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Gender Differences In Recreational Athletes Self Detecting Ventilatory Threshold During Maximal Exercise Testing

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ABSTRACT

INTRODUCTION: Ventilatory threshold (VT) is where minute ventilation (V_E) increases nonlinearly with increasing exercise intensity. Prior studies show subjects are able to recognize VT by noticing changes in breathing during exercise bouts. Studies comparing gender differences in self-detection of VT have equivocal results. Teaching recreational athletes to use VT as a training method could result in better quality training.

PURPOSE: Determine existence of gender differences in recreational athletes accurately perceiving changes in V_E associated with VT during maximal exercise.

METHODS: Subjects (Males:n=16, age= 20.3 ± 1.9 yrs.) (Females:n=4, age= 21.0 ± 0.8 yrs.) performed a maximal treadmill protocol with gas analysis. Subjects indicated when they noticed a considerable change in breathing and was recorded as perceived ventilatory threshold (PVT). Actual VT was calculated from maximal exercise test results. Independent = two-factor mixed model ANOVA was employed to explore differences in time (minutes) and VO_2 between perceived and actual ventilatory threshold (VT) across sex (male and female). Equal error variances across sex were assessed using Levene's Test of Homogeneity of Variance. Normality was assessed using Shapiro-Wilk Test of Normality. Significance was set at $p < 0.05$.

RESULTS: There were no assumptions to the statistical assumptions for both ANOVA procedures. Time main effects: Not Statistically significant $F(1,18) = 3.455$, $p = 0.08$. Sex main effects: Not Statistically significant $F(1,18) = 0.210$, $p = 0.65$. Interaction Effects: Not Statistically significant $F(1,18) = 0.005$, $p = 0.94$. There were no assumptions to the statistical assumptions for both ANOVA procedures. VO_2 main effects: Not Statistically significant $F(1,18) = 11.83$, $p = 0.003$. Sex main effects: Not Statistically significant $F(1,18) = 1.35$, $p = 0.261$. Interaction Effects: Not Statistically significant $F(1,18) = 4.365$, $p = 0.050$. On average, males perceived VT after actual VT, while female perceived VT closer to actual VT.

CONCLUSION: In respect to the study, recreational athletes did not accurately detect changes in breathing associated with VT regardless of gender. Participation in programs providing exercise education on VT could benefit recreational athletes for desired training effects of both genders.

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Exploring Physical Fitness Profile Of College Students Through Principal Component Analysis: A Case Study

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Universities offer lifetime physical fitness (PF) courses and organize health fairs to keep their students physically fit. Despite these efforts, only 49.9% of US students meeting the National Guidelines for physical activity, reporting low fitness levels, as evaluated by the respective scores of the five fitness components. Fitness evaluation though is a time-consuming process and students' time constrains have been postulated as reasons for lack of participation, motivation, and involvement.

PURPOSE: Since time availability may influence students' participation in a battery of fitness testing for evaluating their PF levels, this study aimed through principal component analysis (PCA) to reduce the health-related PF components to the minimum required to assessed them in college students.

METHODS: Students' (N=36) PF of cardiovascular endurance (i.e. Queens College-VO2), musculoskeletal strength (i.e. handgrip-HG) and endurance (i.e. pushups-PU), flexibility (i.e. sit-and-reach-SR), and body composition (i.e bioelectrical impedance-BF) were assessed during a campus wide Health Fair. PCA was used to reduce the # of examined variables. Kaiser-Myer-Olkin (KMO) values and Bartlett's Sphericity test with Eigenvalues >1 were considered for the extraction of PCA. Varimax rotation and threshold of .7 in each PCA loading were used for correlation, differentiation, and interpretation between components. Parallel analysis was also used to verify the number of extracted components. Data analysis was performed by SPSS vs 28.

RESULTS: From 36 students that participated in the fair, only 25% (6 Females, 3 Males) actually completed all fitness testing. For PC1, KMO was .61, $p<.049$. Two components were extracted; HG, VO2, PU, BF with 60% and SR with 21% variance explained respectively. Running PCA again with SR removed this time, resulted to PC2 with KMO = .63, $p<.007$, yielding one component (HG, VO2, PU) with 69% of the variance explained.

CONCLUSIONS: This study confirmed the importance of musculoskeletal strength and endurance, and cardiovascular endurance for PF evaluation. Even though the sample size used in the PCA was marginally acceptable, results indicated that when examining PF in college students, instead of testing all 5 of them, for brevity 3 PF components may be used as well.

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Normative Values For Vertical Jump Kinematic Sequencing By Sex And Collegiate Sport

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Establishing normative data specific to sex and sport participation can improve performance appraisal, and may aid in identification of limitations.

PURPOSE: To generate kinematic sequencing norms specific to each sex in various sports.

METHODS: We tested 543 D1 athletes representing 15 sports using SpartaTrac technology. Subjects executed 6 vertical jumps on a force plate to generate a "Movement Signature" consisting of Load (eccentric force development during the downward phase), Explode (force output during the transitional phase), and Drive (magnitude and duration of concentric force during the upward phase). Athletes were stratified by sex and sport, and normative values were calculated. Multivariate tests estimated differences in these values between groups.

RESULTS: Across the total sample, Load was 49.8 ± 10.2, Explode was 47.0 ± 9.9, and Drive was 55.5 ± 10.2; there was wide variance between different men's sports ($p<0.001$) and women's sports ($p<0.001$) sports. Among men, Load was highest in baseball (53.3 ± 10.3), basketball (52.6 ± 8.9), and soccer (52.5 ± 10.0); it was lowest in tennis (49.0 ± 10.7), water polo (49.1 ± 6.4), and swimming (50.4 ± 9.7) Explode was highest in basketball (53.2 ± 10.2), baseball (52.4 ± 8.6), and soccer (50.8 ± 8.3); it was lowest in water polo (44.0 ± 6.9), tennis (44.9 ± 5.9), and swimming (46.5 ± 8.5). Drive was highest in swimming (60.0 ± 9.9), water polo (54.6 ± 9.5), and baseball (54.0 ± 9.2); it was lowest in tennis (51.4 ± 14.0), basketball (52.8 ± 9.1), and soccer (53.2 ± 7.9). Among women, Load was highest in basketball (55.4 ± 17.1), volleyball (51.0 ± 8.7), and field hockey (48.0 ± 9.0); it was lowest in cross country (40.9 ± 5.8), soccer (45.9 ± 7.1), and water polo (46.1 ± 6.6). Explode was highest in basketball (53.0 ± 12.3), volleyball (48.1 ± 6.6), and field hockey (47.3 ± 8.8); it was lowest in water polo (34.9 ± 5.4), cross country (41.6 ± 8.8), and swimming (41.9 ± 6.6). Drive was highest in water polo (62.9 ± 10.4), volleyball (59.6 ± 7.4), and swimming (57.9 ± 9.9); it was lowest in basketball (51.3 ± 11.2), field hockey (53.0 ± 7.8), and soccer (54.6 ± 8.8).

CONCLUSIONS: Ground reaction forces vary between sport populations. Normative values may aid in the customization of training programs for athletes whose signatures differ markedly from expected performances.

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Comparison Of Different Methods Used To Prescribe Exercise Intensities From Ramp-incremental Exercise

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The oxygen uptake ($\dot{V}O_2$) vs power output (PO) relationship from ramp exercise (RAMP) is used to prescribe aerobic exercise. During a RAMP, as PO increases, there is a delay in breath-by-breath $\dot{V}O_2$ that contributes to a misalignment of $\dot{V}O_2$ from PO. This lag is known as the mean response time (MRT). If the MRT is not considered in exercise prescription, RAMP-identified POs will elicit $\dot{V}O_2$ values that are higher than intended. Three methods are used to quantify MRT including linear modeling (MRT_{Lin}), exponential modeling (τ'), and the steady-state method (MRT_{SS}).

PURPOSE: To compare the time delays between MRT_{Lin}, τ', and the MRT_{SS} at 75%, 85%, and 15% of the difference between estimated lactate threshold (θ_L)and $\dot{V}O_2$peak (Δ15%).

METHODS: 10 males (24.6 ± 7.7 yr, $\dot{V}O_{2max}$ 3.69 ± 0.72 $L \cdot min^{-1}$, Peak PO $\dot{V}O_{2max}$ 352 ± 57 W, θ_L PO 180 ± 58 W, θ_L $\dot{V}O_2$ 2.22 ± 0.69 $L \cdot min^{-1}$) performed a 30W/min RAMP on a cycle ergometer (CYCLE). τ' and the MRT_{Lin} were calculated from the RAMP and converted to a coincident PO. Three 30 min CYCLE trials were performed on separate days, at τ' left-shifted 75%