

## **Gender & sport related differences in electrocardiogram & pre-participation exams (PPE) in college age athletes**

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### ABSTRACT

**Background and Purpose:** The NCAA requires all college level athletes receive a pre-participation physical exam. However, the pre-participation exams occasionally do not require electrocardiogram screening to help detect cardiac abnormalities. Though electrocardiograms may not be available at all testing's, using specific markers and finding differences between gender and sport abnormalities could help detect cardiac abnormalities. The purpose of this study was to determine if there were significant differences in resting 12-Lead ECG markers in a group NCAA Div. II collegiate level athletes.

**Methods:** Three hundred and eight college level athlete's ages 18 to 25 participated in this study. Age, gender, height, weight, BMI, blood pressure and heart rate were measured during a pre-participation exam. Electrocardiogram measurements were gathered by using Mortara X-Scribe™, Vacumed Turbo Fit 5™, Welch Allyn CardioPerfect™. Twelve-Lead ECGs were categorized by sport and analyzed by the lab director and the attending physician. One-way ANOVA was used to analyze differences in ECG findings in genders and sports. Independent t-test and linear regression were used to analyze differences between male and female outcomes. Significance was set at the 0.05 level.

**Results:** No significant differences in wave conformation or arrhythmias were found between sports. Cross country athletes had significantly lower resting heart rate ( $61 \pm 12.5$  bpm) than football ( $70.6 \pm 14$  bpm), baseball ( $72.6 \pm 12.8$  bpm), track and field ( $73.2 \pm 13.4$  bpm), and cheerleading ( $75 \pm 11.8$  bpm) ( $P=0.003$ ). Resting systolic blood pressure was significantly higher in football ( $124.8 \pm 10.4$  mmHg) and baseball ( $124 \pm 10.4$  mmHg) than softball ( $115.8 \pm 5.4$  mmHg), track and field ( $119.2 \pm 10.9$  mmHg), cross country ( $112.7 \pm 11.2$  mmHg), and cheerleading ( $114.9 \pm 7.9$  mmHg) ( $P=0.001$ ). Similarly, heart work expressed as rate pressure product (RPP) was significantly lower in cross country compared to all other sports. Relative to ECG parameters cross country athletes showed ECG changes typical for cardiovascular endurance training compared to all other sports including sinus bradycardia, increased RR interval, and leftward axis shift.

**Discussion:** Although marked differences in 12-lead ECG parameters were not found between sports in this sample, two athletes were sent for further echo evaluation due to abnormal ECGs, but were subsequently cleared to participate in their sport.