FRUVEDomics: A Personalized, Behavioral, Nutritional Intervention to Assess Metabolic and Microbial Changes in College Students

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Introduction

The metabolic syndrome (MetS) has become a rising concern among the nation. Components of MetS make those at risk of the syndrome at greater susceptibility for developing chronic disease. Furthermore, rates of MetS have increased in the young adult population (over 5% in ages 20-49)[a], demonstrating an urgency in developing treatment and prevention through lifestyle approaches. **Objective:** Investigate the effects of an eight-week nutritional intervention on various health indices in young adults (18-28 years) with MetS and those "at-risk" for MetS.

Study Design

The study was completed in two waves: "At-risk" cohort and MetS cohort.
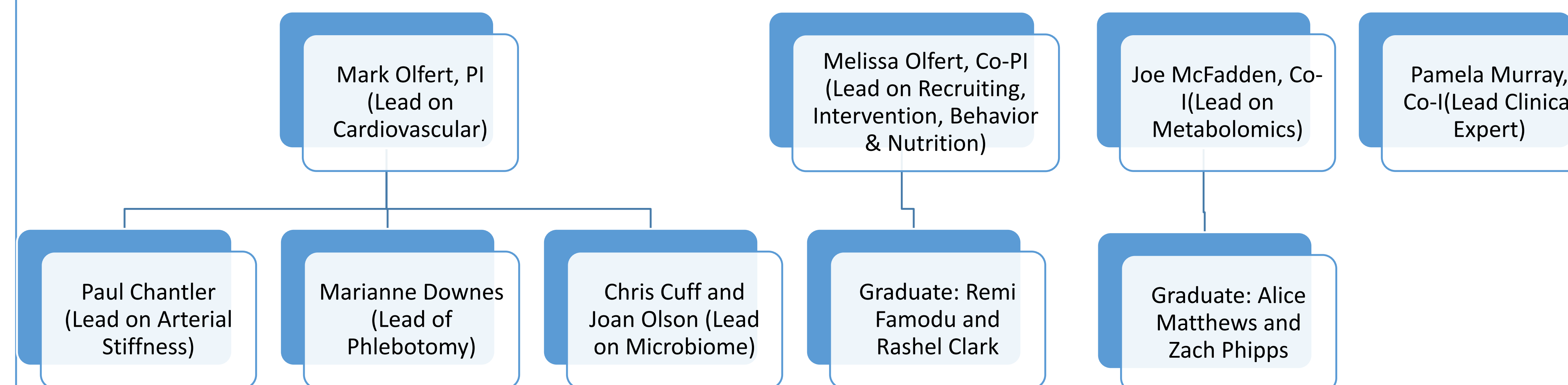
Screen and Recruit

- "At-risk" subjects recruited in the Fall of 2014
- MetS subjects recruited in the Fall of 2016
- Questions administered based off of nutrition and physical activity status, current health summary and family history to score the participant's risk of the MetS.

Educate/Intervene

- Subjects attended a 2 hour group education led by a Registered Dietitian Nutritionist (RDN)
- Educated on nutritional plan received a culinary toolkit and were given a binder of nutrition information.
- Diet was measured by food pictures, receipt inventory and diet logs on a weekly basis by a one-on-one counseling session with the RDN.

Our Team of Scientists

Our group is one of the first team science programs in the Appalachian region to investigate multiple aspects of metabolic health and lifestyle factors in a high risk population.

Mark Olfert, PI (Lead on Cardiovascular)

Melissa Olfert, Co-PI (Lead on Recruiting, Intervention, Behavior & Nutrition)

Joe McFadden, Co-I (Lead on Metabolomics)

Pamela Murray, Co-I (Lead Clinical Expert)

Paul Chantler (Lead on Arterial Stiffness)

Marianne Downes (Lead of Phlebotomy)

Chris Cuff and Joan Olson (Lead on Microbiome)

Graduate: Remi Famodu and Rashel Clark

Graduate: Alice Matthews and Zach Phipps

Data Collection

- Physical activity, stress and sleep behaviors were measured through logs, questionnaires and accelerometers pre and post to assure no changes.
- Body fat (BodPod), height, waist/hip/neck circumference, and weight were measured before and after the 8 week intervention.
- Several markers in the blood were obtained from venous puncture (i.e. HbA1c, fasting blood glucose, total cholesterol, HDL, hsCRP, ceramides, and cytokines).
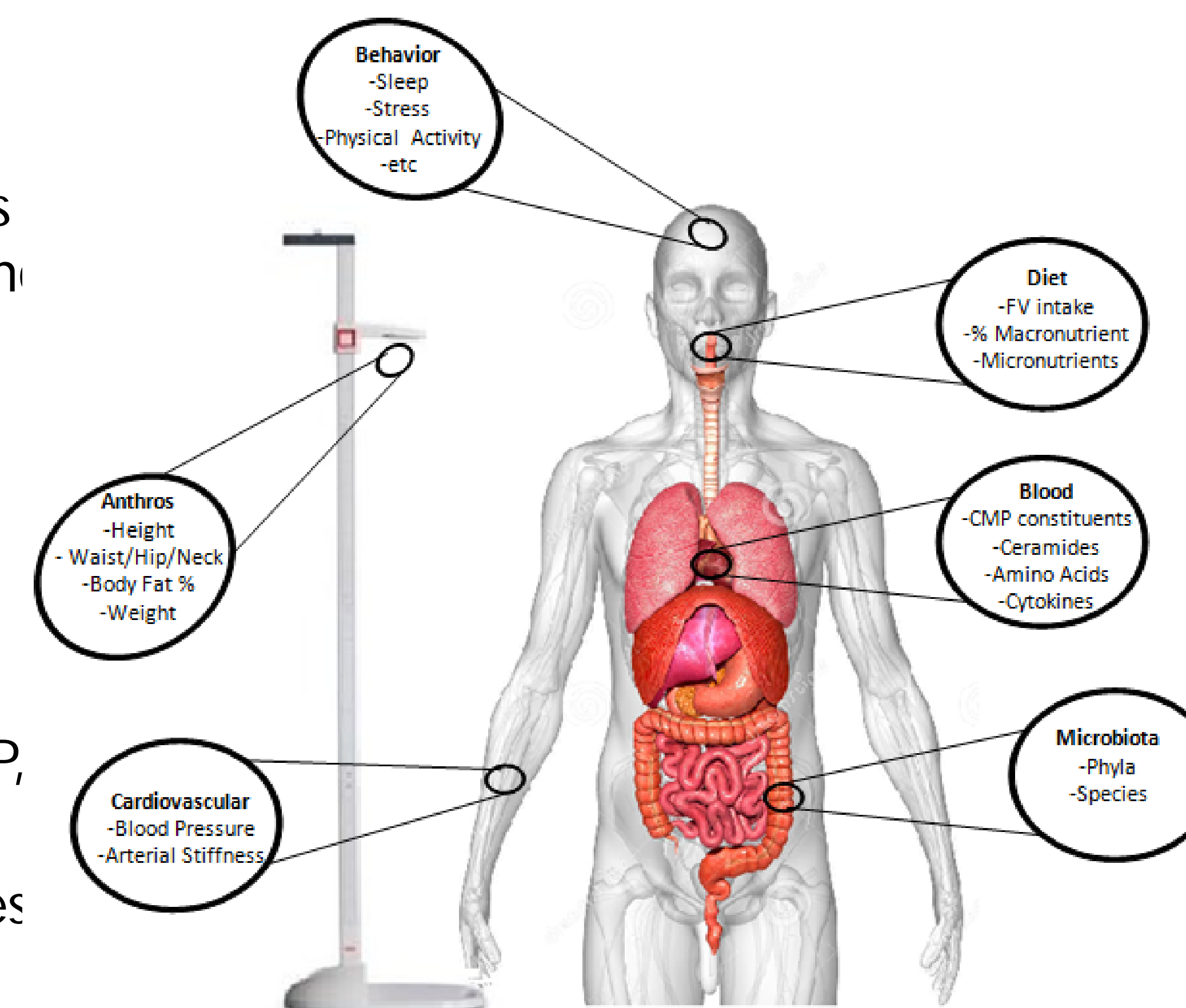- Stool was collected before and after to assess the microbiome.

Behavior
-Sleep
-Stress
-Physical Activity
-etc

Diet
-FV intake
-% Macronutrient
-Micronutrients

Anthros
-Height
-Waist/Hip/Neck
-Body Fat %
-Weight

Blood
-CMP constituents
-Ceramides
-Amino Acids
-Cytokines

Cardiovascular
-Blood Pressure
-Arterial Stiffness

Microbiota
-Phyla
-Species

Table 1: Demographics of "At-Risk" Cohort		
Variable	Frequency (n=36)	Percent
Race		
White	23	63.9
African American	4	11.1
Hispanic	4	11.1
Asian	4	11.1
Indian/Native American	1	2.8
Sex		
Female	21	58.3
Male	15	41.7
Appalachian Origin		
Appalachian	17	47.2
Not Appalachian	19	52.8
metS Risk Score-Screen		
Low Risk	10	27.8
At Risk	26	72.2
BMI Category		
Underweight	0	0
Healthy	16	44.4
Overweight	14	38.9
Obese	5	13.9
Morbid Obese	1	2.8

Table 2: Demographics of MetS Cohort		
Variable	Frequency (n=17)	Percent
Race		
White	13	76.5
African American	3	17.6
Hispanic	0	0
Asian	1	5.9
Indian/Native American	0	0
Sex		
Female	11	64.7
Male	6	35.3
Appalachian Origin		
Appalachian	9	52.9
Not Appalachian	8	47.1
metS Risk Score-Screen		
High Risk	17	100
BMI Category		
Underweight	0	0
Healthy	1	5.9
Overweight	3	17.6
Obese	13	76.5
Morbid Obese		

Conclusions

Preliminary findings of the "at-risk" cohort illustrated improved metabolic health after the dietary intervention. Additionally, changes in the metabolome and microbiome were found, with results indicating less inflammation, therefore reducing risk of disease.

Preliminary findings of the MetS cohort indicate significant increases in fruit and vegetable intake. Subjects also experienced greater lean body mass at the end of the 8 week study. Further investigation is being conducted on the blood analysis and microbiome.

FRUVEDomics
fruits + vegetables + omics

Applications

In gaining this knowledge, we will be able to identify effective therapeutic interventions for young adults who are undergoing a transition of life where behavior is learned and lifestyle modification can be promoted for a sustainable future.

Funding

LIFESTYLE INTERVENTION OLFERT RESEARCH LAB

THE UNIVERSITY of TENNESSEE UT

West Virginia University. SCHOOL OF MEDICINE

West Virginia University. DAVIS COLLEGE OF AGRICULTURE, NATURAL RESOURCES AND DESIGN