Assessment and Rehabilitation for People With Deficits in Executive Functioning.

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The brain’s chief executive is the frontal lobes (Goldberg 2001)

A patient with frontal lobe disease will retain the ability to move around, use language, recognise objects, and even memorize information. Yet like a leaderless army, cognition disintegrates and ultimately collapses with the loss of the frontal lobes.” Goldberg 2001 p23
What are executive functions?

• Programming, regulation and verification of activity (Luria 1966)

• Goal Formulation, Planning, and Carrying out goal-directed plans effectively (Lezak 1983)

• Mental operations which enable the individual to disengage from the immediate context to guide behaviour by reference to mental models and future goals (Hughes, Russell and Robbins 1994).
Frontal Lobes

- Often damaged in TBI
- FLs sensitive to executive deficits
- Story began in 1848 with Phineas Gage
In September 1848, in Cavendish, Vermont, an incident occurred which was to change our understanding of the relation between mind and brain.

Phineas P Gage, a 25 year old railroad foreman, was excavating rock.

In preparation for blasting he was tamping powder into a drill hole when a premature explosion drove the tamping iron—1.1 m m long, 6 mm in diameter, and weighing 6 kg—through his left cheek and out of the vault of his skull with such force that it threw him on his back and fell several rods behind, “smeared with brain.”
Despite his injuries he remained conscious and only a few minutes later was sitting in an ox cart writing in his work book. He recognised and reassured Dr Harlow, who had been summoned to the scene. The wound continued to bleed for two days; then followed a virulent infection that rendered Gage semiconscious for a month.

His condition was so poor that a coffin had been prepared. Nevertheless, Dr Harlow continued treatment, and by the fifth week the infection had resolved and Gage had regained consciousness. He was blind in the left eye and had left facial weakness but no focal neurological deficits.
“Remembers passing and past events correctly, as well before as since the injury. Intellectual manifestations feeble, being exceedingly capricious and childish, but with a will as indomitable as ever; is particularly obstinate; will not yield to restraint when it conflicts with his desires.”

Dr Harlow reports that Gage’s employers, “who regarded him as the most efficient and capable foreman ... Considered the change in his mind so marked that they could not give him his place again..
“His physical health is good and I am inclined to say that he is recovered.... However, the equilibrium, or balance, so to speak, between his intellectual faculties and his animal propensities seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned....in this regard his mind was radically changed, so decidedly that his friends said that he was ‘no longer Gage’.” Harlow (1848).
King Henry VIII. Another case of frontal lobe damage?

• His first serious accident occurred in 1524 when he failed to lower the visor on his helmet and was hit by his opponent's lance just above the right eye, after which he constantly suffered from migraines.

• On the 24th January 1536, 44-year-old Henry, in full armour, was thrown from his horse, itself armoured, which then fell on top of him. He was unconscious for two hours and was thought at first to have been fatally injured.

After the accident – just before he became estranged from the second of his six wives, Anne Boleyn – the king, once sporty and generous, became cruel, vicious and paranoid, his subjects began talking about him in a new way, and the turnover of his wives speeded up.
Anatomy of the Brain

Brain showing lobes, brain stem and cerebellum
Functions of the Lobes

**Executive Functions** (planning, organising, goal management, time management), **Sustained Attention**, **Inhibition/behavior control** (emotion), **Monitoring**, **Initiation**, **Working Memory**

**Motor Cortex**

**Sensory Cortex**

**Space Perception Spatial Attention**

**Parietal lobe**

**Occipital lobe**

**Temporal lobe**

**Frontal lobe**

**Cerebellum**

**Long-Term Memory, LH - Verbal Memory, Language Skills**

**RH - Visual Memory**

**Muscle Coordination and Balance**
“Frontal Lobe Syndrome”

The kind of problems we now call executive deficits were once called “Frontal Lobe Syndrome”

Odd to call a syndrome after a part of the brain rather than after the symptoms.
Dysexecutive Syndrome

• Baddeley (1986) coined the term ‘dysexecutive syndrome’ to describe the nature of the impairment arising from frontal lobe damage.

• Baddeley and Wilson (1988) based on Rylander (1932)
  – impairments in attention (being easily distracted)
  – difficulty grasping the whole of a complicated state of affairs
  – may be able to work along routine lines, but have difficulties in new situations
Executive Functioning: Anatomy

The frontal lobes are important for executive functioning.

The frontal lobes are very often damaged in traumatic brain injury.
Executive functions are very sensitive to brain damage.

Many people with a brain injury have problems with executive functioning = “Dysexecutive syndrome” which consists of difficulties with goal management and problem solving.
Patients with the DES may have

• Cognitive
• Emotional and
• Behavioural problems
Potential cognitive consequences of frontal lobe lesions/DES

- Planning, organisation and strategy application
- Problem solving, reasoning and decision making
- Sequencing
- Problems in forming and shifting concepts/mental set, using feedback - perseveration
- Fluency
Try a fluency test
## Fluency - Perseveration

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Emotional changes following damage to the brain may include:

- Anger, aggression
- Apathy and Indifference
- Depression
- Restlessness
- Euphoria
- Emotional disinhibition
- Irritability, frustration
- Difficulty understanding emotions in others
The frontal lobes & emotions

- Recognising future consequences
- Examining similarities and differences
- Overriding and suppressing socially unacceptable responses
- Storing memories associated with emotions
Two routes to emotion

• Quick route – straight to the amygdala
e.g. fear of spiders!

• Slower route to amygdala via frontal lobes and hippocampus
e.g. Walking down the street and someone you know doesn’t say hello ...

...
Effects of brain injury

A brain injury can disrupt the delicate circuitry linking the frontal lobes with the limbic system.

This leads to problems with emotional and behavioural control.

Relatively minor stressors can result in experiences of strong emotions.
Potential behavioural consequences of frontal lobe lesions

- Behavioural
  - Adynamia, lack of initiation.
  - Impulsivity, utilisation behaviour, environmental dependency syndrome (L’hermitte 1986)
  - Disinhibition
Utilisation behaviour, or environmental dependency syndrome (L’hermitte 1986)

- Patient 1, 51 year old man, left frontal glioma

“Patient 1 was sat down on a table on which various women’s cosmetics had been placed. He looked at them and glared at me in a way that expressed great displeasure, as if I had considered him to be a women. He later saw a pistol and revolver on the table. He got up and went directly to them, with a gesture of intense delight. He spun the bullet chamber of the revolver, looked for the box of cartridges and found it. Seeing that these cartridges did not correspond to the calibre of the gun, he picked up the pistol instead, pulled the magazine back and loaded it with the cartridges. The experiment was then stopped.......”
Environmental dependency syndrome
(L’hermitte 1986)

• Patient 2: 62 year old woman, left frontal astrocytoma.
• The doctor’s office
  – “I put some medical instruments on my desk. She immediately picked up the blood pressure gauge and very meticulously took my blood pressure. After this she took the tongue depressor, and placed it in front of my mouth, which I opened and she examined my throat...when I asked her what she thought she said that she was satisfied with my state of health”.
Models of Frontal Lobe Functions and Executive Deficits

- Luria’s model
- Baddeley’s WM model
- Norman and Shallice’s model
- Duncan’s model
- Stuss’s model
Models of frontal lobe/executive functioning

  - A system for the programming, regulation and verification of voluntary action.
  - Emphasis on action that is normally controlled by inner speech.
  - “In these patients the verbal command remained in their memory, but it no longer controlled the initiated action and lost its regulating influence” (1973, p.200).
  - Complex behaviours are frequently replaced by simpler and more basic stereotypes.
  - “…..they lose not only control over their actions, but also the ability to check their results, although frequently they remember the task assigned” (1973, p.210)
Working memory

• Baddeley’s (1986) concept of the central executive component of working memory.
Shallice and Norman’s SAS Model

The frontal lobes act as a Supervisory Attentional System. The S.A.S. was described as being required in situations that involve;

– (i) planning or decision making;
– (ii) error correction or troubleshooting;
– (iii) responses that are not well learned or where they contain novel sequences of actions;
– (iv) dangerous or technically difficult decisions;
– (v) situations that require the overcoming of a strong habitual response or resisting temptation.
Norman and Shallice’s Supervisory Attention System

- producing a response to novelty that is planned rather than one that is routine or impulsive. The situations in which it [a Supervisory Attentional System] is required are those where the routine triggering by the environment of the organism's battery of specialised thought or action schemata is insufficient to produce an appropriate response. Instead, some form of problem-solving behaviour, trying out hypotheses and learning from failed attempts, is required (Shallice 1988, p345)
Duncan’s model of goal neglect

Duncan – “Disorganisation of behaviour after frontal lobe damage reflects a defect in goal-based search, a failure to constrain the choice of action by its intended results” (1986, p. 285)

The patient is able to report what he/she intends to do, or has been told to do, and yet this intention does not adequately control subsequent action.

Robertson’s Goal Management Training
Stuss Model
Four functional domains

• Action regulation
• Executive cognitive
• Behavioural/emotional self-regulation
• Metacognition
Executive functions

• Activation – *doing*

• Executive cognitive – *thinking*

• Emotional and behavioural self-regulation – *feeling and acting*

• Metacognition – *awareness and socialising*
Activation – *doing*

“She seems to be lazy now, lacking any motivation. She needs to be made to do things”
Executive cognitive – thinking

“Since the injury, my wife sees things from day to day and finds it very hard to plan ahead. We tried to plan a holiday together with the children, but she couldn’t make decisions about where to go or when to go. In the end, I did all the planning and organising.”
Emotional and behavioural self-regulation – *feeling and acting*

“He says and does things that are quite rude, and very out of character for him....he says or does things without thinking”
Metacognition – awareness and socialising

• Other people keep saying I have changed, but I feel the same old me
• It’s harder to get along with other people now
• I’ve lost friends and even some family members

Could there be something wrong that I don’t know about or is it them?
Problem solving exercise

Four pupils, Michael, Peter, George and Thomas are sitting around a table. They are drinking milk, juice, beer and lemonade and achieved grades 1 (best), 3, 4, and 6 in their latest essay. Please find out which pupil achieved the best grade and which one is drinking juice:

1. Thomas does not drink lemonade.
2. Peter invites the pupil sitting opposite him to have a juice.
3. The pupil with grade 6 is opposite the one with grade 4.
4. The pupil with the best grade is sitting to the left of the juice drinker.
5. George is sitting opposite the best pupil.
6. The pupil with grade 6 is drinking beer.
7. Michael thanks Peter for the drink.
Introduction to Assessment
Definition of Assessment

Assessment refers to the systematic collection, organization and interpretation of information about a person and his or her situation. It is also concerned with the prediction of future behaviour in new situations.
Models of Assessment

• Neuropsychological procedures
  – Psychometric
  – Localisation
  – Cognitive theoretical models
  – Exclusion models
  – Ecological models

• Behavioural assessment
  – Observations
  – Self-report
  – Interviews
Psychometric Approach

- Based on statistical analysis
- Establish a procedure for administration
- Collect norms from a representative sample
- Develop a scoring procedure
- Determine the reliability and validity of the test
- Examples: Wechsler IQ and memory scales
Localisation Approach

• At one time this was the main purpose of a neuropsychological assessment

• Now less so (although tests of “Frontal Lobe” damage still widely used)

• Those interested in anatomy may still use tests of localisation
Theoretical Models from Cognitive Neuropsychology

- Some theoretical models of cognitive functioning have had a great influence in recent assessment procedures
- Particularly models of language and reading (e.g. PALPA)
- Also memory, perception and attention
- Doors and People test of visual and verbal recall and recognition
Dual route model of reading (from Coltheart, 1985)

- **Stimulus**
  - **Visual feature analysis**
  - **Letter identification**
    - **Phonological route (letter-sound rules)**
    - **Lexical route (Whole word)**
  - **Response**

- MINT
- JINT
- PINT
Definition by Exclusion

- One of the earliest approaches to neuropsychological assessment
- Need to exclude other possible explanations
- For example “Apraxia” need to exclude paralysis, weakness, poor comprehension etc as explanations for the movement disorder
- “Visual Object Agnosia” have to exclude poor eyesight, naming difficulties etc
- Also used indirectly e.g can these memory problems be explained by anxiety, poor attention etc
Ecological Approaches

• Assessments designed to predict everyday problems
• A poor score on a traditional test does not tell us much about real life problems
• Examples: RBMT, TEA, BADS, BIT, WHIM
• The psychometric approach also used in development of these tests
Rivermead Behavioural Memory Test -3

Barbara A. Wilson, Eve Greenfield, Linda Clare, Alan Baddeley, Janet Cockburn, Peter Watson, Robyn Tate, Sara Sopena & Rory Nannery (2008)
Test of Everyday Attention (TEA)
Robertson et al 1994
Behavioural Assessment of the Dysexecutive Syndrome (Wilson et al 1996)
Behavioural Inattention Test (Wilson, Cockburn & Halligan 1987)
Wessex Head Injury Matrix (Shiel et al 2000)
Two ecologically valid tests

• **Behavioural Assessment of the Dysexecutive Syndrome (BADS)**  
  Barbara A Wilson, Nick Alderman, Paul W Burgess, Hazel Emslie and Jonathan J Evans, 1996

• **Cambridge Prospective Memory Test (CAMPROMPT)**  
  Barbara A Wilson, Hazel Emslie, Jennifer Foley, Agnes Shiel, Peter Watson, Kari Hawkins, Yvonne Groot and Jonathan J Evans, 2005
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Assessments are carried out to answer questions

• Different questions require different assessment procedures

• A research question, for example, like “Are there dissociations between LTM and STM” will be answered one way

• A clinical question such as “Can this man go back to work” will require a completely different approach.
Questions that we can answer with standardised tests

• What is this person’s general level of intellectual functioning?
• Is this a decline from the premorbid level?
• How does this person compare with others of the same age?
• Does this person have a global memory deficit or is it restricted to a particular modality?
• What kind of reading disorder does this person have?
Behavioural or Functional Assessments

- Although standardised tests can build up a profile of a person’s cognitive strengths and weaknesses, they can’t tell us all we need to know.
- We need to assess real life functioning (and in more detail than we obtain from the ecological tests)
- We can do this with direct observation, self report measures and interviews.
A Comparison of Standardised and Behavioural/Functional Assessments

**Standardised**
- Tell us what a person has (e.g. amnesia)
- Behaviour is seen as a sign of the disorder (e.g. can’t do paired-associates and that is a sign of amnesia)

**Behav/Functional**
- Tell us what a person does (e.g. forgets peoples’ names)
- Behaviour is seen as a sample of what happens in real life (e.g. tester samples remembering and forgetting performance)
Comparison continued

Standardised
• Samples **one** situation (e.g. how a patient performs in the psychologists office)
• Diagnostic
• Indirect relationship to treatment

Behav/Functional
• Samples **many** situations (e.g. observes in OT, PT, SALT, on the ward
• Helps select t’ment
• Direct relationship to treatment
Comparison of standardised and behav/functional

Standardised

- Prior to (and sometimes during or post) treatment

Behav/Functional

- Assessment and treatment are continuous
Both types of assessment are useful as they provide complementary information
Assessment of Executive Functioning
How do we assess?

- Clinical Interview – include family, carers etc
- Standardised Neuropsychological tests
- Rating scales
  - Self report measures
  - Carer Measures
- Observation of behaviours & emotions
  - Behavioural Ratings
  - Emotional rating
- Functional Assessment
Clinical Interview
NEUROPSYCHOLOGICAL ASSESSMENT
Executive Control

• Executive functions
  – Assess higher cortical functions such as planning, response inhibition, controlled functions (e.g., new task, or new environment)

• Behavioural Assessment of the Dysexecutive Syndrome (BADS)
  – Includes DEX – 20 item questionnaire for patient and another for Sos

• Hayling and Brixton Tests

• Delis Kaplan Executive Functions System - DKEFS:
  – 9 stand alone tests inc. Trails; Stroop, verbal fluency

• Wisconsin Card Sort Task still used frequently (similar card task in BADS)
Behavioural Assessment of the Dysexecutive Syndrome (BADS)

- **Authors**: Barbara Wilson, Nick Alderman, Paul Burgess, Hazel Emslie & Jonathan Evans

- The BADS is designed to test everyday problems that occur in frontal lobe damage = Dysexecutive Syndrome

- Specific areas it assesses include:
  - problem solving,
  - organizing & planning (central executive (CE) part of the Working Memory Model),
  - contentional scheduling system (routine aspects of attention)
  - supervisory attention system (differing levels of demands for tasks)
  - assessing real-life behaviours
  - It is also designed to find general or specific executive deficits.

- Ecologically valid test
Hayling and Brixton Tests

• Authors: Paul Burgess & Tim Shallice
• The Hayling Sentence Completion Test consists of two sets of 15 sentences, each having the last word missing, yielding measures of response initiation speed, response suppression ability, and thinking time.

• The Brixton Spatial Anticipation Test is entirely spoken and is suitable for people with reading, visual perception, or movement problems. It takes approximately five minutes to administer and yields three different measures of executive functioning which can be considered separately or combined into an overall score.
• Designed to measure a variety of verbal and nonverbal executive functions for both children and adults (ages 8 – 89 years)
• The D-KEFS comprises nine tests that are designed to stand alone
• Use to:
  – assess the integrity of the frontal system of the brain
  – determine how deficits in abstract, creative thinking may impact upon an individual’s daily life
  – plan coping strategies and rehabilitation programmes tailored to each patient’s profile of executive-function strengths and weaknesses
• This measure consists of the following subtests:
• The *Trail Making Test* measures flexibility of thinking on a visual-motor sequencing task
• The *Verbal Fluency Test* measures letter fluency, category fluency, and category switching
• The *Design Fluency Test* measures one’s initiation of problem-solving behaviour, fluency in generating visual patterns, creativity in drawing new designs, simultaneous processing in drawing the designs while observing the rules and restrictions of the task, and inhibiting previously drawn responses
• The *Colour-Word Interference Test* measures ability to inhibit a dominant and automatic verbal response
• The *Sorting Test* measures concept-formation skills, modality-specific problem-solving skills
Wisconsin Card Sorting Test

• Still used to assess executive functioning
• Is a test of executive functioning ability that requires subjects to sort cards, altering the chosen sorting approach based on feedback received at unannounced intervals during the task
Sort according to unspoken rule; examiner changes rule – can patient adapt to new rule?
RATING SCALES
Dysexecutive Scale (DEX)

• The Dysexecutive Questionnaire (DEX) is a 20-item questionnaire designed to sample emotional, motivational, behavioural and cognitive changes in a subject with DES.
• One version is designed for the subject to complete and another version is designed for someone who is close to the individual, such as a relative or caregiver.
• Instructions are given to the participant to read 20 statements describing common problems of everyday life and to rate them according to their personal experience.
• Rated on a likert type scale
1. I act without thinking, doing the first thing that comes to mind
2. I find it hard to remember to do things I want to do
3. I am lethargic, or unenthusiastic about things
4. I find it difficult to start something
5. I have difficulty planning for the future
6. I do or say embarrassing things when in the company of others
7. I have difficulties deciding what I want to do
8. I tell people openly when I disagree with them
9. I struggle to find the words I want to say
10. I lose my temper easily
11. I find it hard to stop repeating saying or doing things once I’ve started
12. I find it difficult to notice if I make a mistake or do something wrong
13. I have difficulty thinking ahead
14. I get concerned when I have worrying thoughts
15. I am unconcerned about how I should behave in certain situations
16. I have difficulty showing emotion
17. I find it difficult to keep several pieces of information in mind at once
18. I get over-excited about things and can get a bit ‘over the top’ at these times
Frontal Systems Behavior Scale™ (FrSBe™)

- Authors: Janet Grace, & Paul F. Malloy
- Is a 46-item rating scale designed to measure frontal systems behavioural syndromes
- Quantifies behavioural changes over time, including both baseline (retrospective) and current assessments of behaviour
- Provides a total Score, which is a composite of three subscales:
  - Apathy,
  - Disinhibition, and
BEHAVIOUR AND EMOTIONS
**Behavioral Observation Record Form** (borrowed from Jill Winegardner)

Observed in 5 minute block (only 1 tick/block); 0 = Not observed.

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(Tick once for each 5 min block)
# ABC Charts

## ABC Chart

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<th>DATE</th>
<th>TIME</th>
<th>NAME &amp; SIGNATURE OF PERSON RECORDING INCIDENT</th>
<th>ANTECEDENT (what was happening prior to behaviour?)</th>
<th>BEHAVIOUR (what was the behaviour? Who was there?)</th>
<th>CONSEQUENCE (what happened/what did you do?)</th>
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Analysing behaviour: ABC method

“A” Antecedents

“B” Behavior

“C” Consequences
Behaviour

- Describe the behaviour
  - What does it look like?
  - Frequency
  - Duration
  - Intensity
What factors preceded the behaviour?

- People
- Places
- Objects
- Time of day
- Activities occurring
Consequences

- What happened?
- How did people react?
- What did the person get?
- What did the person avoid?
- What else changed?
# Mood Diary

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**Emotions:**
- Elevated:
  - Severe
  - Moderate

- Normal:
  - Mild
  - Normal
  - Mild

- Depressed:
  - Moderate
  - Severe

**Additional:**
- Anxiety
- Irritability
- Hours slept
- Notes
FUNCTIONAL ASSESSMENT
• Create structured tasks and observe how person completes e.g.

• **Community**

• Ask person to plan a trip to the cinema or to the shops to purchase specific items
  – Include:
    • Time
    • Travel
    • Budget
    • Support

• Then complete task and observe

• “in house”

• E.g. ask person to plan a meal with some given ingredients
Any Questions... Just Ask!
How should we rehabilitate patients with deficits in executive functioning?

• Restoration/re-training?
• Internal strategies
• External aids/strategies
• External control
In rehabilitation much of the emphasis is in Problem Solving (particularly in three areas)

- Three broad processes are involved in problem solving & task/goal management, each of which is dependent on several other more basic cognitive processes.
  - Planning
    - Impairment leads to impulsivity, poor judgement.
  - Implementation/initiation
    - Impairment leads to inertia, failure to follow through.
  - Monitoring
    - Impairment leads to failure to notice problem; failure to notice that solution not achieving goal (goal neglect).
Problem-solving Therapy

• von Cramon and colleagues (1991, 1992) adapted an approach from psychiatry to provide patients with techniques to problem solve
• Slow down, break tasks into steps etc
• Some evidence of success
• Also larger study from Rath et al USA also showed benefit of PST
Does Problem-solving Therapy work?

• von Cramon, Matthes-von Cramon and Mai (1991) compared a PST group (N=20) with a control 'memory therapy' (MT) group (N=17).

• Significant improvement of PST group on ratings of problem solving ability and some test performance (e.g. Tower of Hanoi).
Problem-solving further evidence

• Rath, Simon, Langenbahn, Sherr and Diller (2003)
  – 60 outpatients, all at least 1 year post-injury
  – ‘Conventional group neuropsychological rehabilitation’
    (cognitive remediation and psychosocial components) vs. problem solving group.
  – Assessed on:
    • Cognitive tests (inc. WCST)
    • Psychosocial functioning (e.g. SIP, CIQ, RSES)
    • Problem-solving questionnaires (self-appraised)
    • Observer ratings of role-played scenarios.

• Results
  – P/S group (and not conventional group) improved on:
    • WCST
    • problem solving self-appraisal
    • self-appraised clear thinking
    • self-appraised emotional regulation
    • Observer ratings of role played scenarios
  – Gains maintained at 6-month follow-up.
PST possibly a restoration approach: What about internal strategies?

Self instruction techniques
(Cicerone and Wood 1987; von Cramon et al 1995 etc)

Goal Management Training (Levine et al 2000)
Approaches to the rehabilitation of executive deficits

- Restoration/re-training
- **Internal strategies**
- External aids/strategies
- External control
Self-instructional techniques

• Cicerone and Wood (1987) reported a study of the use of self-instructional training to improve problem-solving in a 20 year old man who had sustained a severe head injury.

• He was functioning independently, but was impulsive, interrupted conversations, and “appeared not to think before he did something”.
Self-instructional techniques

• Cicerone and Wood (1987)
  – Used Tower of London task as a training task.
Tower of London Test

Start Position

End position
Self-instructional techniques

- Cicerone and Wood (1987)
  - Treatment
    - Stage 1: verbalise aloud each move before he made it and then verbalise the move as he is making it.
    - Stage 2: ask the patient to do the same except whisper.
    - Stage 3: ask the patient to “talk to himself” i.e. to think through what he is doing.
Self-instructional techniques

• Cicerone and Wood (1987)
  – Results
    • Successful at improving his performance on the trained task and two other untrained tasks.
    • With some generalisation training, there were improvements in his general social behaviour, as rated by family etc..
Goal Management Training

• Levine et al (2000)
  – Study of effectiveness of Robertson’s (1996) Goal Management Training
  – Derived from Duncan’s concept of Goal Neglect as the core executive deficit.
  – A set of paper and pencil training exercises are used, with participants being taught to follow a set of five stages of goal management
Goal Management Training

- STOP! “What am I doing? Check the mental blackboard”
- DEFINE The main task
- LIST The steps
- LEARN The steps
- DO IT!
- CHECK “Am I doing what I planned?”
Goal Management Training

• Levine et al (2000) Study 1
• 30 TBI patients
• GMT or Motor skills training (15 in each)
• GMT done in 1 session (4-6 hours)
• GMT associated with gains on paper and pencil tasks (proof reading/grouping/room layout)
Goal Management Training

• Levine et al with Clare and Wilson (2000) Study 2
• 35 year old woman, university graduate
• Encephalitis; range of cognitive dysfunction
• Major problem with meal preparation
  – Major problem with repeated checking
• GMT over 5 sessions
• Checklist plus “Stop and think!”
• Evidence of improvement
Oliver Zangwill Centre

• Developed Attention and Problem Solving Group Intervention.

• Influenced by Problem Solving Therapy (von Cramon) and Goal Management Training (Robertson)
Problem Solving Framework

Notice the problem!

Define the main goal
*what am I trying to achieve?*

Is there really only one solution?

Yes          No

Identify the possible solutions
*think flexibly and broadly; use past experience*

Decide on your solution
*weigh up the pro’s and cons of each solution*

Plan the steps involved
*think about the sequence and timing*
*what strategies will I use*

Carry out the plan, monitor progress and adjust plan
*am I still on track? is my solution working? Am I doing what I should be doing?*

Overall evaluation
*was it a success, what went well, what went badly*
Planning and Problem Solving Template

1. **Main goal**

2. If there is really only one obvious solution go to section 5 and plan the steps. If there is more than one possible solution go to section 3.

3. **Alternative solutions**
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<tr>
<th>Pros</th>
<th>Cons</th>
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4. **Decision:**

5. **Plan**

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<tr>
<th>Steps</th>
<th>Strategies</th>
<th>Done? Y or N</th>
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Remember to monitor and evaluate!
Are things going well? If not, do you need to change your plan?
Attention & Problem Solving Group Training

- Miotto and Evans (2005 & 2009)
- Treatment group showed greater improvement on tests, functional multi-element task and Dysexecutive Questionnaire

<table>
<thead>
<tr>
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<th>G1</th>
<th>BL1</th>
<th>T1</th>
<th>BL2</th>
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Approaches to the rehabilitation of executive deficits

- Restoration/re-training
- Internal strategies
- External aids/strategies
- External control
External aids

• Checklists
  – Removing need for planning and problem solving, prompting action, maintaining task focus.
  – NeuroPage
  – Content Free Cueing
NeuroPage (series of studies 1997-2007)

- Wilson et al series of studies showing benefit of paging system for memory and executive deficits
Percentage success rate for participants in Group A (pager first) and Group B (pager later) at Time 1 (baseline); Time 2 (weeks 8 and 9) and Time 3 (weeks 15 and 16)

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<th></th>
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<th>T2</th>
<th>T3</th>
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<td>62.15</td>
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<tr>
<td>Group B</td>
<td>48.63</td>
<td>48.18</td>
<td>76.13</td>
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</table>
Content Free Reminders

• Do general reminders to “pay attention” work?
• Robertson et al 1995 “Attend” improved attentional performance
• Fish et al 2007 messages to STOP, THINK, ORGANISE, PLAN lead to improved prospective memory performance
Patterns of Performance

Approaches to the rehabilitation of executive deficits

- Restoration/re-training
- Internal strategies
- External aids/strategies
- External control
Environmental Control

• Manage the external environment
  – Reduce distractions (auditory, visual etc.)
  – Allocate sufficient time for tasks so less time pressure to distract
  – Structure and routine

• Manage the internal environment
  – Manage mood (to reduce intrusive thoughts)
  – Manage fatigue (pacing- regular breaks)
  – Manage pain, hunger, thirst etc.
Improving implementation/ initiation in a patient with severe executive deficits

- RP: 50 year old woman with bilateral frontal lobe damage arising from rupture of anterior communicating artery aneurysm.
- Preserved IQ/Memory/ Perception/ Language
- Impaired attention and problem solving
Improving implementation/initiation: Pat R

• Main problems
  Failure to translate intention into action & Distractibility
• NeuroPage intervention: ABAB design
• In R.P.’s case, this seemed to both ‘kick-start’ her into action and help her maintain task goal in mind once started. All targeted tasks improved with pager and returned to baseline without.
Pat: Watering plants

A₁ → B₁ → A₂ → B₂
Pat: Since First Project

- RP spent a large amount of time getting ready in the mornings (up to 5 hours) and again at night (1½)
- Similar to earlier bathing routine problem, but more general in nature (nobody could really say how the time was being spent)

Pat: Goals

- REDUCE GETTING READY TIME
- REDUCE GETTING UN-READY TIME
- REMEMBER MEDICATION UNPROMPTED
  - Increase RP’s independence
  - Reduce strain on RP’s husband – sleep, prompting.
  - Increase time available for other activities

Pat: Strategies

- Checklist: Listed the steps in both routines, included space to record total time. Check boxes for medication

- NeuroPage:
  - 3 messages for medication
  - 5 messages for the morning routine
  - 2 messages for the evening routine

- JP (husband) recorded progress

Pat: Current Status

- Consistently reaches the target set by herself and husband
- Fully independent in taking medication
  - Greater freedom for social participation
  - Reduced burden on husband
  - RP enjoys having the pager

Executive problem evident from neuropsychological and/or functional assessment

Are factors other than executive deficits contributing to functional difficulties and preventing goal achievement?

Yes

No

Identify factors and treatment/management options, e.g. Other cognitive deficits such as memory impairment or Mood/Worry/Anxiety; Sleep; Fatigue; Pain; Medication

Does patient have at least some awareness of problem?

Yes

No

Plan and implement interventions to improve awareness e.g. education, feedback, self/other monitoring of errors in functional settings.

Consider education group format.

Has awareness improved?

Yes

No

How severe is the executive dysfunction or broader cognitive impairment?

Mild/moderate

Consider:

Self-instructional approaches such as Goal Management Training and Time-pressure management training

Problem-solving Training

Alerting

Autobiographical memory cueing

Consider use of group format

Train skills/strategies and then support generalisation to everyday functional situations

Severe

Identify priority everyday tasks and select strategy to reflect need e.g.

Establish consistent routines

Checklists

Externally directed prompting devices e.g. NeuroPage

Use of carers to monitor/prompt action.

Modifications to the environment - behaviour modification techniques

Consider use of group format with additional 1:1 support.

In the case of severe challenging behaviour, behaviour modification techniques may be appropriate.

With thanks to Jonathan Evans
Conclusions

1. Identifying and treating executive deficits arising from brain injury and neurological disease remains a vital task in rehabilitation.

2. Work suggests that interventions may improve problem solving and goal management.

3. These interventions are gradually being incorporated into clinical practice.

4. The combination of cognitive training and cognitive prosthetics (technology based memory aids) seems particularly promising in reducing the level of disability associated with executive deficits.
Thanks for your attention!

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