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Investigating the influence of representative scaling in football practice games via positional data

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INTRODUCTION:

One major problem in football practice is defining the scaling of the field size when a chosen practice game reduces the number of players unlike the formal 11 vs. 11 game (FG11vs11) [1]. In common practice, the frequency of actions per player increases due to a much smaller area per player in sub-task designs (e.g. 5 vs.5) [2]. Whereas the emergence of individual and collective skills is constrained by the ambient information of the learning environment [3]. Thus, the representative (RP) interpersonal layout given in training remains to be elucidated, particularly on how collective behaviors change when the area per player is reduced in sub-task designs.

METHODS:

22 male football players (age: 23 ± 5 years) of a professional German U21 football team are separated into two teams, competing in five different field conditions: One FG11vs11 and two practice game conditions (RP7vs7, RP5vs5) are played with an area per player that represents an official match scaling ($296\text{m}^2/\text{player}$). In contrast, two practice game conditions are played with a commonly smaller (S) area per player [2] (S7vs7, $174\text{m}^2/\text{player}$; S5vs5, $184\text{m}^2/\text{player}$). Each team plays six attacks per condition in a crossover study design (60 attacks total). Players' positional data are computed using a GPS unit (10Hz, Catapult®). The data is processed to calculate the parameters distance-to-nearest-opponent, convex hull, and relative convex hull.

RESULTS:

Results from the repeated-measures ANOVA revealed significant differences between the played conditions for distance-to-nearest-opponent, $F(4, 55) = 14.76$, $p < 0.0001$, $\eta^2 = 0.52$, convex hull, $F(4, 55) = 275.07$, $p < 0.0001$, $\eta^2 = 0.95$, and relative convex hull, $F(4, 55) = 53.41$, $p < 0.0001$, $\eta^2 = 0.80$. Tukey's post-hoc pairwise comparisons revealed that merely the RP7vs7 showed a similar distance-to-nearest-opponent as the FG11vs11. Furthermore, the convex hull differed notably between the sub-tasks S5vs5 compared to the RP5vs5 and S7vs7 compared to the RP7vs7.

CONCLUSION:

Data show, that the space occupied by both teams and thereby their collective behaviour, is highly influenced by the available space surrounding them. Moreover, smaller field scales as well as fewer players tend to reduce the representativeness of the interpersonal layout in practice tasks. Further investigation of RP field scales might be fertile ground to improve the effectiveness of practice designs.

[1] Clemente et al. (2023)

[2] Owen et al. (2013)

[3] Pinder et al. (2011)

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