The Relationship between Stress, Carotenoids and Cognitive Function in The Irish Longitudinal Study on Ageing

Joanne Feeney
Queen’s University Belfast and Trinity College Dublin, Ireland
CONFLICT OF INTEREST DISCLOSURE

I have no potential conflict of interest to report
How does stress influence cognitive ability in older adults?

- Psychological Stress
- Biological Stress/protective mechanisms
- Cognitive Function

- Socio-demographic factors
- Social engagement
- Health behaviours
- Good nutrition - antioxidants
What are carotenoids?

- Nutritional pigments, entirely dietary derived
- Found in brightly coloured vegetables and fruit, egg yolk

**Carotenoids**
- Beta-carotene, alpha-carotene, lycopene

**Xanthophylls**
- Lutein, Zeaxanthin, cryptoxanthin

- Form macular pigment in the eye
- Higher concentrations relative to other carotenoids in the brain
- Stabilize reactive oxygen species (ROS)
Aims

• To investigate the cross-sectional and longitudinal association between psychological stress and cognitive function

• To explore whether lutein (L) and zeaxanthin (Z) can moderate the effect of stress on cognition
Methods
The Irish Longitudinal Study on Ageing

- Observational cohort study of adults 50+ in Ireland, community dwelling at outset
- Three-stage approach to sampling
  - 3,155 population sampling units (clusters)
  - 640 clusters selected based on geographical spread and socio-economic status
  - 40 addresses randomly selected from each cluster
- Interviewers visited 25,600 houses
- n=8,504 community-dwelling adults
- Household response rate: 62%
Data collection

- Computer-Assisted Personal Interview (CAPI)
- Self-Completion Questionnaire (SCQ)
- Health assessment
Timeline

Design & Pilot

Wave 1

Wave 2

Wave 3

Wave 4

Wave 5

Wave 6

06-09
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Data collection

**Self-Completion Questionnaire (SCQ)**

**Perceived stress scale** (short form)
- Feelings of stress over the past month
- 0-16

**Health assessment**

- Blood plasma samples
  - Concentration of *lutein and zeaxanthin* peripherally, measured by HPLC

- **Cognitive tests**
  - Memory (word recall)
  - Global cognition (MoCA)
  - Executive function (Colour Trails Task 2)
  - Attention (Sustained Attention to Response Task)

N = 3,577
Results
Negative linear association between stress and word recall

**p<.01, ***p<.001; Mixed effects regression model adjusted for age, sex, education, smoking, alcohol use, exercise, plasma vitamin D and vitamin B-12, chronic health conditions
The relationship between stress and memory performance differs according to level of Z

* \( p < .05 \); Mixed effects regression model adjusted for age, sex, education, smoking, alcohol use, exercise, plasma vitamin D and vitamin B-12, chronic health conditions
Similar pattern is evident for L

* p<.05; Mixed effects regression model adjusted for age, sex, education, smoking, alcohol use, exercise, plasma vitamin D and vitamin B-12, chronic health conditions
Conclusions and future steps

• Circulating blood carotenoids lutein and zeaxanthin moderate the association between perceived stress and memory performance in this sample
• Cross-sectional association only
• What does this mean, if anything?
• Location and role of these nutrients in the brain
Acknowledgments

Aisling O’Halloran
Rachel Moran
Daniel Carey
John Nolan
Stephen Beatty
Professor Rose Anne Kenny
Professor Ian Young
TILDA participants
Funders

[Logos of IPH, Irish Life, The Atlantic Philanthropies, and An Roinn Sláinte Department of Health]