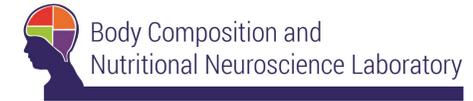


# The Relationship Between Lutein Levels and Body Fat

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## ABSTRACT

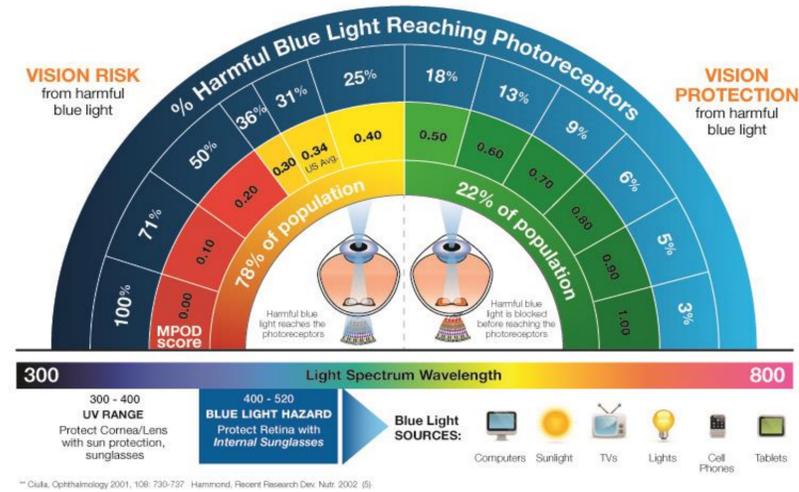
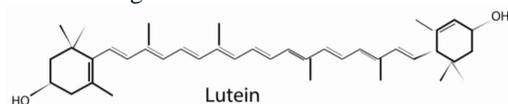
The carotenoid lutein has been shown to have protective functions for the retina, lens, and brain. Lutein is the primary carotenoid in the brain, and preferentially accumulates in the retina of the eye. Opportunely, accumulation in the eye and in the brain are closely correlated. This correlation allows us to measure the amount of lutein in the brain using noninvasive examination of the retina to determine Macular Pigment Optical Density (MPOD), which has been found to significantly correlate to measures of processing speed - a key aspect of cognitive function. Increased amounts of body fat have been shown to hinder MPOD values by sequestering lutein, blocking the individual from receiving full cognitive benefits. Unfortunately, these studies have only been conducted thus far in individuals of healthy weight status. Thus, the objective of this research was to examine the relationship between total body fat, MPOD, and serum lutein in adults with a wide range of BMI's. Our sample includes middle-aged adults (25-45 years) who are overweight or obese. Total body fat mass and BMI was collected by dual-energy X-ray Absorptiometry Serum lutein was collected using liquid chromatography, and retinal lutein was assessed using heterochromatic flicker photometry. As lutein is fat-soluble, we hypothesize that lutein levels in both the bloodstream and the retina will be lower in increasingly overweight individuals as the carotenoids will be sequestered away by stores of adipose tissue.

## BACKGROUND

- Overweight individuals have been associated with having poorer cognitive ability across the lifespan. However, the exact factors causing this relationship are unclear.
- Lutein is a dietary carotenoid with potent antioxidant properties known to disproportionately accumulate in the retina and brain compared to other body regions.
- Macular Pigment Optical Density (MPOD), a non-invasive proxy measure of brain lutein, has been associated with and used to measure cognitive function.
- Significant fractions of the carotenoids in the body are stored in adipose tissue. Therefore, obesity could limit the availability of carotenoids for neural tissues, with potential consequences for cognition.
- Whether or not adiposity mediates the positive relationship between MPOD and cognitive function remains to be discovered.

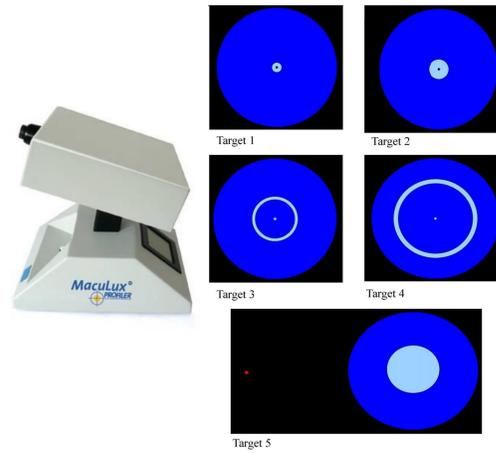
## AIM

This study aimed to examine the relationship between lutein levels in the retina/blood and stores of adipose tissue in overweight individuals.



## METHODS

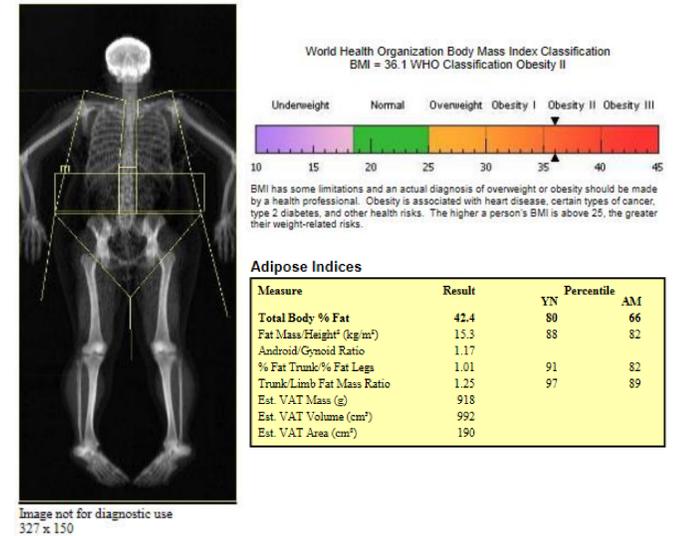
**Macular Pigment Optical Density**  
Macular Pigment Optical Density (MPOD) was assessed using heterochromatic flicker photometry.



$$MPOD = \log_{10}(R_f/R_p)$$

$R_f$  = radiance for foveal flicker null  
 $R_p$  = radiance for parafoveal flicker null

**Dual-energy X-ray Absorptiometry (DXA)**  
WB %Fat Mass was assessed using a Hologic QDR 4500A bone densitometer.



## RESULTS

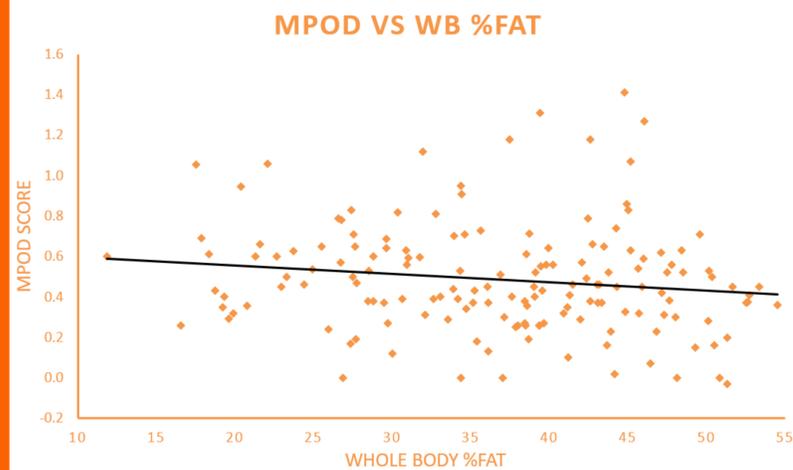


Table 1. Participant Characteristics

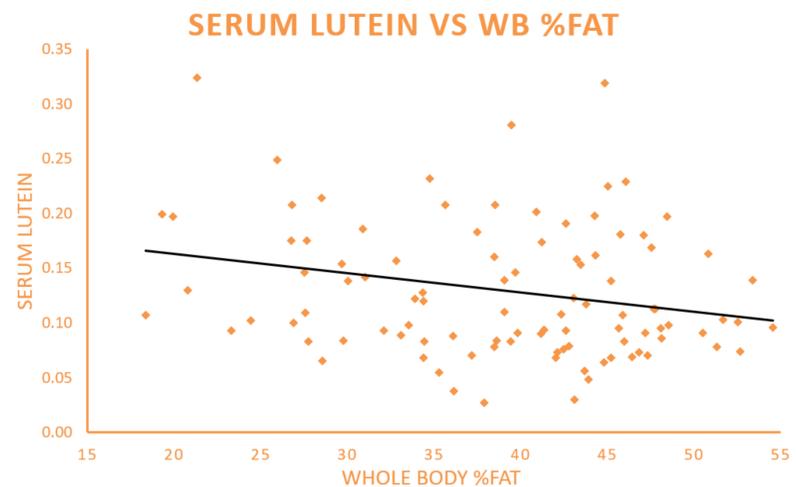
Characteristic	
Number of Subjects (N)	158
Sex	100 Female, 58 Male
Age, years	33.98 ± 5.88
MPOD	0.50 ± 0.26
Serum Lutein, µg/mL*	0.13 ± 0.064
BMI, kg/m <sup>2</sup>	30.98 ± 6.08
Whole Body %Fat	36.78 ± 9.55

\*Data present for 100 subjects

Table 2. Bivariate correlations

		MPOD	Serum Lutein
WB %Fat	r	-0.17*	-0.06
	p	0.03	0.67

\*\*Correlations are significant at the 0.01 level  
\*Correlations are significant at the 0.05 level



## DIETARY SOURCES OF LUTEIN

- Lutein is a dietary carotenoid that is only provided through the foods we eat.
- Foods rich in carotenoids are the often the same foods that most Americans lack in their diets.



## CONCLUSIONS

- Subjects with a greater whole body percentage of fat displayed lower scores in both Serum Lutein and MPOD.
- Greater quantities of fat sequester increasing amounts of serum lutein and decrease Macular Pigment Optical Density, a measure of carotenoid levels in the brain.
- MPOD has been previously positively associated with attentional abilities.
- Thus, increasing amounts of fat on the body can lead to decreased attention span and impaired cognitive function.

## ACKNOWLEDGEMENTS

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