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Changes in Kicking Pattern: Effect of Experience, Speed, Accuracy, and Effective Striking Mass

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Purpose

The purposes of this study were to: (a) examine the effect of experience and goal constraints (speed, accuracy) on kicking patterns; (b) determine if effective striking mass was independent of ankle velocity at impact; and (c) determine the accuracy of kicks relative to independent factors.

Method

Twenty participants were recruited to kick at 3 different velocities with and without an accuracy requirement. Multivariate analysis of variance determined if relative timing of joint angular velocities changed during the kick. Chi-square analysis determined if calculated effective mass was independent of ankle velocity at impact. Analysis of

variance (ANOVA) was used to examine differences in absolute constant error and variable error according to independent factors.

Results

Results indicated that experience and speed affect absolute timing of joint velocities with no changes in the relative timing of peak joint velocity across independent factors. Chi-square analysis indicated that calculated effective mass is not independent of ankle velocity. ANOVA indicated that experienced performers displayed less variability error than did inexperienced performers.

Conclusion

It was concluded that: (a) Experience, velocity, and accuracy do not affect the relative timing of kicks; (b) kickers trade ankle velocity at impact for greater effective striking mass and ball velocity; and (c) variability in ball placement is affected by experience.

Keywords:

constraints | dynamic systems | pattern change | striking mass

Notes

[1] Data regarding coordination and effective mass were also analyzed using a principal component analysis. Thirteen variables representing data collected for this study were entered into analysis. Five components were identified with eigenvalues greater than 1.0. The components were differences in joint velocities, calculated and actual effective mass, ball and foot velocity, joint lag, and joint velocity. Results substantiated that the variables analyzed for this study were those that accounted for 83.75% of variance in the data.