Effect of Aerobic Capacity on Sprint Performance in College Football Linemen
Nicholas F. Bianco, MS, ATC; Kyle S. Strunk, MS, ATC; Gary B. Wilkerson, EdD, ATC

BACKGROUND AND PURPOSE

• High aerobic capacity promotes efficient recovery from the physiologic effects of repeated anaerobic exertions1
  - Repeated sprints are a common form of football conditioning believed to improve game performance
  - Phosphocreatine is the sole energy source for the initial 10 seconds of a sprint
  - Aerobic sources account for ~20% of the energy utilized during a subsequent sprint without recovery time2
  - The extent of aerobic compensation for depleted anaerobic energy during repeated high-power tasks is unknown4
  - There is evidence that post-sprint phosphocreatine level is positively influenced by aerobic metabolism
  - The purpose of this study was to compare decline in repeated anaerobic sprint performance between football players with high versus low aerobic capacity

RESULTS

• VO2Max was associated with magnitude of average change in sprint time from baseline to post-fatigue (Figure 1)
  - VO2Max mean =37.9 ± 4.6 mL/kg/min (Figure 2); Sprint time decrement mean ±0.06 ±0.11 s (Figure 3)
  - VO2Max was estimated using the Uth-Sørensen-Overgaard-Pedersen equation: VO2Max = 15 * (HRmax/HRrest)
  - 3 “fatigued” 20-yd sprints were performed very shortly after termination of the treadmill test (i.e., within ~15-30 s)
  - Baseline and fatigued trial (average of 3 sprints each) were compared to quantify performance decrement
  - Cases dichotomized on the basis of published VO2Max standard,5 data analyzed by 2x2 cross tabulation
  - Receiver operating characteristic (ROC) analysis used to dichotomize sprint performance decrement

• Among athletes who exhibited slower post-fatigue performance, 78% had a low VO2Max value (Table 1; Figure 4)
  - VO2Max ≥ 40 mL/kg/min considered to represent “average” aerobic fitness level6
  - Low VO2Max associated with 10.67 X greater odds for post-fatigue sprint time decrement (90% CI: 1.24, 91.56)

• An aerobic threshold for anaerobic performance benefit has been theorized to exist for each individual athlete3
  - Men with VO2Max ≥ 40 mL/kg/min considered to represent “average” aerobic fitness level5

• VO2Max appears to have an effect on the ability to perform repeated sprints at a consistent level in a fatigued state

PARTICIPANTS AND PROCEDURES

• 18 male NCAA Division I-FCS Football Linemen; 10 Offensive; 6 Defensive
  - Age (20.6 yrs ±1.4); Height (188.43 cm ±3.99); Mass (126.3 kg ±9.2); BMI (20.59 kg/m2 ±2.82)
  - All athletes were fully participating in all preseason football conditioning activities at the time of testing
  - Only “interior” defensive linemen were included because of much larger body mass than defensive ends

• VO2Max was associated with magnitude of average change in sprint time from baseline to post-fatigue (Figure 1)

CLINICAL RELEVANCE OF FINDINGS

• VO2Max appears to have an effect on the ability to perform repeated sprints at a consistent level in a fatigued state
  - A high VO2Max may reduce the likelihood for a substantial anaerobic performance decrease late in competition
  - Conditioning of football linemen should include development of both anaerobic power and aerobic fitness
  - Repeated sprints with jogging intervals may provide a means for concomitant anaerobic and aerobic conditioning

REFERENCES