CHRONIC DISEASE RISK AMONG ADULTS WITH CEREBRAL PALSY: THE ROLE OF PREMATURE SARCOPENIA, OBESITY, AND SEDENTARY BEHAVIOR

Mark D. Peterson, Ph.D.
Research Assistant Professor

Physical Medicine & Rehabilitation
University of Michigan Health Systems

Secondary health complications in Adults with CP

- Risk of overweight/obesity
- Decreased aerobic capacity
- Decreased strength
- Decreased levels of Physical Activity
  - Especially Health-Related PA

Like much of America…

Obesity Misclassification

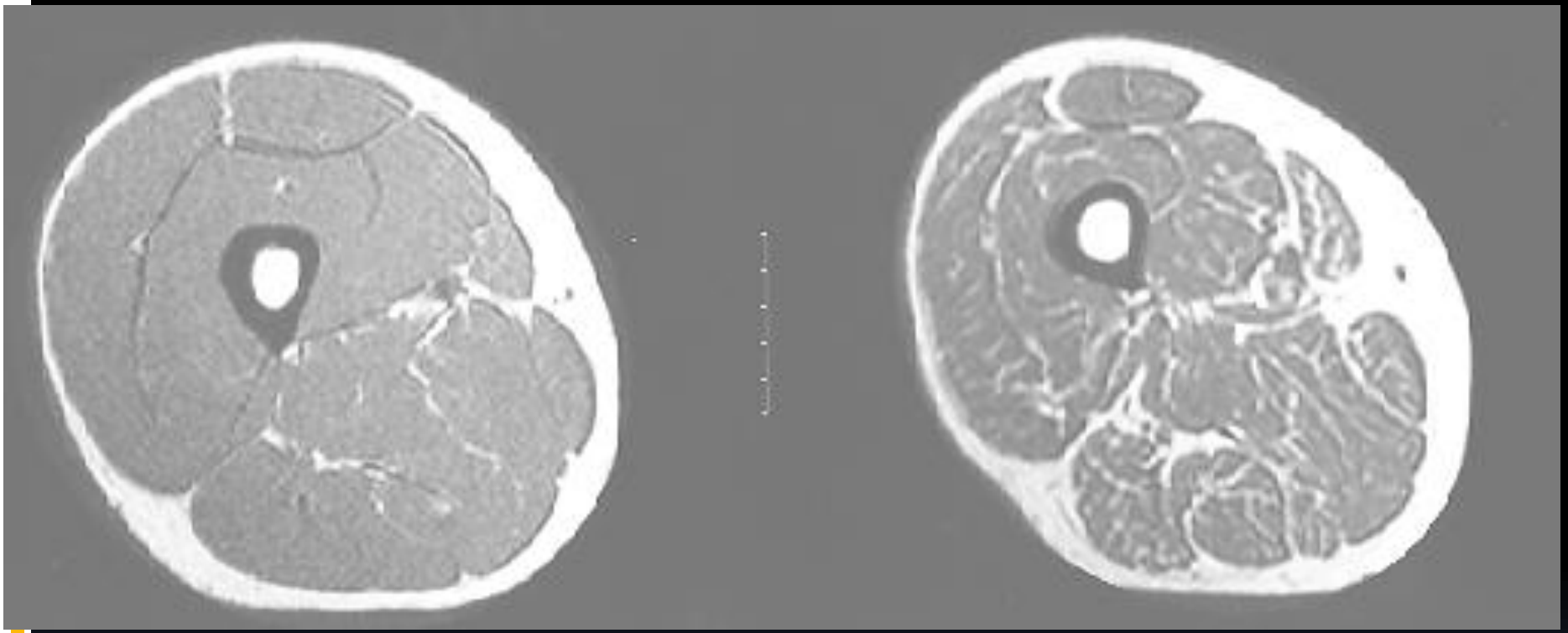
- BMI does not discriminate adipose tissue and muscle, and lacks sensitivity to identify non-obese individuals with excess body fat.
  - Okorodudu et al. *Int J Obes.* 2010
- "Normal Weight Obesity" Romero-Corral, A., et al., *Eur Heart J*, 2010.
  - ~30 million Americans, increased risk for MetS and early cardiovascular mortality

Intermuscular adipose tissue and Intramyocellular Lipid

- IMAT and IMCL also develop as a feature of certain disease processes (e.g. DMD, T2DM), spinal cord injury, sarcopenia, and obesity, as well as in conjunction with prolonged sedentary behavior *

*Manini TM, et al. *Am J Clin Nutr.* 2007; 85(2): 377-84.2007

Age as a covariate: When Muscle Turns to Fat…

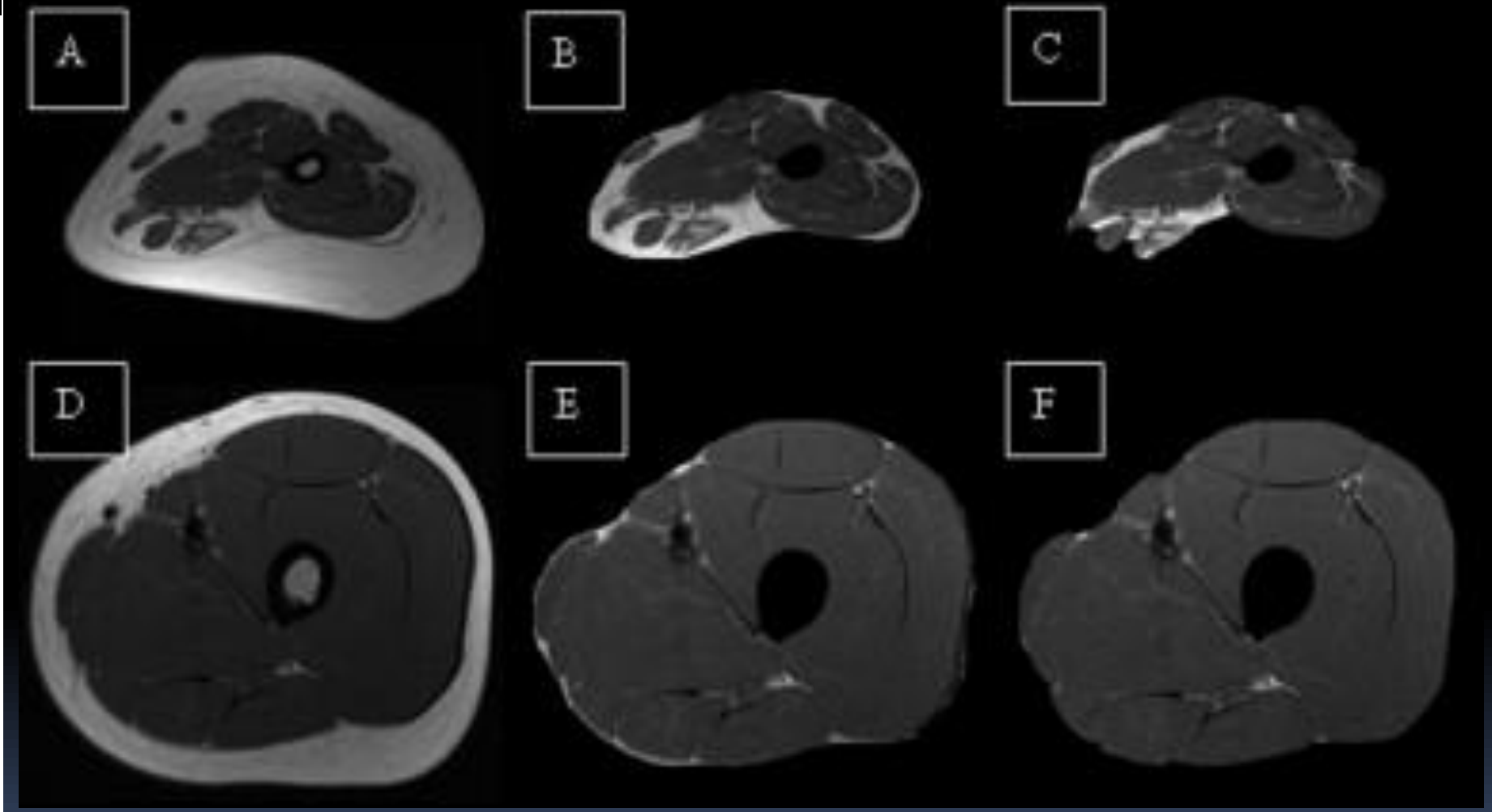


25 Years Old

65 Years Old

Goodpaster et al, 2006

IMAT in CP?



Separation of AT from MRI of the midthigh of a prepubertal girl with QCP and **D-F**, a typically developing prepubertal girl. **A** and **D** contain subcutaneous, subfascial, and intermuscular AT; **B** and **E** contain only subfascial and intermuscular AT; and **C** and **F** contain only IMAT.

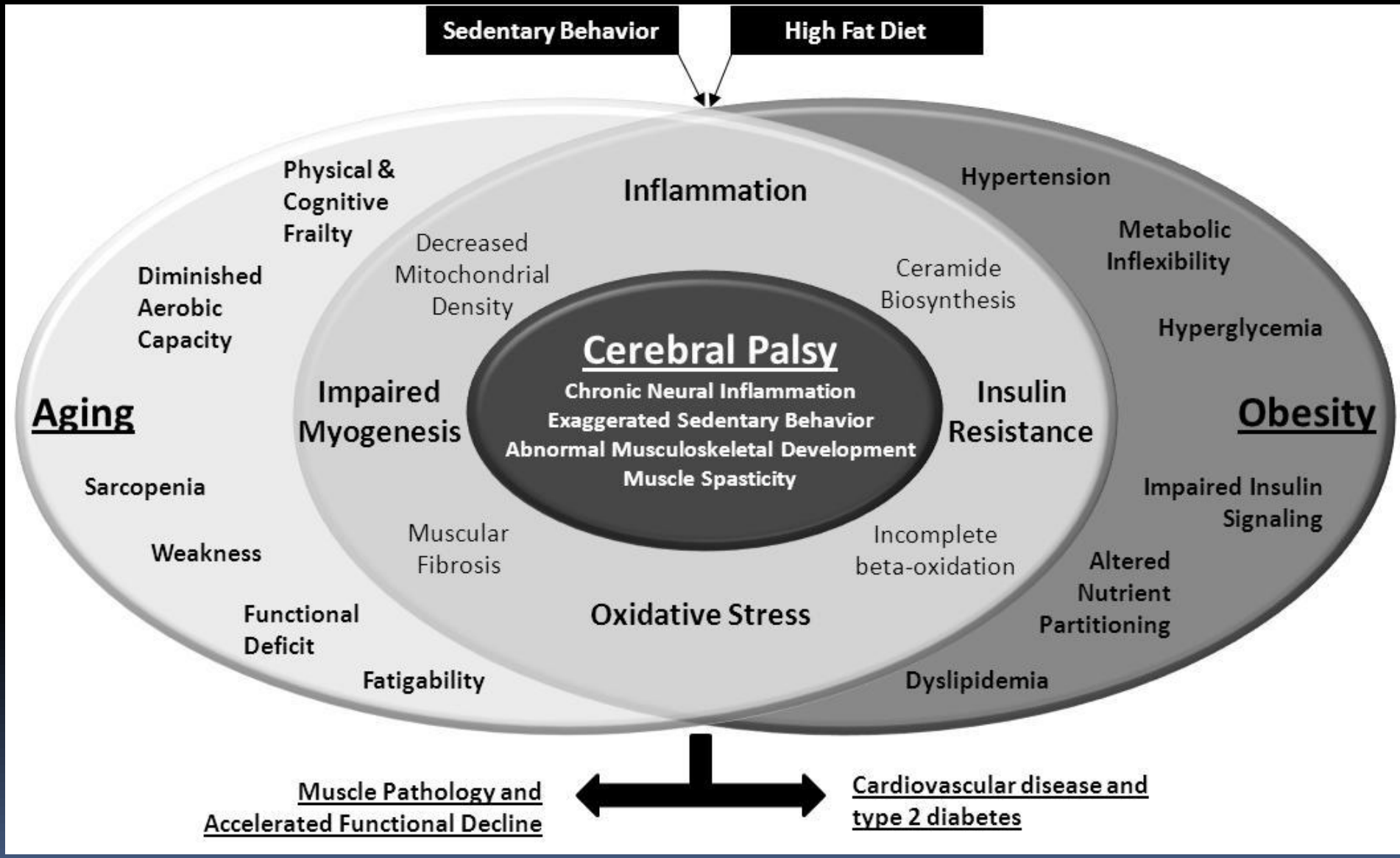
My Current Focus

Predictors, Confluence and Consequences of Frailty and Obesity in Adults with CP

+

1 K01 HD074706-01; Peterson (PI), National Institutes of Health… Pending…

Not so novel, novel concept



Peterson, Hurvitz, Burant. *AJP-Endo Metab.* 303: E1085-E1093, 2012..

Specific Aim 1: Exploratory

- Adults with and without CP will be matched and compared on measures of insulin sensitivity (FSIVGTT), and whole body and regional (IMAT) adipose tissue distribution (DXA and 3T MRI Dixon).
  - Also collected: Serum and tissue biomarkers of insulin signaling, ROS, inflammation, mitochondrial biogenesis, and glucose transport.

- Secondary Outcomes & Covariates:
  - Sedentary behavior assessment (accelerometry)
  - RMR and cardiovascular fitness (VO_2)
  - Standard Anthropometry (e.g. BMI, WC, WHR).

Specific Aim 2

- Subjects with CP from aim 1 will be entered into an 8-week PA intervention to:

1. Assess the efficacy of multi-modality PA to elicit improvements in both health and function and
2. Determine the extent to which changes in adiposity are associated with improvements in insulin sensitivity

Specific Aim 3: Exploratory

- To examine within-subjects transcriptional and morphological differences in spastic versus non-spastic muscle from adults with hemiplegic CP and contrast with matched non-CP controls.

- Markers: proteins for insulin signaling, mitochondrial biogenesis, skeletal muscle and adipose macrophage phenotype (i.e. content and subtype), profibrotic markers

Of Particular Interest: Sedentary behavior… NIDRR FIR

- Time spent sitting correlates with an elevated risk of mortality for all causes and for cardiovascular disease
  - Dose-response relationship
- Sitting seems to have be associated with mortality independent of leisure time physical activity levels
- 56% of all deaths among overweight and obese, highly sedentary individuals are attributable to their SB.
- Never been considered a risk factor for cardiometabolic complications in CP. Can it be reduced?

-van der Ploeg HP, Chey T, Korda RJ, Banks E, Bauman A. Sitting time and all-cause mortality risk in 222 497 Australian adults. Arch Intern Med. 2012; 172(6): 494-500.
-Peterson M, et al. Letter to the Editor: *Arch Intern Med*. 2012;172(16):1270-1272.