

# Quantifying soccer penalty kick technique

When targeting different goal zones during a penalty kick without specific technique instructions, experienced soccer players ( $N = 16$ ) exhibited the following technique characteristics for upper compared to lower goal zones:

No difference in horizontal lean

Increased downward vertical movement (lower hip position)

Increased lateral lean toward the standing-leg side



3D movement data of soccer players were recorded using the **Xsens IMU system**.



**Soccer kicking technique** was evaluated using **principal components (PCs)**: These PCs were derived in a preliminary step using predefined instructions to execute extreme technique variations, thereby aligning PCs with **practice-informed** technique principles (e.g., horizontal, vertical, and lateral movement) onto which the goal-targeted shots could be projected and analyzed using **statistical parametric mapping (SPM)**.

