Associations of Aerobic Capacity and Dietary Attitudes to Metabolic Syndrome

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BACKGROUND AND PURPOSE

- NFL linemen have a 52% higher risk of cardiovascular disease (CVD) mortality than the general population[1]
  - Heart disease mortality is 3.7X more likely among offensive and defensive linemen than other football players
- Previous studies of cardiometabolic risk for professional and college linemen have not addressed dietary habits[1-4]
  - Convenience and lack of education are major determinants of athletes' dietary practices[5]
- Identification of metabolic syndrome provides an opportunity to reduce risk for CVD and type 2 diabetes[6]
  - Maintaining optimal lean body mass promotes long-term health while enhancing performance capabilities
- The purpose of our study was to determine whether or not an association exists among performance capabilities, dietary attitudes, and metabolic status among college football linemen

PARTICIPANTS AND PROCEDURES

- 13 NCAA Division I-FCS football players: 8 offensive linemen (OL) and 5 defensive linemen (DL)
  - Age (20.6 ±1.6 yrs), Height (188.9 ±3.5 cm), Weight (126.6 ±9.8 kg)
- Dietary habits and attitudes classified on the basis of responses to survey questions
  - 3-question dietary habits stage (Prochaska transtheoretical model of behavior change); 3-level classification
    - 1 = pre-contemplation + contemplation; 2 = preparation; 3 = action + maintenance
  - 40-question Eating Attitudes Test (EAT-40)
- VO_2Max was estimated using the Uth-Sørensen-Overgaard-Pedersen equation: VO_2Max = 15 * (HRmax/HRrest)
  - 4 mph with a 6% grade; increased 1 mph and 2% every 3 minutes to fatigue
- Metabolic syndrome (MetS) testing performed same day as dietary habits and attitudes analysis
  - Blood analysis: Cholestech LDX® blood analyzer (Alere, Inc., Waltham, MA)
  - ATP-III definition: ≥ 3 positive factors[7]
    1) Waist circumference (WC) >102 cm
    2) Systolic and diastolic BP (SBP & DBP) ≥135/85
    3) High density lipoproteins (HDL) <40 mg/dL
    4) Triglycerides (TRG) ≥150 mg/dL
    5) Fasting blood glucose (FBG) ≥110 mg/dL
- Receiver operating characteristic (ROC) analysis used to identify cut-points for dichotomized associations

Table 1

EAT-40 Item (0 = Never to 5 = Always)	Score	Odds Ratio
1. Like eating with other people	≤ 3	7.00*
8. Cut my food into small pieces	≤ 1	4.50
11. Feel bloated after meals	≤ 1	4.00
18. Like my clothes to fit tightly	≤ 2	12.14*
25. Am preoccupied with the thought of having fat on my body	≤ 1	4.67
34. Give too much time and thought to food	≤ 1	4.67
36. Feel uncomfortable after eating sweets	= 0	4.50

* Estimated OR: 0.05 added to each 2X2 cell to avoid division by zero

RESULTS

- 62% of linemen (8/13) had MetS, which is associated with elevated cardiometabolic risk
  - 8 cases: high TRG (157.25 ±75.28), high WC (113.38 ±7.17), high SBP (138.00 ±7.67), low HDL (37.13 ±5.54)
- VO_2Max <40 mL/kg/min predicted 75% of MetS cases; associated with 4.5X greater odds for MetS (Figure 1)
- Some EAT-40 components were found to provide substantial predictive value, whereas others did not
  - 7 of the 40 items were strong predictors of MetS (Table 1)
    - 7-item sum score ≤12 identified attitudes that appear to have an association with MetS (Figure 2)
- Logistic regression yielded a 3-factor prediction model (Nagelkerke R^2=.416) (Table 2)
  - Cut-points: low fruits/vegetables category =1, 7-item score ≤12 , and VO_2Max <40 mL/kg/min (Figure 3)
    - ≥2 factors positive: Sensitivity =100%; Specificity =60%; Fisher's one-sided p =.035; Odds Ratio =23.8*
  - Alternative prediction models were evaluated to potentially simplify screening (Figure 4)
    - Dichotomized EAT-40 responses for items #1, #18, and #25 yielded an alternative 3-factor model
    - ≥2 factors positive: Sensitivity =88%; Specificity =80%; Fisher's one-sided p =.032; Odds Ratio =28

Figure 1

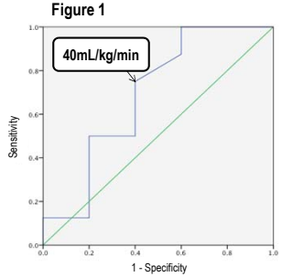


Figure 2

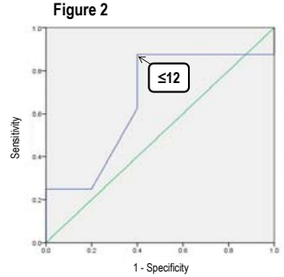


Table 2

Factor	Univariable OR	Adjusted OR
Eat-7 ≤ 12	10.50	9.40
VO_2Max < 40	4.50	5.89
Lo Fruit/Veg = 1	2.00	2.06

Figure 3

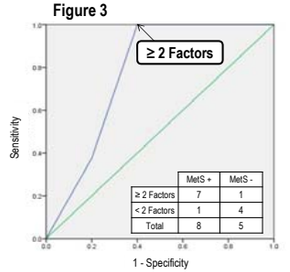
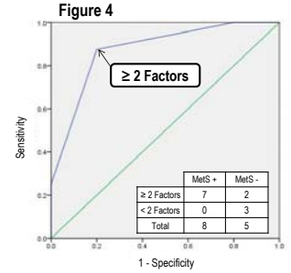


Figure 4



CLINICAL RELEVANCE

- MetS prevalence in general US population is 22.9%, whereas 62% of the linemen were positive for MetS
- The EAT-40 survey was designed to assess eating disorder risk, but also appears to have MetS screening value
  - Dichotomized EAT-40 responses for 3 items provided 90% sensitivity
- Assessment that included 7 EAT-40 items, aerobic capacity, and dietary habits category provided 100% sensitivity
  - Cut-point identified for VO_2Max corresponded to "average" aerobic fitness standard; ≥ 40 mL/kg/min[8]
- Aerobic capacity and dietary behaviors appear to have a profound effect on metabolic status
  - Impaired glucose metabolism adversely affects long-term health, and possibly performance capabilities
- Further research is needed to identify strategies for dietary behavior change and to assess possible benefits of aerobic training for improvement of the metabolic status of offensive and defensive linemen

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