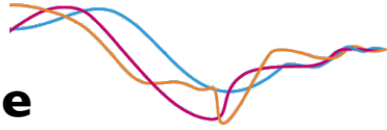


**Centre for  
Educational  
Neuroscience**



 **Bloomsbury**  
Doctoral Training Centre  
for the Social Sciences



# Workshop on Educational Neuroscience

Discussion Session

# Discussion

- Mathematics:
  - tES to enhance neuroplasticity
  - dyscalculia - causes
- Reading:
  - why hasn't science been more useful for reading outcomes?
- Science:
  - reasoning, inference, and prior knowledge
- Interventions
  - challenges and mechanisms
  - working memory, training, transfer, individual differences

# Discussion topics

- Dialogue between teachers and scientists
- Dorothy Bishop on EN (screening, practicality)
- Smart pills
- Personalised learning
- Genetics
- Mending psychology
- Alleviating the effects of social disadvantage
- Intervention roll out (resources, fidelity)
- Focus on disability => shift to resilience?

# On using neuroscience measures for diagnosis or to predict outcome

- “The first thing you need is to demonstrate that the measure is reliable at the individual level.
- The next thing you need to do is to demonstrate adequate sensitivity and specificity for prediction in a realistic population.
- Most neuroscientists who work in this area aren't trained in either psychometrics or statistical epidemiology and don't have much of a clue about either of these things, but they are absolutely crucial if the technique is to be of any use.
- I agree this doesn't preclude the diagnostic use of such methods in the future, and you have to start somewhere.
- I just think many of those who talk about using neuroscience to predict outcomes gravely underestimate the kind of work that would need to be done, and the timescale that would be required, for this work to be translated into practice.”



Dorothy  
Bishop  
28/1/14

# Effect sizes in improving educational attainment (made up data to show possibilities!)

LITERACY	NUMERACY	SCIENCE
Diet	Domain-specific reps	Executive functions
Sleep	Reward schedules	Personality
Exercise	Executive functions	Spaced learning
Executive function	Personality	Sleep
Personality	Spaced learning	Reward schedules
Domain-specific reps	Exercise	Diet
Spaced learning	Sleep	Exercise
Reward schedules	Diet	Domain-specific reps

- Bigger effect sizes for domain-specific or domain-general factors?
- Same or different across topics, syllabus, age?

# Mending psychology

- Hints psychology is not fit for purpose:
  - It is poor at predicting the range of transfer effects in training interventions; training often doesn't generalise as much as you'd expect given cognitive theory
  - Psychological constructs don't seem to match particularly well to the activation of neural structures; there are too many many-to-one and one-to-many relationships
  - Emotion is peripheral to most cognitive theories, despite its primary adaptive role for mammals;
  - Current cognitive theory doesn't explain how and why plasticity should change with age;
  - There are phenomena that seem surprising given current cognitive theory, typically leading psychologists to cellotape post-hoc additions to their theories – such as embodiment, the role of sleep, or the effects of meditation.

## Naïve versus less-naïve notions of the contribution of imaging data to intervention studies

Possible effects of reading intervention

A Brain changed Reading changed	B Brain unchanged Reading changed
C Brain changed Reading unchanged	D Brain unchanged Reading unchanged

VS

1. A working memory intervention does not show the transfer effects from Task A to Task B that you would expect given current cognitive theory
2. Functional brain imaging shows that the changes induced when training on Task A do not overlap with the areas typically activated during performance of Task B
3. What are the implications??