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INTRODUCTION:
The forehand smash in badminton is a skill which requires elite performers to gauge and determine the most appropriate speed-accuracy trade-off (SATO) given the task, environment and individual constraints (1, 2). Fitts' law (3) has often been characterised as an adept model for understanding SATO. Manipulation of constraints such as a target for accuracy has become a common coaching practise (4). The aim of this study is to determine and compare what SATO relationships international badminton players utilise when confronted with three constraint practises: maximal speed (MS) towards the direction of a target; maximal speed aiming to hit the centre of three shuttlecock tubes (TUBE); and maximal speed aiming to hit the centre of a circular target placed flat on the ground (TAR).
METHODS:
Fifty-two (males:29; females:23) international badminton players training/competing at the Glasgow BWF World Championships (2017) participated in the study. Racket-shuttlecock kinematics were collected using a Vicon 3D Motion Analysis System (400 Hz; OMG Plc, Oxford, UK). A ⌀ 3m target (Podium 4 Sport) was placed flat on the centre line of the opposite side of the court to score accuracy (zero: centre circle=most accurate; five: out of bounds/net=least accurate) (5). Using percentage (TUBE:TAR) of MS shuttlecock speed and accuracy score, a combination of two twostep cluster analyses (IBM SPSS V23) were used to identify clusters. A mixed ANOVA was used to analyse group*constraint interaction.
RESULTS:
Three SATO relationships with different magnitudes (high (H): < 90%; moderate (M): 90-97%; low (L): > 97%) were identified in the cluster analyses: Inverse relationship (IR): decrease in shuttlecock speed, improvement in spatial accuracy; Alternative inverse relationship (AIR): shuttlecock speed increases, decline in spatial accuracy; Linear relationship (LR): Increase in shuttlecock speed, improvement in spatial accuracy. Clusters were combined (TUBE:TAR) to create 5 groupings: HIR:HIR; HIR:MIR; LLR:MIR; LLR:LLR; AIR:AIR. The mixed ANOVA revealed that group shuttlecock speed and accuracy score significantly differed across constraints ($p < 0.001$). The LLR:MIR group increased shuttlecock speed and improved spatial accuracy the most from the MS to the TUBE condition.
CONCLUSION:
Elite badminton players adopt different SATO relationships when attempting to meet task constraint goals. A LLR can be used to produce fast and accurate smashes. Controlled constraint practises must be compared to those which incorporate more complex inter-personal dyadic interactions for both singles and doubles badminton.
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