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The effects of divided attention and decision-making on single-leg landing stability in elite youth football players

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INTRODUCTION:

In football, athletes are required to quickly adapt their motor actions to the dynamics on the field. Previous studies have shown that athletic high-speed tasks (e.g., cutting or landing) involving either divided attention or time-constrained decision-making result in aberrant movement biomechanics associated with an increased risk for lower limb injuries. However, the effects of both cognitive components combined are largely unclear. Thus, the aim of this study was to investigate the effect of divided attention and decision-making on single-leg landing stability in elite youth football players.

METHODS:

Twenty-one male elite youth football players (17.5 ± 0.5 years) performed a total of 24 counter-movement jumps with single-leg landings on a pressure plate. Of those, $n=6$ were anticipated without visual distraction (control condition 1), $n=6$ anticipated with visual distraction (control condition 2), and $n=12$ unanticipated with visual distraction (experimental condition). Jump order was randomized. During the flight phase, the participants had to perceive and react to a game situation (movement of two opponents, two teammates), which was displayed on a screen in front of them. In the unanticipated condition, the landing leg had to be selected based on the movement of the opponents. In the control conditions, the landing leg was indicated before the jumps. In the conditions with divided attention (control 2 and experimental), participants had to register the movement of teammates (visible only during flight phase) and report it after landing. Biomechanical stability outcomes were vertical peak ground reaction force (pGRF; [N]), time to pGRF [ms], and center of pressure path length (COP, [mm]). Recall error rate (incorrect perception of the teammate movements, [%]) was assessed to quantify divided attention performance. To test for differences between conditions, repeated measures ANOVA were used for landing stability outcomes and Wilcoxon-tests for recall error rates.

RESULTS:

We found main effects (condition) for pGRF ($p < 0.001$, $\eta^2 = 0.37$), time to pGRF ($p < 0.001$, $\eta^2 = 0.36$) and COP ($p < 0.001$, $\eta^2 = 0.34$). Post-hoc tests indicated significantly higher pGRF, and COP values as well as shorter time to pGRF in the unanticipated condition compared to the control conditions 1 and 2 ($p < .05$). However, visual distraction alone (control 2) did not result in differences in landing stability ($p > .05$). Finally, compared to the anticipated jumps, the unanticipated condition resulted in a higher recall error rate ($z = -3.1$; $p = .002$) indicating impaired divided attention performance under time constraints.

CONCLUSION:

The combination of time-constrained decision-making and visual distraction may cause potentially harmful lower limb biomechanics and erroneous visual perception during jump-landings. These changes do not seem to occur with divided attention tasks only. This may have relevant implications for injury prevention in elite football players.

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