



Association of Fish Consumption and Metabolic Syndrome Criteria in College Students

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Introduction

Metabolic Syndrome (MetS) is a cluster of conditions which increases the risk of developing cardiovascular disease and diabetes.¹ MetS affects one-third of American adults, and 26%-40% of American college students meet at least one of the MetS criteria.^{2,3} Early detection of MetS criteria in young adults could lead to targeted interventions to lower the risk of developing MetS, diabetes, and cardiovascular disease in the future.¹

The American Heart Association (AHA) recommends consuming at least 2 servings of fish per week (one serving equals 3.5 ounces, cooked).⁴ Higher fish consumption may be associated with protective factors against MetS, but limited studies have investigated the association between fish consumption and MetS prevalence among college students.^{5,6}

Objective

This study aims to examine the association between fish consumption and MetS criteria prevalence in a sample of college-aged students (18-24).

Metabolic Syndrome

Defined based on the presence of ≥ 3 criteria:

Waist circumference	Women: ≥ 88 cm Men: ≥ 102 cm
HDL-C	Women: < 50 mg/dL Men: < 40 mg/dL
Blood pressure	Systolic: ≥ 130 mmHg Diastolic: ≥ 85 mmHg
Triglycerides	≥ 150 g/dL
Fasting blood glucose	≥ 100 mg/dL

Methods

Study Design:

This study is part of the College Health & Nutrition Assessment Survey, an ongoing study of the health status of college students (18-24 years old) at the University of New Hampshire (UNH IRB # 5524).

Participants:

Young adults were recruited from an introductory nutrition course at UNH between 2012-2018; all subjects provided informed consent to participate, and demographic information was self-reported via Wellness Questionnaire.

Measurements:

- Fish consumption was determined using the question "In the past 30 days, and on average, how many servings of fish per week did you consume?"
- Waist circumference (WC) was measured twice by trained technicians
- A finger-stick was used to obtain fasting blood samples and LDX Cholestech analyzed HDL-C, triglycerides (TGs), and fasting blood glucose (FBG)
- Systolic and diastolic blood pressure (SBP and DBP) were measured twice after a 5-minute rest using an automatic device; mean pressures were analyzed

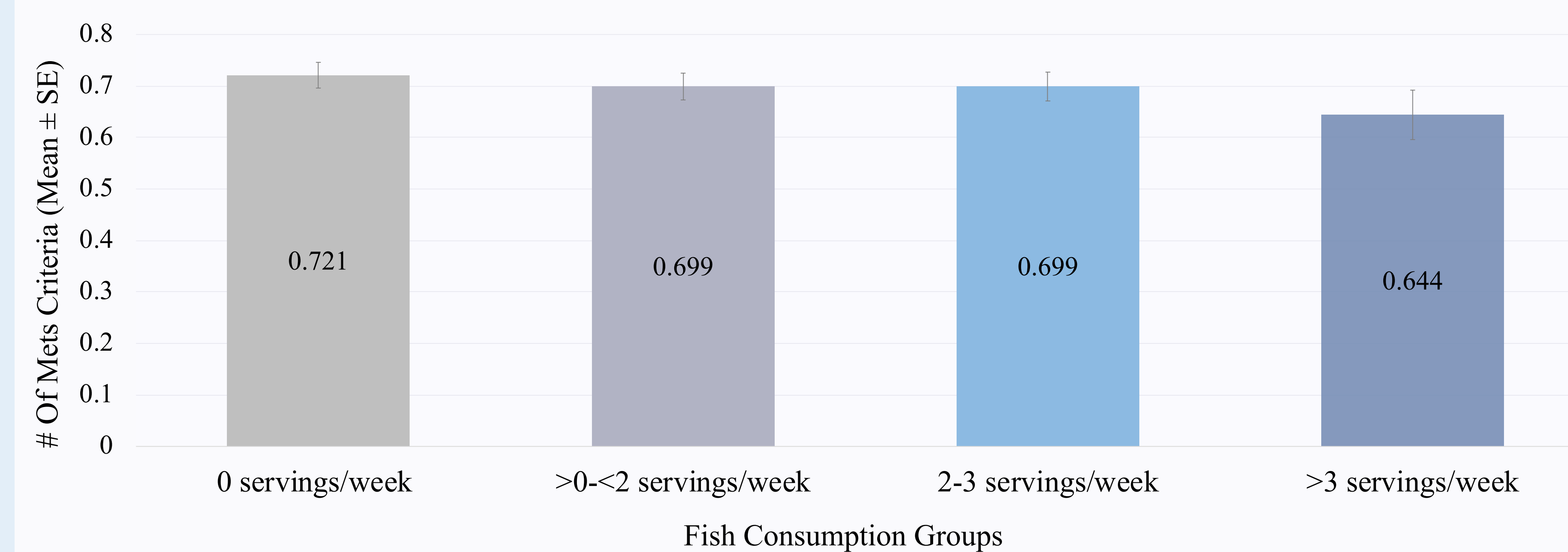
Data Management & Analysis:

- Fish consumption was categorized into four frequency groups: 0, $>0-<2$, 2-3, or >3 servings/week
- Analyses was conducted using ANCOVA
- Covariates: gender, exercise, kilocalories (3-day average), and BMI

Subject Characteristics According to Level of Fish Consumption

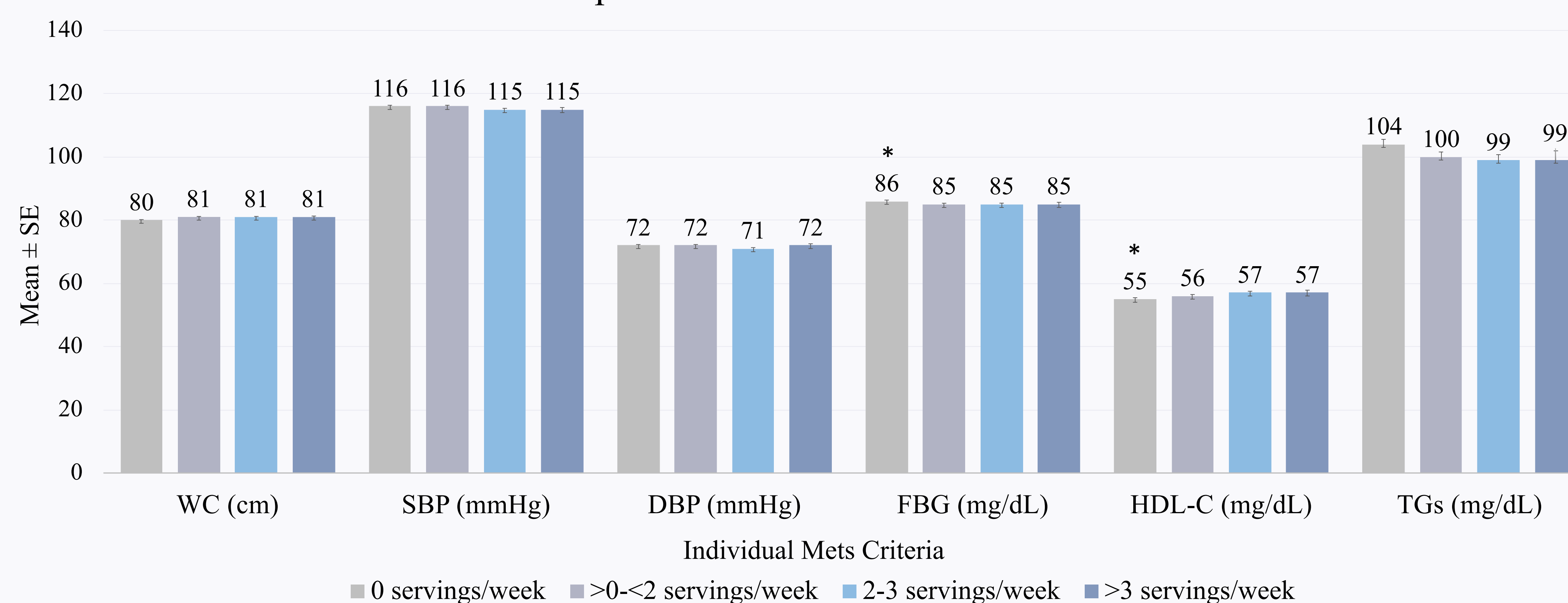
Fish Consumption Groups	0 servings/week (N=917)	$>0-<2$ servings/week (N=905)	2-3 servings/week (N= 754)	>3 servings/week (N=272)
Mean Age (years, \pm SE)	18.7 \pm .03	19 \pm .04	19 \pm .04	19.1 \pm .07
% Gender				
Male/Female	26.4/73.6	27.3/ 72.7	36.5/63.5	48.9/51.1
% Class				
Freshman	58.3	52.4	54.9	52.2
Sophomore	29.9	33.1	31.8	30.5
Upper classmen	11.8	14.5	13.3	17.3
% Race				
White	94.0	95.2	92.0	90.5
Mean BMI (kg/m ² , \pm SE)	23.5 \pm .12	23.5 \pm .13	23.6 \pm .13	24 \pm .22
% Physical activity				
Low active	23.7	19.8	16.9	16.3
Moderately active	45.6	45.8	43.6	37.8
High active	30.7	34.4	39.5	45.9
Smoking Status (% YES)	4.4	4.8	6.4	9.9
% Major				
Nutrition	5.8	6.4	6.6	5.1
Allied health	20.0	16.8	16.6	17.6
Non-nutrition or allied health	74.3	76.8	76.8	77.2

Fish Consumption Differences in # of MetS Criteria



Adjusted for gender, exercise, kilocalories (3-day average), and BMI

Fish Consumption Differences in Individual MetS Criteria



Adjusted for gender, exercise, kilocalories (3-day average), and BMI; * $p < 0.05$ between all other fish consumption groups

Results

- The prevalence of MetS was 3.4%; 49.4% of students met ≥ 1 criteria of MetS
- The majority consumed less than the AHA's recommendation of 2 servings of fish per week (64%), and 32.2% consumed 0 servings of fish/week
- There were no differences between number of MetS criteria according to fish consumption group
- There were no differences according to fish consumption groups for WC ($p=.55$), SBP ($p=.43$), DBP($p=.09$), and TGs ($p=.16$)
- The 0 servings fish/week group had significantly lower HDL-C (all $p \leq 0.02$) compared to the other groups and significantly higher FBG (all $p \leq 0.04$)

Strengths & Limitations

Strengths:

- Large sample size (N=2,848)
- Anthropometric measurements were collected by trained technicians and validated instruments

Limitations:

- Reporting bias; over- or underestimation of fish servings/week
- Unable to determine type of fish or fish preparation
- Cross-sectional studies cannot determine cause and effect

Conclusion

Given the observed modest benefit in selected MetS parameters with higher fish consumption, these findings support emphasizing fish as part of the dietary recommendations for young adults.

Acknowledgement

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