ADVANCED NEUROIMAGING IN CONCUSSION: A TRANSLATIONAL COLLABORATION OPPORTUNITY

DAVID BARON, MSED, DO, DFACN
PROF. AND VP WESTERN UNIV OF HEALTH SCIENCES
CO-DIRECTOR, ENIGMA SPORTS CONCUSSION NEUROIMAGING GROUP, USC
EMILY DENNIS, PHD ENIGMA
INGA KOERTE, MD, PHD BWH HARVARD SCHOOL OF MEDICINE

OMED / ACONP OCT. 18TH, 2018
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
REFERENCES: 2017 AND NEWER


QUESTIONS/COMMENTS

• Thank you for your time and attention!!
• Enjoy OMED
REFERENCES-CONT.


