What happened to the boss?

Or.....It’s my party.

JEF©: A New Ecologically-Valid Assessment of Executive Functions

Dr Ashok Jansari
Talk Overview

- Overview of executive functions & measures
- Study 1: Development of Jansari assessment of Executive Functions (JEF®)
- Study 2: Cognitive enhancement of nicotine
- Study 3: Acute effects of alcohol
- Study 4: Impact of long-term alcohol use/abuse
- Study 5: Cognitive dysfunction following cancer therapy
- Study 6: Replication in Louvain, Belgium in French
- Study 7: Development of children’s assessment: JEF-C®
- Study 8: Use of JEF-C® for Atypical Development (ASD & ADHD)
- Future Directions
Figure 11.3 The shaded areas show the extent of prefrontal cortex in six species. Note how small this region is in the cat, dog, and squirrel monkey. It is greatly enlarged in humans. The brains are not drawn to scale. Adapted from Fuster (1989).
EVR
(Eslinger & Damasio, 1985)

EVR

- Financial controller for a company
- Tumour in orbitofrontal region of the brain
- Invasive surgery to remove tumour
- IQ was still in the superior range
- However....
- Unable to make the smallest decisions – could take up to 5 hours to decide where to go for dinner!
- Within 2 years of his surgery, he had become divorced, married again and divorced again!!!!!!
- And bankrupt 😞
Unsuspecting Indians lose billions to bogus investments

By Anu Anand
West Bengal, India
Dopamine and Reward

http://www.youtube.com/watch?v=aNXhyPj-RsM
Brain Reward Pathways Implicated in Addiction

Addictive drugs: opiates, cocaine, cannabis, nicotine
How can executive dysfunction be detected clinically?

A range of tests exist to clinically assess frontal dysfunction, e.g.:

- Wisconsin Card Sorting Test (WCST)
- FAS fluency task
- Trail-making task

Shallice and Burgess (1991) Multiple Errands Task (MET):

- Tested patients who had passed WCST on a ‘real-world’ task
- Patients showed severe impairments despite passing WCST
- Findings like this led to the development of the Behavioural Assessment of Dysexecutive Syndrome (BADS: Wilson et al, 1996)
- Executive deficits have proved hard to capture with traditional neuropsychological tests (Wood & Rutterford, 2004)
A non-immersive virtual reality office-based role-playing task - involves participants carrying out the duties of an office-temp setting up a meeting
task was carefully constructed to assess a number of constructs involved in executive functions, i.e.:
- Planning (PL)
- Prioritisation (PR)
- Selective Thinking (SE)
- Creative Thinking (CT)
- Adaptive Thinking (AT)
- Action-Based Prospective Memory (ABPM)
- Event-Based Prospective Memory (EBPM)
- Time-Based Prospective Memory (TBPM)
Study 1: Development of JEF® (cont.)

- 2 tasks per construct; 0-2 scoring system
  - IRR Pearson correlation coefficient = 0.956 to $r = 1.0$
- 8 separate scores, one total score
- Clients at vocational rehabilitation centre (Rehab UK) who all performed within the unimpaired range on the BADS and Brixton-Hayling tested plus age & WTAR IQ matched controls
Study 1: Development of JEF® (cont.)
Study 1: Development of JEF©
(cont.)
Study 1 JEF©: Results

![Graph showing accuracy for different cognitive constructs, with error bars and p-value]
# Individual level z-scores

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*- 2-3.9  
**= 4-7.9  
***= 8+

*Jansari et al (2014)*
Study 2: Effects of nicotine

- Smokers are less likely to develop SDAT (Senile Dementia of the Alzheimer’s Type) than non-smokers
- Nicotine has been found to reduce agitation in severe dementia (Carmel & Sheitman, 2007)
- Contradictory findings in the experimental literature on the impact of nicotine on cognitive functions (Dawkins, Powell, West, Powell & Pickering, 2006)

- 36 smokers, 36 age & IQ matched non-smokers
- Each group divided into Nicotine or Placebo group
Study 2: Effects of nicotine

Cognitive Construct

Accuracy (%)
Study 3: Acute effects of alcohol

- 69% increase in hospital admissions directly related to alcohol consumption in England over the past 5 years (Statistics on Alcohol: England, 2009)
- Global think tanks rank Britain as having the highest rate of teenage binge drinking in the world (Radnedge, 2009)
- Alcohol intoxication adversely affects performance on the WCST (Lyvers & Malzman, 1991)
- Dose of 0.8g/kg impairs planning time and number of trials completed in the minimum number of moves on the Tower of London task (Weissenborn & Duka, 2003)
- However, 0.6g/kg alcohol does not appear to affect any aspect of TOL performance (Leitz et al. 2009), and paradoxically may facilitate performance (Paraskevaides et al. 2010)
- 40 participants
- 0.4g/kg alcohol or matched placebo in a double-blind design
Study 3: Acute effects of alcohol

Montgomery, Ashmore & Jansari (2011)
Study 4: Long-term effects of alcohol

Cognitive Construct

RA (N=8)  NC (N=12)  **p<0.01

Accuracy (%)

PL  PR  SE  CT  AD  ABPM  EBPM  TBPM  AVERAGE
Study 5: Impact of Androgen Deprivation Therapy (ADT) for prostate cancer

![Graph showing cognitive construct accuracy for ADT and HC groups.](Image)

- ADT (N=12)
- HC (N=52)

**Accuracy (%)**

- PL
- PR
- ST
- CT
- AT
- APBM
- TBPM
- EBPM
- Average

**Note:** ***p<0.005**
Study 6: French JEF©!

Accuracy (%)

Cognitive Construct

- PL
- PR
- SE
- CT
- AT
- ABPM
- EBPM
- TBPM
- Average

ABI (N=12)
HC (N=30)

***p<0.001
The child’s developing brain
Study 7:
The Jansari assessment of Executive Functions for Children: JEF-C©

- a role-playing task involving children running their own birthday party 😊
- task recreated in a virtual reality (VR) environment
- task was carefully constructed to assess a number of constructs involved in the dysexecutive syndrome, i.e.:
  - Planning (PL)
  - Prioritisation (PR)
  - Selection (SE)
  - Creative thinking (CT)
  - Adaptive thinking (AT)
  - Action-based prospective memory (ABPM)
  - Event-based prospective memory (EBPM)
  - Time-based prospective memory (EBPM)
- 2 tasks per construct; 0-2 scoring system
Study 7
JEF-C©: Typical Development

Group 1: Age 7-10 (N=17)
Group 2: Age 12-14 (N=19)
Group 3: Age 16-18 (N=17)

**p<0.001
Study 8

JEF-C©: Atypical Development

Accuracy (%)

- ASD
- ADHD
- TD

Cognitive Construct:
- Planning
- Prioritisation
- Selective-Thinking
- Creative-Thinking
- Adaptive-Thinking
- ABPM
- EPPM
- TBPM
- AVERAGE
Discussion

Summary of JEF© (Jansari assessment of Executive Functions) findings:

- Both real-life and virtual reality versions of the task can differentiate brain damaged patients who pass the standard tests from healthy individuals.
- Looking across the cognitive constructs, the patients’ abilities are found to be less impaired on some than others revealing rich individual-level differences.
- The task can be used to look at impact of substances such as nicotine, alcohol, ecstasy and cannabis on executive functions.
- Can be used to investigate executive dysfunction related to drug therapies.
Summary of JEF-C© findings:

- Children’s version seems to map onto development of executive functions through childhood and adolescence
- Seems to reveal EF differences as a function of atypical development
- Sensitive to EF problems following paediatric brain injury
Future directions….

- Use in guiding rehabilitation
- Theoretical implications of findings
- Translation into other languages – currently French, Hebrew, (Brazilian) Portuguese, Italian, Dutch, Swedish, Finnish
- Current collaborations with researchers at PUC Rio, D’Or in Rio, Federal University of Rio, Federal University of Minas Gerais and research planned with Institute of Psychiatry (Sao Paolo), Federal University of the Bahia
- German, Danish, Spanish translations underway
  (all new collaborations welcome 😊)
- Investigation of other conditions where faulty executive processes may be involved – e.g. OCD, gambling, those who make bad financial decisions
Obrigado!

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