Poster No:

P10-5

Associations between pro-inflammatory cytokines, learning and memory in late-life depression and healthy aging

Rebecca A. Charlton PhD[1,2], Melissa Lamar PhD[2], Aifeng Zhang PhD[2], Xinguo Ren MD[2], Olusola Ajilore PhD MD[2], Ghanshyam N. Pandey PhD[2,3] & Anand Kumar MD[2].

[1] Department of Psychology, Goldsmiths University of London; [2] Department of Psychiatry, University of Illinois at Chicago; [3] Department of Bioengineering, University of Illinois at Chicago .

Background

- Learning and memory problems are common in healthy ageing and late-life depression (LLD).
- There is growing evidence that pro-inflammatory cytokines may also affect learning and memory.
- Pro-inflammatory markers are often elevated in ageing, age-related vascular disease and depression.
- The impact of pro-inflammatory cytokines may be exacerbated in LLD versus healthy older adults (HOA).

Hypotheses

- Pro-inflammatory cytokines will be higher in LLD compared to HOA.
- Pro-inflammatory cytokines will be associated with learning and memory, particularly in LLD.

Methods

- Participants: 34 HOA, 24 LLD(aged ≥ 60 years)
- Depression rating: Hamilton Depression Rating Scale (LLD, range=15-27; HOA, range=0-6) and Geriatric Depression Scale.
- Cognitive Assessment: Learning, immediate free recall from CVLT; Logical Memory & Visual Reproduction. Memory, long delay free recall from the above measures.

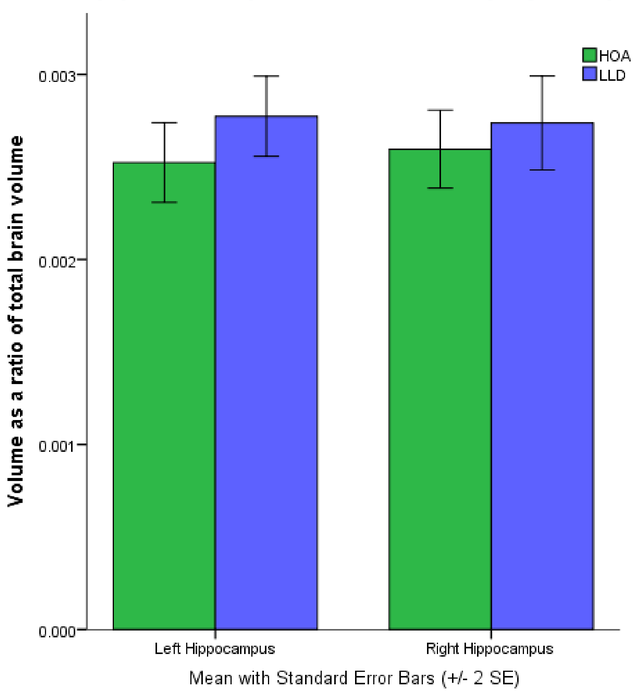
Table 1: Demographic variables by Group

	HOA	LLD	Group differences F(1,56), p
Age	70.15 (6.07)	67.21 (9.09)	F=2.18, p=.145
Sex (m,f)	13,21	8,16	X^2=.146, p=.786
Highest Education	16.41 (3.01)	15.92 (2.75)	F=.409, p=.525
GDS	2.10 (2.78)	18.86 (5.80)	*F=186.50, p<.001*
Learning	-.046 (.816)	.065 (.807)	F=.260, p=.612
Memory	-.096 (.717)	.136 (.882)	F=1.22, p=.274

- Pro-inflammatory cytokines: Interleukin-1β (IL-1β), tumor necrosis factor-α (TNF-α) and Interleukin-6 (IL-6) were measured in plasma/serum, ELISA Quantakine kits.
- MRI, acquisition: Philips Achieva 3T scanner. T1-weighted high resolution 3D image (MPRAGE; FOV=240mm; 134 contiguous axial slices; TR/TE= 8.4/3.9ms; flip angle=8º; voxel size=1.1X1.1X1.1mm).
- MRI, image analysis: Left and Right hippocampal volumes extracted with Freesurfer image analysis suite.

Results, Group differences

Figure 1: No hippocampal volume by group differences



Results, Group differences

- Health measures: no differences in stroke risk, BMI, or HA1c (not shown)

Results, Pro-inflammatory Cytokines

Table 2: Pro-inflammatory Cytokines by Group

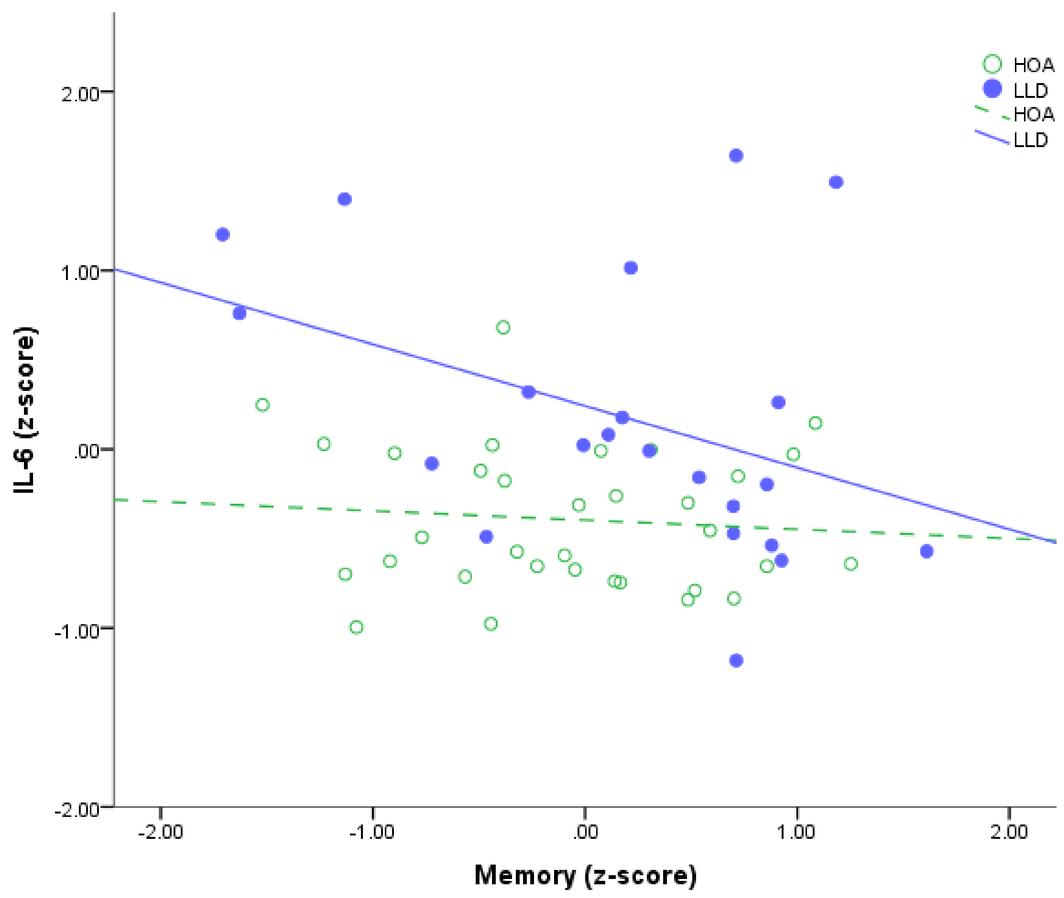
	HOA	LLD	Group differences
IL-1β	1.52 (.699)	2.38 (1.03)	*F(1,56)=14.49, p<.001*
TNF-α	3.09 (1.40)	4.05 (2.16)	*F(1,56)=4.18, p=.046*
IL-6	1.24 (.443)	2.03 (1.22)	*F(1,56)=11.73, p=.001*

- GDS (across whole sample) correlated significantly with:
  - IL-1β (r=.379, p=.017)
  - IL-6 (r=.390, p=.014)
- But not with TNF-α (r=.121, p=.461)

Results, Logistic Regression Analyses

- Learning (41.4%; F=13.05, p<.001) explained by:
  - Education level (21.2%)
  - Right hippocampal volume (20.2%)
- Memory (40.7%; F=9.92, p<.001) explained by:
  - Education level (21.4%),
  - Right hippocampal volume (17.1%),
  - Grp x IL-6 interaction term (6.7%)

Figure 2: Association between IL-6 and Memory by group



Conclusions

- IL-1β, TNF-α and IL-6 were higher in LLD versus HOA.
- IL-1β and IL-6 correlated significantly with severity of depression across the whole sample.
- High levels of IL-6 seem to impact Memory in LLD group but not HOA.
- Results suggest that the impact of high pro-inflammatory cytokines may be different in LLD versus HOA.
- Pro-inflammatory cytokines may significantly impact cognition in “at-risk population”, but have a lesser impact in healthy ageing.

Acknowledgments

- Funding Provided by the National Institutes of Health: NIMH 7RO1 MH073989-04 (AK).