Effects of different exercise modalities on cortical excitability and cognitive function in healthy participants

Bernhard Haas, T. Bray, S. Hawksley, E. Roberts, N. Spicer, J. Marsden
Background

- Exercise can help maintain physical and brain health (Cotman 2002)
- HIIT beneficial in healthy and long term conditions (Adamson 2014; Gibala 2012)
- BDNF release through HIIT, essential for neuroprotection, long term potentiation, synaptogenesis and neurogenesis (Schmolesky 2013; Marquez 2015)
- Optimal type of HIIT for various outcomes unclear at this stage
Methodology

• Immediate effects of 2 types of HIIT cycling on 15 healthy participants (mean age 27.66 ± 12.69, 11 female)
  – High HIIT with 100 rpm
  – Low HIIT with 50 rpm
  – Resistance adjusted to achieve similar HR increases (>80% HRmax)
  – 1 min HIIT, 1 min active rest x 10

• Outcomes measured pre and post HIIT cycling
  – Cortical excitability from Transcranial Magnetic stimulation (TMS) (Summers 2017)
  – Cognitive function from Trail Making Tests A & B (TMTA/TMTB) (Costigan 2016)
Findings

• Safe, no ill effects, all participants completed all tests
• TMS measurements were reliable
• Cognitive function improved significantly after High HIIT ($p=0.04$) but not with Low HIIT
• No differences in cortical excitability between High and Low HIIT
• Participants subjectively preferred cycling at higher rpm
Conclusions and cautions

• Cortical function can be improved by HIIT with high cycling revolutions
  – ...but there may have been a training effect
  – ... longer washout periods between tests
• No effects on cortical excitability
  – ... longer exercise periods needed?
  – ... needed larger sample (39-256) to show effect
• Alternative outcome measurements may show direct effects
  – fMRI
  – Serum BDNF