THE FACTOR STRUCTURE OF ISOKINETIC TORQUE, WORK, POWER; ISOKINETIC FATIGUE, PLYOMETRIC POWER AND SPRINT ACCELERATION

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INTRODUCTION
Many constructs in biomechanics are measured as discreet constructs, which does not reflect the complex interrelationships of these constructs. Factor analysis is a multivariate statistical technique that examines the interrelationships between sets of measured variables that may or may not be correlated and a method which can provide insights into how biomechanical exercise and sport science constructs are related. Such as in multiple events in athletics and measurement theory in biomechanics [4]. The two theoretical approaches using factor analysis are confirmatory factor analysis and exploratory factor analysis [5]. In confirmatory factor analysis, the most common approach, the researcher attempts to refute or corroborate the factor structure based on research hypotheses that have originated from previous theory. The research question was what is the factor structure of isokinetic torque, work, power and acceleration when apparently different measurements are utilised or are they discrete or highly correlated?

METHODS
Sixty healthy, physically fit, active males (N=32) and females (n=28) participated in the study (mean age = 25 years; mean height = 175cm; mean weight = 70kg). Maximal performance on the experimental dependent variables of isokinetic torque, work, power, isokinetic fatigue, plyometric power and sprint acceleration was assessed in a university laboratory environment. Specifically, were measured on the CYBEX 340 isokinetic muscle evaluation system with HUMAC software at isokinetic speeds of 60, 180 and $300^{o}s^{-1}$ using leg extension/flexion to assess torque, muscular work and fatigue index. Leg power indices of contact time, flight time and height were assessed with Speed Light Sports Timing System using jump mode and acceleration at 10m using timing gates was tested with the same instrument.

RESULTS AND DISCUSSION
The initial factor extractions were based on principal component analysis and maximum likelihood methods. Factor loadings vary in absolute value from zero to one. The closer the factor loading is to one the stronger the relationship between the factor and the measured variable. The most interpretable solution was a three significant factor model derived by principal component analysis, which explained 74.1% of common variance in the data set using the eigenvalues greater than 1 followed by varimax rotation. Factor 1 loaded significantly with peak torque and total work across the three isokinetic speeds (loadings .803 to .919). Factor 2 loaded significantly with jump height, 10m acceleration and flight time (loadings .698 to .861). Factor 3 loaded significantly with isokinetic fatigue index across the different isokinetic speeds (loadings .782 to .829). The only variable that displayed factor complexity was vertical jump contact time, which loaded across factors 1 and 2.

CONCLUSIONS
The three factor solution identified factor 1 as isokinetic peak torque and total work ability, factor 2 as plyometric power/acceleration ability and factor 3 as isokinetic fatigue ability. These findings indicate that many measures of strength and work; power and speed; and isokinetic fatigue index, although measured using different measurement protocol are redundant and should promote measurement parsimony.

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