ADVANCED NEUROIMAGING IN CONCUSSION: A TRANSLATIONAL COLLABORATION OPPORTUNITY

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FINANCIAL DISCLOSURES

- None
- Unpaid consultant
  - IOC workgroup on psychiatric aspects of sports concussion
  - CDC Safety in Youth Sports, concussion group
  - Co-director, ENIGMA Sports Concussion Section
  - NCAA/ PAC 12 concussion research review panel

LEARNING OBJECTIVES:

AT THE CONCLUSION OF THIS PRESENTATION THE LEARNER WILL BE ABLE TO;

- Compare and contrast TBI and Concussion
- Discuss the role of biomarkers, specifically neuroimaging in concussion assessment and management
- List the challenges and opportunities for future research and collaboration in concussion neuroimaging

TBI VS CONCUSSION

- Kissing cousins, not identical twins
- Baron ***Sunburn Analogy***
- Sensitization kindling model
  - Post et al
- Different role of neuroimaging
  - White matter vs grey matter impact

ROLE OF BIOMARKERS

- Despite ongoing research in imaging and proteomics
  - GFAP, NFL, SB100, UCH-L1(and others)
  - DTI, NIS
  - Balance
  - Eye-tracking
- *No approved, FDA endorsed Biomarkers for Concussion*

NEED FOR LARGE INTERPROFESSIONAL COLLABORATIONS

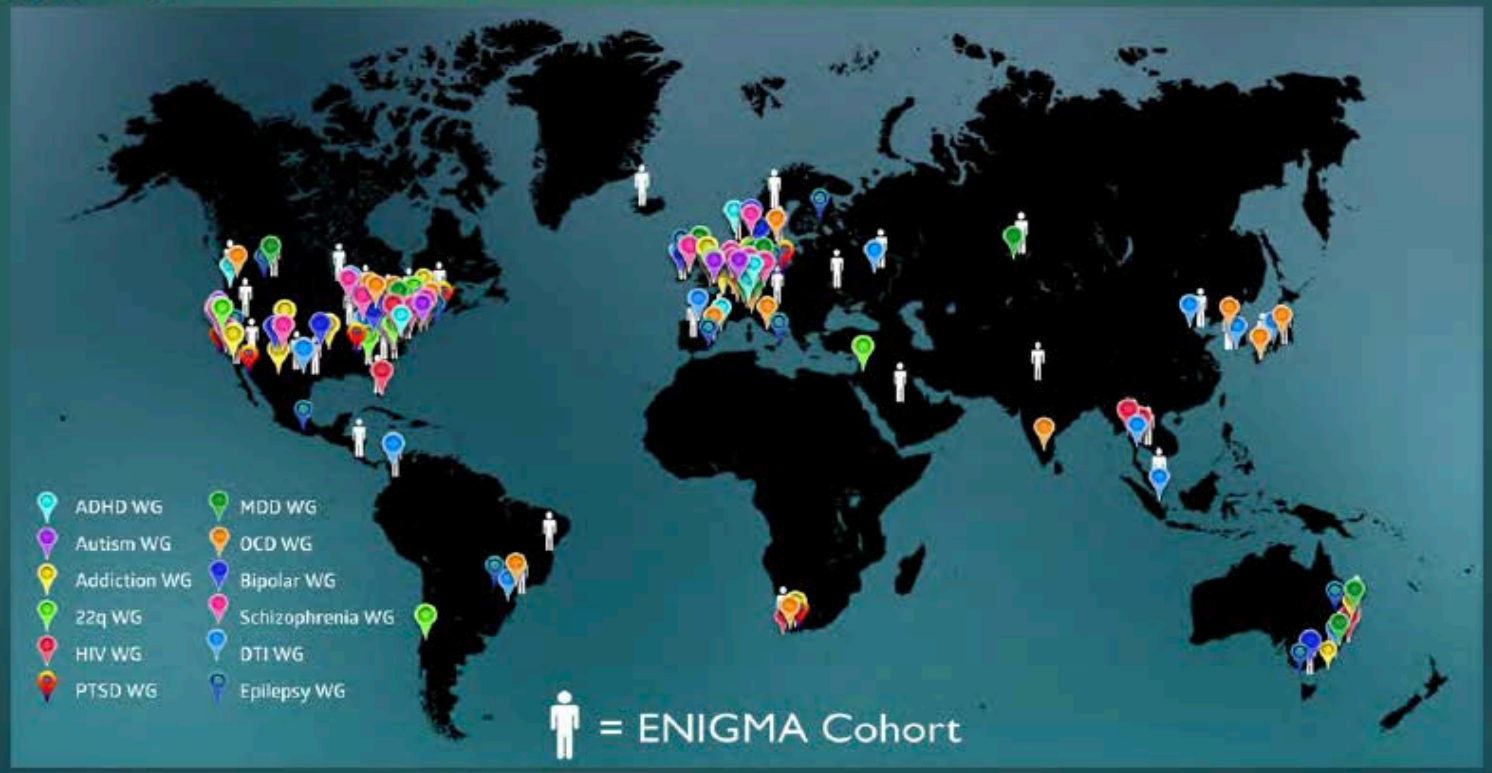
- Puzzle with many pieces
  - Need for translational approach- *Molecules to Mainstreet*
    - *Basic neuroscience/neuroimaging/neurogenetics*
    - *Clinical perspective*
    - *Public health/public policy*
  - Osteopathic approach

EXAMPLE OF COLLABORATION

- ENIGMA
- NHSCA-ISSP
- NCAA-IOC-FIFA

ENIGMA

- Started in 2009 – increased power for GWAS with brain measures
  - Brain measures as intermediate phenotype between genetics and psychiatric and neurological disorders
- 28+ working groups dedicated to psychiatric, neurological, and developmental disorders
  - Working groups dedicated to methods as well



ENIGMA Brain Injury

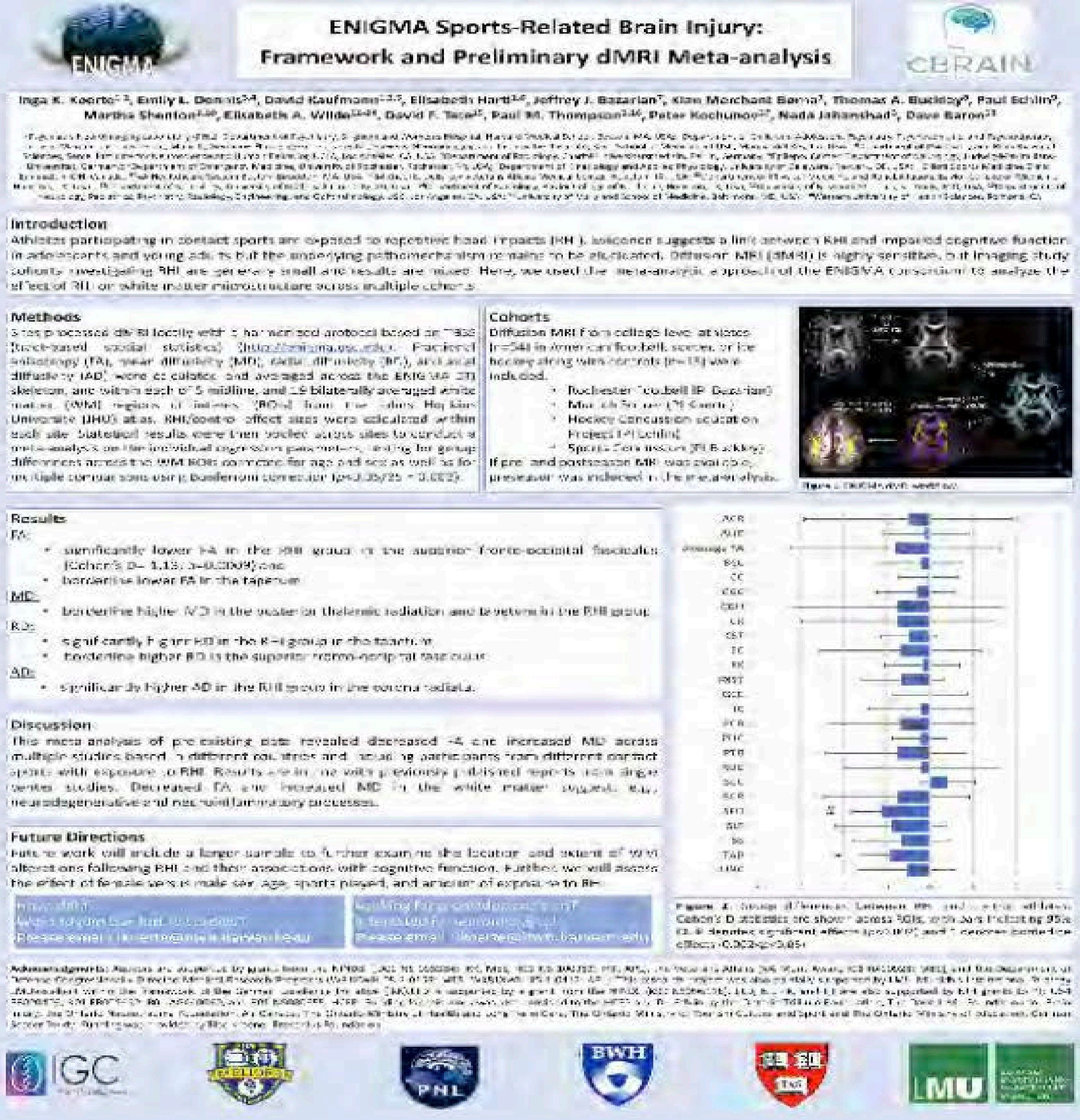
- Working group PIs: Emily Dennis (USC), David Tate (UMSL), Elisabeth Wilde (Utah)
- 38 groups across 9 countries so far
- ENIGMA Military Brain Injury
  - David Tate (UMSL) & Elisabeth Wilde (Utah)
- ENIGMA Pediatric msTBI
  - Emily Dennis (USC), Karen Caeyenberghs (ACU), Elisabeth Wilde (Utah)
- ENIGMA Sports Concussion
  - David Baron (USC) & Inga Koerte (Harvard and LMU)
- ENIGMA Adult msTBI
  - Alexander Olsen (NTNU) & Frank Hillary (Penn State)
- ENIGMA ED Civilian mTBI
  - Pratik Mukherjee (UCSF) & Andrew Mayer (UNM)
- ENIGMA Intimate Partner Violence
  - Carrie Esopenko (Rutgers)

ENIGMA Sports

- 3 sites
  - Total: n=54 Repetitive Head Impacts (RHI); n=13 Controls
- Diffusion MRI
- Results in RHI compared to controls
  - **Lower FA** in fronto-occipital fasciculus and borderline lower FA in the tapetum.
  - Borderline **higher MD** in the posterior thalamic radiation and tapetum
  - **Higher RD** in the tapetum, borderline higher RD in the superior fronto-occipital fasciculus
  - **Higher AD** in RHI in the corona radiata.

ENIGMA Sports

Poster tomorrow:
PS2.04.174



Discussion

- MOU
- Harmonizing outcome scales
- Secondary proposals
- Grant possibilities
- Workflows for new modalities

Harmonizing outcome scales

- Common test data across cohorts
- Common domains; use or create standard scores to compare
  - Working memory
  - Memory
  - Processing speed
  - Executive function
- Set impairment threshold, use categorical grouping
- Other approaches?

CHALLENGES/ OPPORTUNITIES

- *Speak the same language*
  - Defend the clinical phenotype
- Stay focused on the **Science**, not the politics/economics
- View this as PH issue, as well as pt. issue
- Prospective, longitudinal trials
  - Consider confounding B-P-S factors Type 1 and 2 error
- Emerging science

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QUESTIONS/COMMENTS

- Thank you for your time and attention!!
  - Enjoy OMED

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