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Modeling the Relationship between Velocity and Time to Fatigue in Elite Male Long-track Speed Skaters

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(No disclosure reported)

Several mathematical models have been used to describe the relationship between exercise intensity and time to fatigue.

PURPOSE: The purpose of this study was to evaluate different methods of describing the mathematical relationship between skating velocity and time to fatigue in elite male speed skaters.

METHODS: Competition results (times) for the top 11 finishers at the 2003 Men's Long-track Speed Skating All-round World Championships were used. Data for the first 100 m were excluded, due to the dissociation between metabolic demand and velocity during the acceleration phase. To determine critical velocity (CV), anaerobic work capacity (AWC), and maximal velocity (V_{max}), times for the four corrected distances (400, 1400, 4900, and 9900 m) were fitted to three mathematically-equivalent 2-parameter models (1a: time = AWC · (velocity - CV)-1; 1b: distance = (time · CV) + AWC; 1c: velocity = CV + (AWC · time-1)) and two different 3-parameter models (2: time = AWC · (velocity - CV)-1 - AWC · (V_{max} - CV)-1; 3: velocity = CV + AWC · (1- e- (time / tau)) · time-1).

RESULTS: The 2-parameter models (1a-1c) produced significantly different values (p<0.001) for CV and AWC, and thus were deemed unacceptable for describing the velocity-time relationship. The 3-parameter models (2-3) resulted in high values for coefficients of variation (R2 > 0.999) and small values for SEE for AWC and CV (~10% and <1% of the values for AWC and CV, respectively); however, values generated by the models differed (p<0.001): CV (10.9 ± 0.2 and 11.2 ± 0.2 m·s-1) and AWC (727 ± 179 and 404 ± 89 m) for models 2 and 3 respectively.

CONCLUSION: The all-round event in competitive speed skating provides a unique and excellent source of data for use in evaluating models of the velocity - time relationship. In no other major sport does each male participant provide four timed all-out efforts with performance times ranging from <1 min to 15 min; and laboratory testing rarely elicits the level of effort achieved in competition. Only the 3-parameter models described the velocity and time to fatigue relationship well, and therefore these models might be useful in evaluating performance-related physiological characteristics (CV, AWC, and V_{max}) in elite male speed skaters.

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Evaluation of Body Composition, Strength and Power of Division II Competitive Female Cheerleaders

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The relationship between body composition (lean and fat mass), strength, and power is not well understood in collegiate competitive female cheerleaders.

PURPOSE: To evaluate the relationship between body composition, strength and power in Division II competitive female cheerleaders.

METHODS: 35 female cheerleaders (age 18.8 ± 0.28 years, BMI 21.45 ± 0.30 kg/m2) completed a battery of fitness measurements including body composition (air displacement plethysmography), strength (handgrip, 1RM bench press, 1RM squat) and power (vertical jump). Pearson correlation coefficients were used to analyze relationships.

RESULTS: Group analysis demonstrated that measures of upper body strength (handgrip and bench press) were moderately related (r = 0.49, p = 0.01), but lower body strength (squat) and power (vertical jump) were only weakly related (r = 0.36, p = 0.05). Body composition was not related to strength or power except as absolute lean mass (kg). There was a fairly strong and positive relationship between lean mass and grip strength (r = 0.66, p = 0.01), bench press (r = 0.59, p = 0.01), squat (r = 0.69, p = 0.01) and vertical jump (r = 0.52, p = 0.01). However, subgroup analysis by positions (bases vs. flyers) identified marked differences. In bases (n = 25) (BMI 21.90 ± 0.36 kg/m2), lean mass was significantly related to grip strength (r = 0.64, p = 0.01), bench press (r = 0.53, p = 0.01), squat (r = 0.55, p = 0.01) and vertical jump (r = 0.61, p = 0.01). By comparison in flyers (n = 10) (BMI 20.66 ± 0.33 kg/m2), although lean mass had a strong relationship to squat strength (r = 0.84, p = 0.01), it had no relationship to grip strength or vertical jump, and only a moderate relationship to bench press (r = 0.65, p = 0.05).

CONCLUSIONS: Among the cheerleaders in this study, bases maintained consistent and positive relationships between lean mass, upper and lower body strength, and lower body power, while flyers did not. These findings may reflect differences in the positional demands placed on cheerleaders.

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Anthropometric And Physiological Characteristics In Male And Female American University Basketballers

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Current sports medicine literature contains many references about the physiologic and anthropometric profile of both professional and non-professional basketballers from varying countries. However, no scientific data exists comparing players from universities within the same country by gender. **PURPOSE:**The aim of the study was to identify pre-seasonal variation in anthropometric and physiologic variables between gender in basketballers in the NCAA Big East Conference.

METHODS: Nineteen players, men (M) and women (W), participated in this study. The characteristics were as follows for M and W respectively: age (Mean ± SD: 20.5 ± 1, 20.3 ± 1 years), height (6.2 ± 0.4, 5.8 ± 0.3 ft), weight (210.9 ± 36.7, 165.4 ± 19.0 lbs). The subjects were tested twice during the pre-season in conditioning program of 10 Weeks duration, consisting of strength and aerobic exercises. M trained 10-H Week and W 8-H Week. Each player performed 1RM, in bench press, clean and ½squat, and CMJ was assessed with a force plate. 1, 2 and 3 miles running tests were performed (men only). Additionally, blood pressure was determined.

RESULTS: At the beginning of the season M and W were significantly different in all variables measured excepting age, height [6.2 ± 0.4 vs. 5.8 ± 0.3 in.]; weight [213,1 ± 39.1 vs. 161.9 ± 15.9 lb], body fat [10.6 ± 3.2 vs. 18.7 ± 6.9 %], clean [209.3 ± 35.6 vs. 131.1 ± 6.9 cm], ½ squat [319.3 ± 57.2 vs. 177.2 ± 33.4 lb], and blood pressure [260.6 ± 48.0 vs. 142.7 ± 12.7 lb].(men and women respectively) (p<0.05). Furthermore, the men's group reduced the time in running (-6.2% and -10.1%, 1 and 2 miles respectively) (p<0.05), pre- and post-training. Nevertheless, there were no statistically significant differences between groups after the training program in any variables tested, except for squat (group x time interaction) (p<0.02).

CONCLUSIONS: At the beginning of pre-season training, differences exist between men and women. During the course of pre-season training, both of them improved their performance, although none of these changes were statistically significant, except for squat. In other words, despite training 20 more hours of conditioning training along the pre-season, men achieved no significant benefits in terms of results. Future studies may help to show if this time could be better used for rest or different types of training.