Testosterone Level in Men correlates with BMI and Cardiorespiratory Fitness But Is Not Related to Age.

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INTRODUCTION

- Age-related decline in testosterone may be due to causes other than aging alone
- Weight gain, decreased physical activity, low cardiorespiratory fitness (fitness), and chronic illness may play a role in testosterone decline with age
- Testosterone replacement use among men has increased 3-fold in the past decade despite the risks associated with its use

OBJECTIVE

To determine if testosterone level in relatively healthy males is associated with age, BMI, and/or fitness

METHODS

- Men were either self-referred or referred by their employer for a comprehensive clinical examination including a maximal treadmill test, testosterone measurement, and measurement of traditional risk factors from January 2012 - December 2012 at the Cooper Clinic, Dallas TX
- Exclusions: use of any form of androgens and 5-alpha-reductase inhibitors
- Morning Total Testosterone Measurement
  - Blood drawn between 7 and 9 am following a 12-hour fast
  - Standard Chemiluminescence method
  - Mean intra-assay and inter-assay coefficients of variation were <10 percent

- Testosterone ng/dl • BMI kg/m²

- Low: <250
- Lown:250-<400
- Normal: ≥400
- Normal:18.5-24.9
- Overweight: 25-29.9
- Obese: ≥30

STATISTICAL ANALYSIS

- Cross-sectional analysis of 1464 men
- Means and frequencies were used to summarize characteristics of the sample within decades of age and BMI categories
- Multiple logistic regression was used to test the association between low testosterone and age, BMI, and fitness

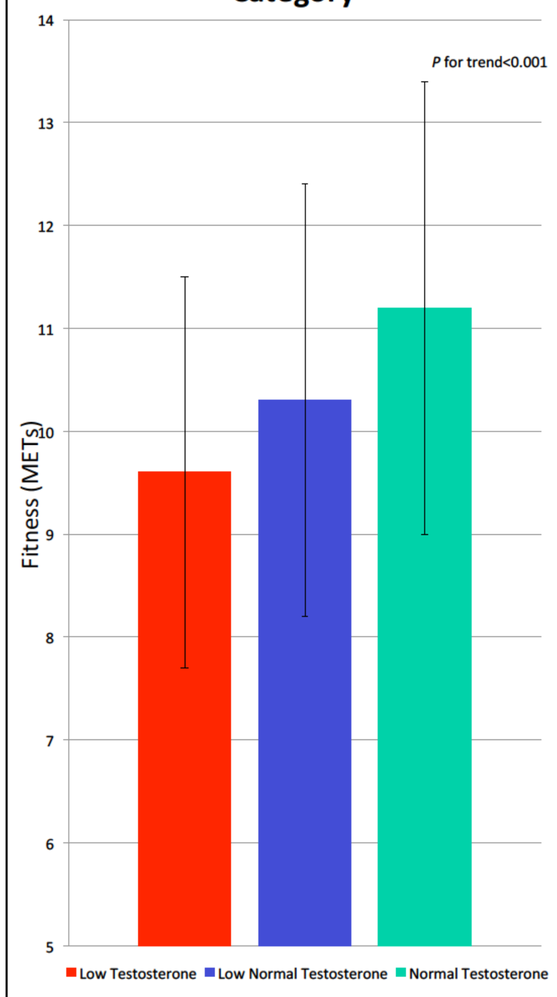
RESULTS

Characteristics of 1464 Men Undergoing Testosterone Screening

	Ages 50-59	Ages 60-69	Ages 70-79	p value
N (%)	727	506	231	
Age, years*	54.7 (2.8)	64.0 (2.8)	73.5 (2.9)	
Decreased Libido, n (%)	146 (20.1)	145 (28.7)	88 (38.1)	<0.001
Impotence,† n (%)	144 (19.8)	155 (30.6)	111 (48.1)	<0.001
BMI, kg/m²*	27.8 (4.0)	28.0 (4.8)	26.7 (3.6)	0.008
Hemoglobin A1c, %*	5.6 (0.5)	5.7 (0.4)	5.8 (0.5)	<0.001
PSA, ng/mL*	1.3 (1.1)	1.6 (1.5)	2.0 (2.4)	<0.001
Total Testosterone, ng/dL *	479.0 (175.4)	457.2 (204.1)	464.6 (176.7)	0.052
Fitness, METs*	11.5 (2.1)	10.4 (2.1)	9.3 (2.0)	<0.001

*Values are mean (SD) unless otherwise noted
† Impotence is defined by self-report and/or use of Viagra, Cialis, Levitra, Staxyn, or Trimix

Means (SD) of Fitness by Testosterone Category

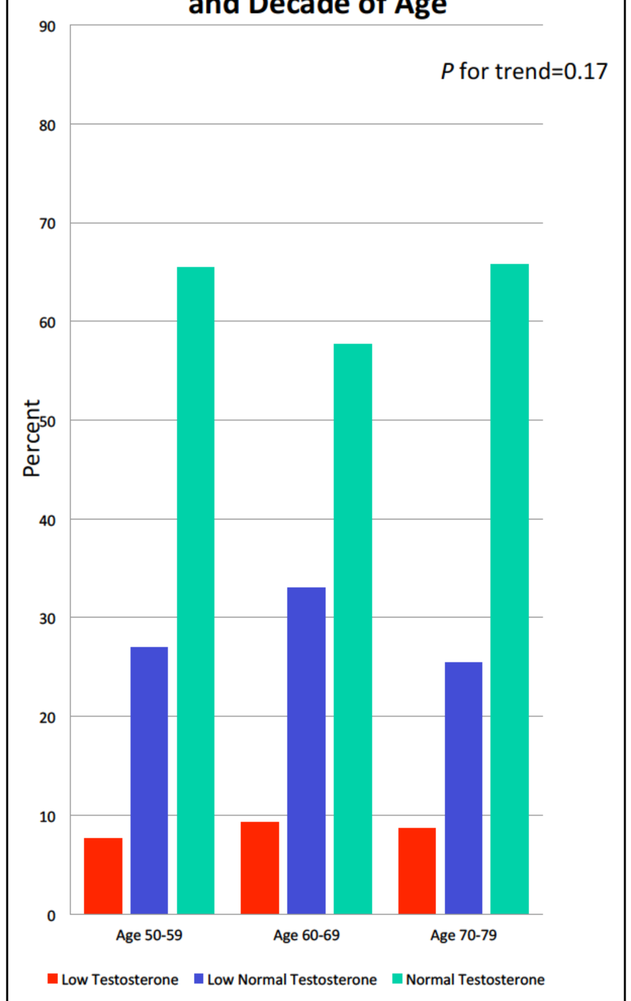


Odds of Having Testosterone <250 ng/dL by Age, BMI, and Cardiorespiratory Fitness

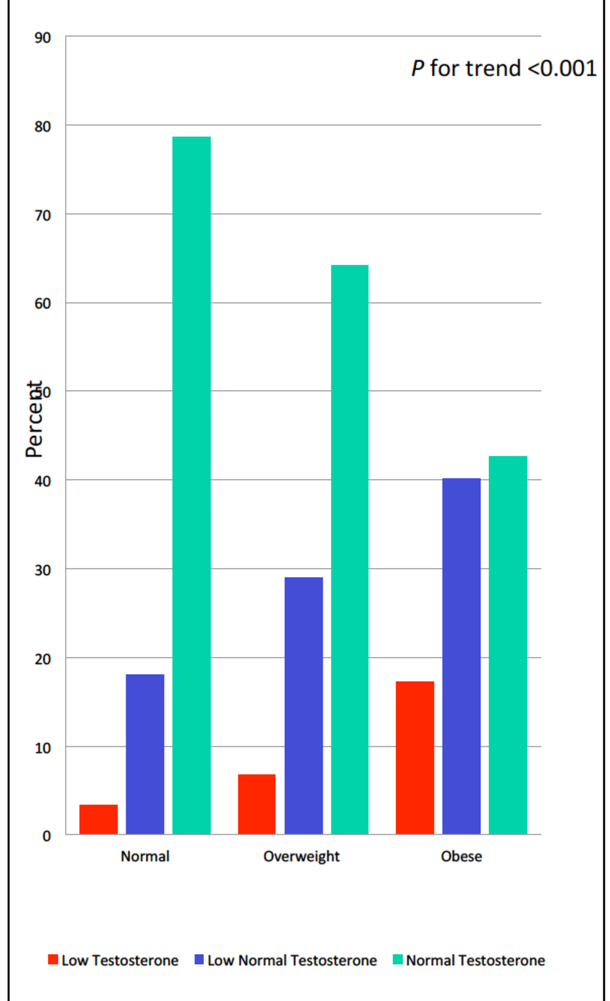
	Odds Ratio (95% CI)	p value
Age*, per year	1.00 (0.98, 1.03)	0.85
Body mass index (BMI)*, per kg/m²	1.15 (1.10, 1.20)	<0.001
Fitness*, per MET	0.75 (0.67, 0.84)	<0.001
Age†, per year	0.96 (0.92, 1.00)	0.07
BMI†, per kg/m²	1.08 (1.01, 1.16)	0.02
Fitness†, per MET	0.78 (0.67, 0.91)	0.002

• Unadjusted †Multivariate model with age, BMI, and cardiorespiratory fitness

Distribution of Men by Testosterone Category and Decade of Age



Distribution of Men by Testosterone and BMI Categories



SUMMARY & IMPLICATIONS

- Prevalence of low testosterone was not significantly different across decades of age.
- Prevalence of low testosterone was higher with increasing BMI category.
- Mean fitness increased with increasing testosterone category.
- In multivariate models, fitness and BMI were significantly associated with the odds of having low testosterone. Age was not significantly associated with the odds of having low testosterone after adjusting for fitness and BMI.
- Future research should determine if low testosterone levels can be normalized through lifestyle changes such as improved cardiovascular fitness.

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