenery, acoustically, e.g. splash during immersion of the oar, and haptically, e.g. water resistance at the oar. We tested six rowing novices with different forms of augmented feedback (acoustic, visual, and control group with two participants each). Depending on the participant's group, a reference movement of the oar blade was displayed. All participants received video instructions explaining the correct rowing movement before and twice during training. Between the instructions, the participants had the opportunity to row autonomously while augmented feedback was provided. One training session lasted fifteen minutes and was repeated on three consecutive days. All participants showed a training effect, indicated by a reduced temporal and spatial variation. However, displaying the reference movement distracted participants; their cycle duration varied significantly more during phases with augmented feedback. Although rowing with the acoustic feedback was the most affected condition concerning spatial variation, it led to a reduced variation of the cycle duration compared to the visual group. Visual feedback facilitated to emphasize horizontal and to reduce vertical oar blade movements. In conclusion, video instructions and self-exploring time on the simulator already resulted in improved rowing skills. Just displaying the reference movement was rather distracting than beneficial. We will therefore now realise real-time feedback related to the deviation of the athlete's movement from the reference movement.