28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

The Physical Demands During Transitions in Elite Soccer: Analysis of Positional Differences, The Novel Concept of Clusters, and Implications for Training Design.

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INTRODUCTION:
Transitional activities (TA's) and high-pressure actions in soccer match play represent specific high-intensity blocks and include a high technical-tactical context within. Given that limited number of studies exist on the physical demands during transitions, gaining more knowledge in this area, might equip practitioners with additional tools to effectively replicate high-intensity periods in training. Hence, this study investigated physical match demands across different playing positions during transitional activities and analysed repeated activities during transitions.
METHODS:
Data was collected using 10 Hz GPS units from 10 official matches including 23 elite soccer players of the 1st Polish Division (Ekstraklasa) in season 2020-21. The following positions were investigated: center backs (n = 4), fullbacks (n = 5), central defensive midfielders (n = 2), central attacking midfielders (n = 2), central midfielders (n = 2), wingers (n = 5), and attackers (n = 3). Match data reflected distances covered per minute (m·min-1): total distance (TD), high-speed running distance (HSRD, > 19.8 km·h-1), sprint distance (SD, > 25.2 km·h-1), as well as the number of high-intensity accelerations and decelerations (A+D, > 3 m·s-2; n·min-1). Total absolute and relative high-speed running and sprint distances were also quantified. Metrics were observed in relation to 4 TAs commonly observed in football matches. Positive Transitions (PT), Negative Transitions (NT), Fast Attacks (FA) and High-Pressure Activities (HP). Clusters of transitional activities (CTA) included two or more transitional activities that occurred within a period shorter than 61 secs.
RESULTS:
A univariate analysis of variance revealed position-specific differences and elevated physical outputs across all variables. Significant effects of position were found for all metrics during transitional play (large ESs; $p < .001$). Central attacking midfielders showed higher TD (m·min-1), fullbacks covered highest SD (m·min-1) and wingers had the highest A+D (n·min-1) ($p \leq 0.05$). Center backs showed lower physical outputs compared to other positions but achieved highest A+D (n·min-1) during defensive transitions ($p \leq 0.05$). Attackers reached higher physical metrics during high pressure activities ($p \leq 0.05$). Transitional activities recovery period was found to be 108.5 ± 26.2 s, CTA recovery period was 25.7 ± 3.6 s, while CTA peak duration reached 53.3 ± 18.2 s.
CONCLUSION:
Physical metrics are increased when observing transitional play. This study shows that players are exposed to repeated short, intermittent high-velocity actions together during contextualized peak intensity periods (transitions) in football, emphasizing the need to move away from 90min averages. Findings could inform coaching practices and training programme design in elite soccer to prepare players for their position-specific role during peak intensity periods and reduce their risk of injury.

Topic: **Coaching**

Presentation **Oral**

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