Nutrition as a Preventative Tool Against Cognitive Decline in High Risk Individuals

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Purpose

Alzheimer's disease (AD) affects an estimated 5.2 million people in the U.S. African Americans are six times more likely to develop AD than Caucasians, and individuals with a parental history of AD are ten times as likely to become afflicted with AD. In an effort to prevent AD, we need to identify high risk individuals, and implement modifiable treatment regimens to reduce their risk. Nutrition is a potential modifiable risk factor which has been linked to late life cognition, though racial and geographical differences are not known. Here, we investigated the relationship between nutrition, vascular risk factors, and cognition in individuals at high risk for Alzheimer's disease (AD), namely African Americans with a parental history of AD.

Participants

- Sixty one subjects ages 58.6 +/- 6.3 years with a parental history of AD, who are enrolled in an ongoing NIH funded study and who have a parental history of AD.

Nutrition

- Dietary patterns were assessed utilizing the shortened version of the Lower Mississippi Delta Nutrition Intervention Research Initiative (DNIRI) Food Frequency Questionnaire
- Quantity and frequency of the food categories: 100% Orange Juice (OJ), tea, fish, nuts, pies, rice with beans, and added salt

Cardiovascular

- Participants underwent a one hour comprehensive assessment of peripheral vascular function including 1) Ambulatory BP monitoring 2) Microvascular endothelial function assessed via EndoPat. 3) Macrovascular endothelial function assessed via flow-mediated vasodilation (FMD)

Cognition

- Executive function is most vulnerable to hypertension
  - Montreal Cognitive Assessment (MOCA), Mental Rotation Test (MRT), Multilingual Naming Test (MINT)
  - Backwards Digit Span and Accuracy, Benson Delay

Results

Table 1: Participant Demographics for 19 Black and 40 White Individuals

	Black	White
Age	57.21 +/- 7.43	59.13 +/- 5.81
Gender (%Female)	84.2%*	60%*
College Graduate or Greater Level of Education	84.2%	60%
Income (race difference in all brackets)*		
Income $39,000 or less	36.8%	10%
Income $40,000-$79,000	36.9%	27.5%
Income $80,000 or more	26.3%	62.5%
Currently Exercise	78.9%	80%
Smoking Status	5.3%	10%

Table 2: Cardiovascular Data for All Participants

	Black	White
Systolic (mmHg)	129 +/- 12.19	125.3 +/- 12.86
Diastolic (mmHg)	76.12 +/- 4.09	77.2 +/- 9.49
% Nocturnal Dipping	6.57 +/- 7.05	7.85 +/- 6.14
FMD 60 s.	6.11 +/- 6.06	5.90 +/- 4.19
FMD 90 s.	4.27 +/- 6.91	4.47 +/- 3.83
EndoPat RHI	2.40 +/- 0.80	2.28+/- 0.75
EndoPat AI	28.81 +/- 19.22	21.73 +/-17.57

RHI=Reactive Hyperemia Index
AI= Augmentation Index

Table 3: Cognitive Data for All Participants

	Black	White
MOCA	25.39 +/- 2.40*	27.13 +/- 2.18*
Benson Delay	11.89 +/- 3.35	10.97 +/- 2.16
Buschke Delay	5.37 +/- 3.33	6.87 +/- 2.76
MINT	29.53 +/- 2.09*	30.68 +/- 2.01*
MRT	17.37 +/- 3.29	18.11 +/- 5.49
Trails B s.	120.32 +/- 102.45*	82.39 +/- 43.73*
Backwards Digit Span	4.11 +/- 1.20	4.82 +/- 1.78
Backwards Digit Span Accuracy	5.47 +/- 1.87	6.63 +/- 2.97

Table 4: Pearson's r Correlations between Cognition and Nutrition by Ethnicity. All correlations controlled for age and education.

	100 % OJ	Tea	Nuts	Pie	Rice with Beans	Added Salt
MOCA Black	.264	-.664	-.169	-.904*	-.661	.253
MOCA White	-.146	.348	.167	-.115	.020	-.069
MRT Black	.151	.312	.127	.059	.523	-.413
MRT White	.267	.118	.077	.259	-.101	-.275
Digit Span Black	.597	-.400	.297	-.777	-.750	-.064
Digit Span White	.411*	.367	.425*	-.217	-.196	-.436*
Digit Span Accuracy Black	.526	-.193	.373	-.696	-.856*	.066
Digit Span Accuracy White	.281	.346	.415*	-.273	-.169	-.382*
Benson Delay Black	-.360	-.924**	-.736	-.454	-3.74	.363
Benson Delay White	.061	.140	-.105	.061	-.254	-.102

Nutrition Influences Cognition

Table 1 shows our at risk population is middle aged, mostly female and highly educated. While Blacks and Whites are similar in all demographics including education, they report significantly less income compared to Whites.

Tables 2 and 3 show results of our vascular and cognitive measures. Blacks and Whites did not differ on any measure including blood pressure, arterial stiffness and endothelial function. Cognitive function differed significantly in Blacks and Whites, such that Whites outperformed Blacks on 8 of 9 tests (MOCA t= -2.7, p < .05; Trails B t=2.0, p=.05; MINT t=-2.0, p=.04).

Table 4 shows correlations between cognitive tests and nutrition by race. We found correlations across multiple domains, but the correlations were not the same in Blacks and Whites.

http://www.rmos.in/2015/11/12/how-to-sharpen-your-brain/

Conclusion

- Racial differences on cognitive testing exist in individuals with a parental history of AD.
- The racial differences in cognition between races cannot be accounted for by age, education, vascular risk factors, or exercise in our healthy, middle-aged subjects.
- There is a relationship between cognition and nutrition which may be centered around the southern diet.
- The racial differences on cognitive testing may be influenced by nutritional intake.
- It is possible that nutrients influence the brain differently than the body.

Future Directions

- Future studies should examine brain blood nutrient levels to obtain a quantitative measure of nutrition.
- Lifetime nutrition should also be considered.

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