RELATION OF MAXIMAL STRENGTH TO RATE OF TORQUE DEVELOPMENT

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INTRODUCTION: The inconsistency of the time intervals used to calculate rate of torque development (RTD) has been accounted for the conflicting relations of RFD and various parameters, including maximal strength (Andersen and Aagaard, 2006), however, the joint angle influence on these relations has not been examined.

METHOD: The rapid and maximally developed knee extensor isometric torque-time curve was recorded in 20 track & field jumpers (TFJ, 16.9±1.8yrs) and 21 volleyball players (VP, 16.3±1.8yrs), at three knee angles (10, 60 and 90°, 2min rest, randomised order). The maximal torque (T_{MAX}) and RTD at various intervals from onset of contraction (0-25, 0–50, 0–300ms) were determined. The partial for age coefficient of correlation (*r*), squared (R^2) and expressed as a percentage (%) was used to determine the T_{MAX} relations to RTD, ($p<0.05$).

RESULTS & DISCUSSION: Joint angle and group influence, possibly associated to range-specificity of heavily loaded knee angles were evident at 10°, with the greater inter group R^2 difference at 90° (Figure 1). The R^2 increase as time intervals increased may be attributed to muscle fiber type for times < 50ms (Harridge, *et al.,* 1996), whereas, for times > 150ms, a stiffer muscle–tendon complex may account up to 30% in the T_{MAX} relation to RTD (Bojsen-Moller, *et al.,* 2005), nevertheless, maximal strength appears the most important contributor (Andersen and Aagaard, 2006), a concept that justifies the greater overall R^2 percentages at 60° (peak of the torque-angle curve in our young female athletes).

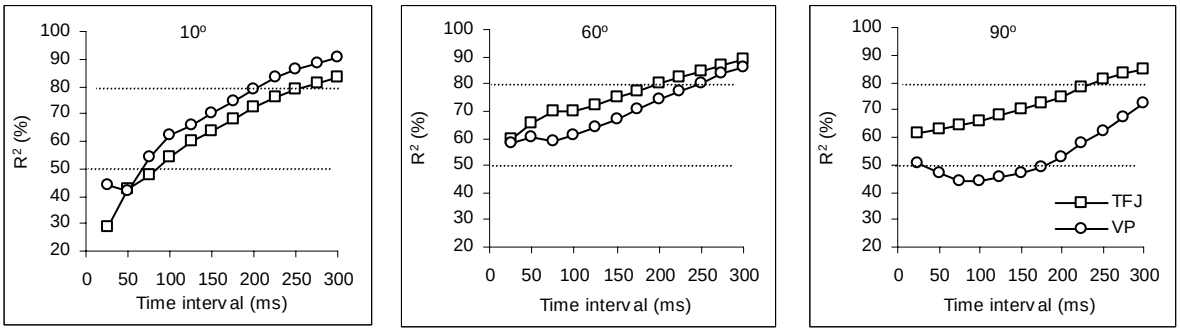

Figure 1. Percentage of explained variance (R^2) for the T_{MAX} relation to RTD determined at various time intervals from onset of contraction, at 10, 60 and 90°, for the TFJ (squares) and the VP (circles).

CONCLUSION: The activity time span and the sport-specific range of heavily loaded joint angles should be accounted for in T_{MAX} and RTD training programs of young athletic females.

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