Executive function and dysfunction

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Overview

- Case study
- What is executive function
- Developmental course
- Assessment issues
- Secondary implications
- Intervention & Resources
- Concluding remarks

Case study

- Ash 9 years old
- Refractory epilepsy
  - Began at 3.5 years
- Bottom of sulcus dysplasia left sylvian fissure
  - Subcentral – precentral gyrus
- Current AED Trileptal, Topamax, Frisium

Previous assessment

- 6 years
- Milestones normal
- Literacy development slow
  - Struggle to focus on reading
- Variable IQ profile
  - ↓ WM, ↓ PS, Av verbal & non-verbal
- Inefficient memory
- Difficulties with maths, word reading

Current function

- Grade 3
- Had reading recovery in Grade 1
- Social difficulties
- Reads well but rushes
- Slow progress with maths
  - Doesn't see patterns
- "A thousand years to get things done"
- Fidgets/distractible/not goal oriented

Current function

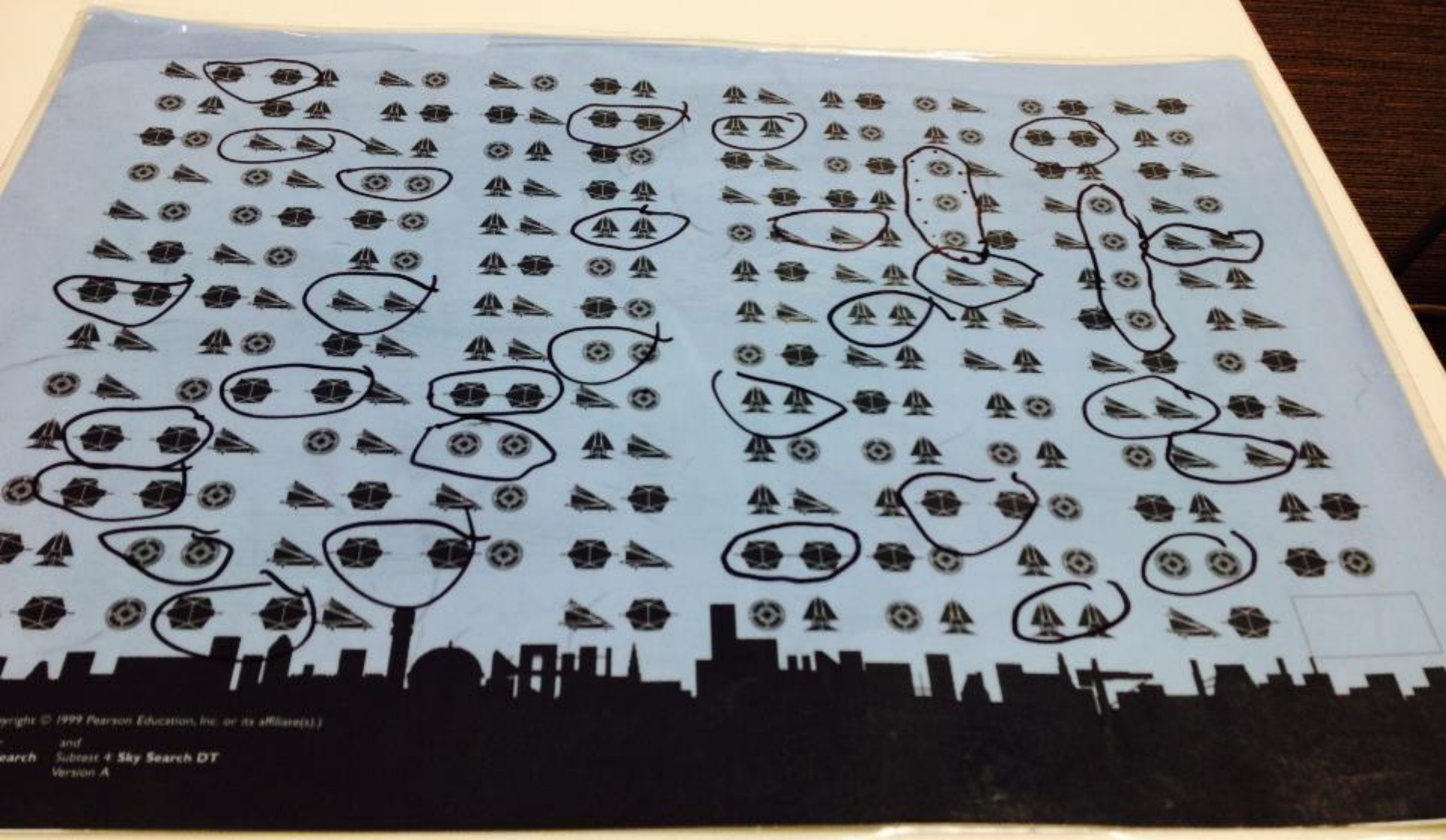
- Inattentive but not full ADHD
- Recently started on Ritalin (20 mg bd)
- No obvious difference at home
  - More talkative/pressured speech
- Minimal gains at school
  - V disorganised
- Busy parents; lots of extra-curricular activities

Presentation

- Cooperative
- Slow and self-distracting
- Lost in his own world
- Fidgeting with fingers and objects
- Out of seat
- Poor impulse control
- Assessment very draining and effortful

Results

- No real change in IQ profile
  - Overall low average/borderline
  - ↓ WM, ↓ PS, Av verbal & non-verbal
  - (5F, 3B – unreliable)
- Significant attentional disturbance
  - Especially focused and divided attention
  - Sustained attention mildly reduced but better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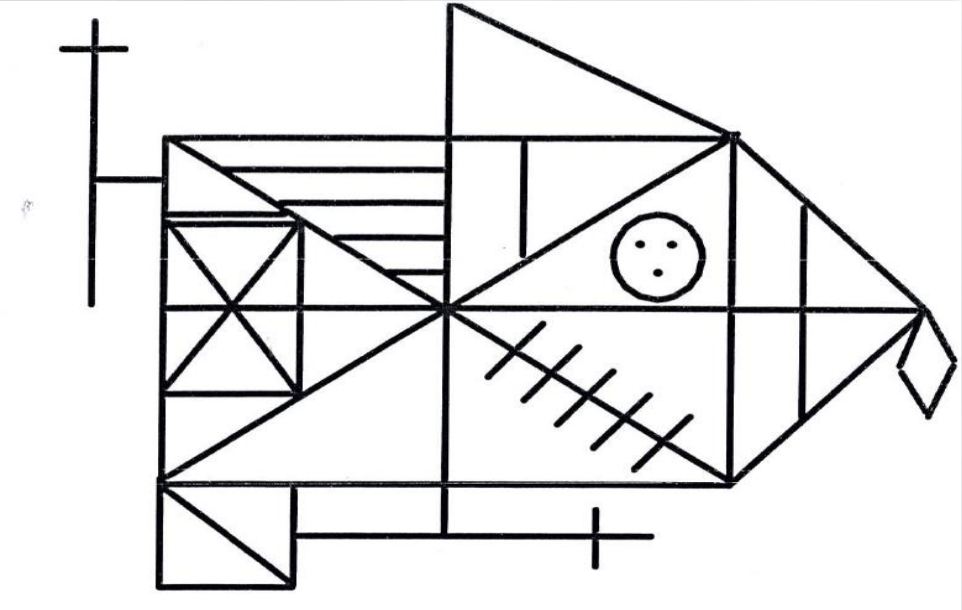
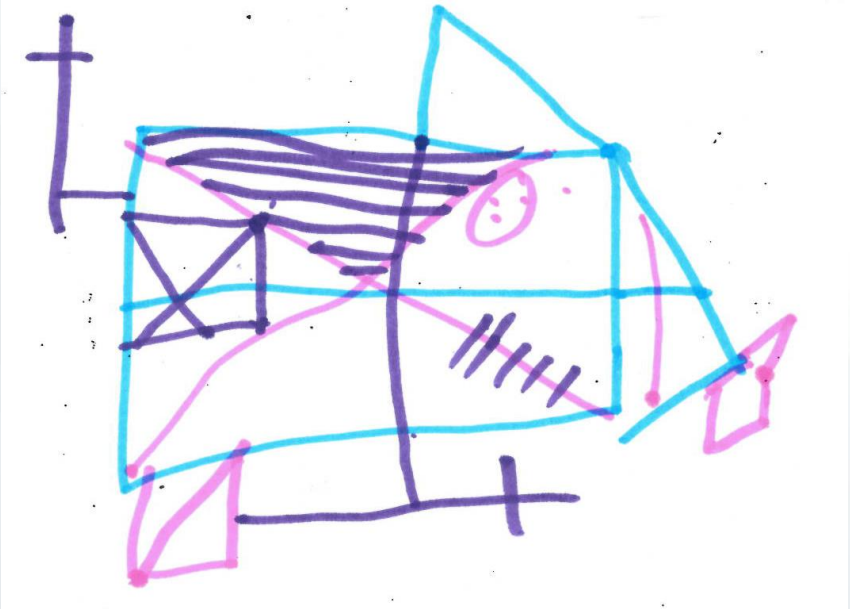
and
Subtest 4 Sky Search DT
Version A

Results continued

- Memory fundamentally intact but inefficient
- Executive functions variable
  - Good verbal fluency
  - Parent BRIEF behavioural and cognitive scales elevated
- Word reading average
- Comprehension borderline (5th percentile)
- Maths borderline (3rd percentile)
- BASCII ↑ Atypicality, ↓Functional skills, ↓ Adaptive behaviour

Results





Issues

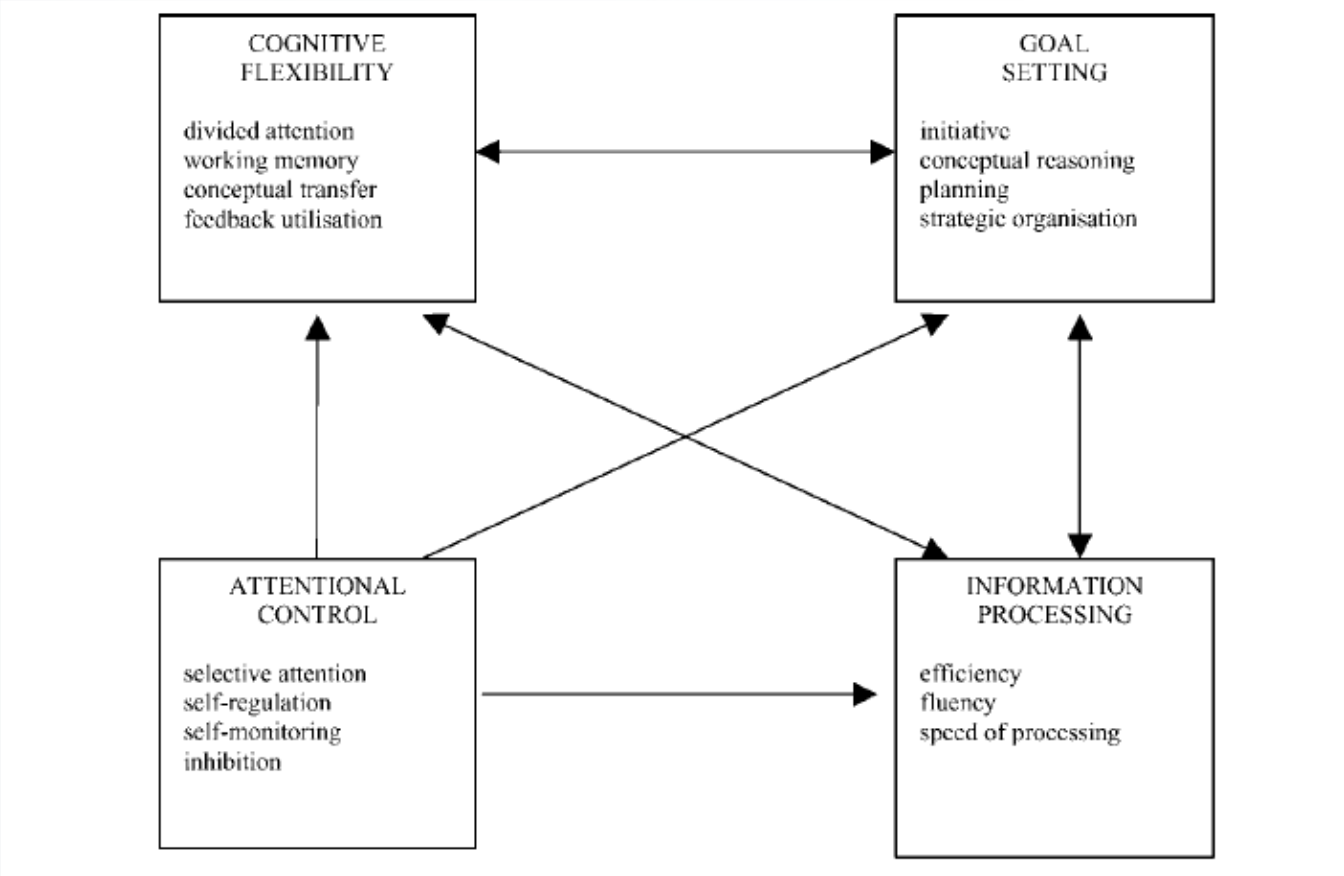
- Significant inattention
  - Benefit of medication
- Diagnosis of a specific learning disorder
- Relationship between EF and learning
  - Change over time
  - Not evident on reading screen
- Inconsistency between tests and questionnaire

Executive functions

"The executive functions are a set of processes that all have to do with managing oneself and one's resources in order to achieve a goal"

Cooper-Kahn & Dietzel, 2008, p.10

Models of executive functions



Anderson, P.J. (2002) Assessment and Development of Executive Function (EF) During Childhood, Child Neuropsychology, 8:2, 71-82,

Hot and Cold Executive functions

- Empathy
- Inhibition
- Self-monitoring
- Self-regulation
- Emotional control
- Self-reflection/insight

- Planning/organisation
- Working memory
- Shifting set
- Mental flexibility
- Strategy generation
- High-level reasoning
- Utilisation of attention
- Prospective memory
- Utilisation of feedback
- Pragmatic language

Zelazo, P. D; Mller, Ulrich (2002). "Executive Function in Typical and Atypical Development". pp. 445–469.

Attention – in or out

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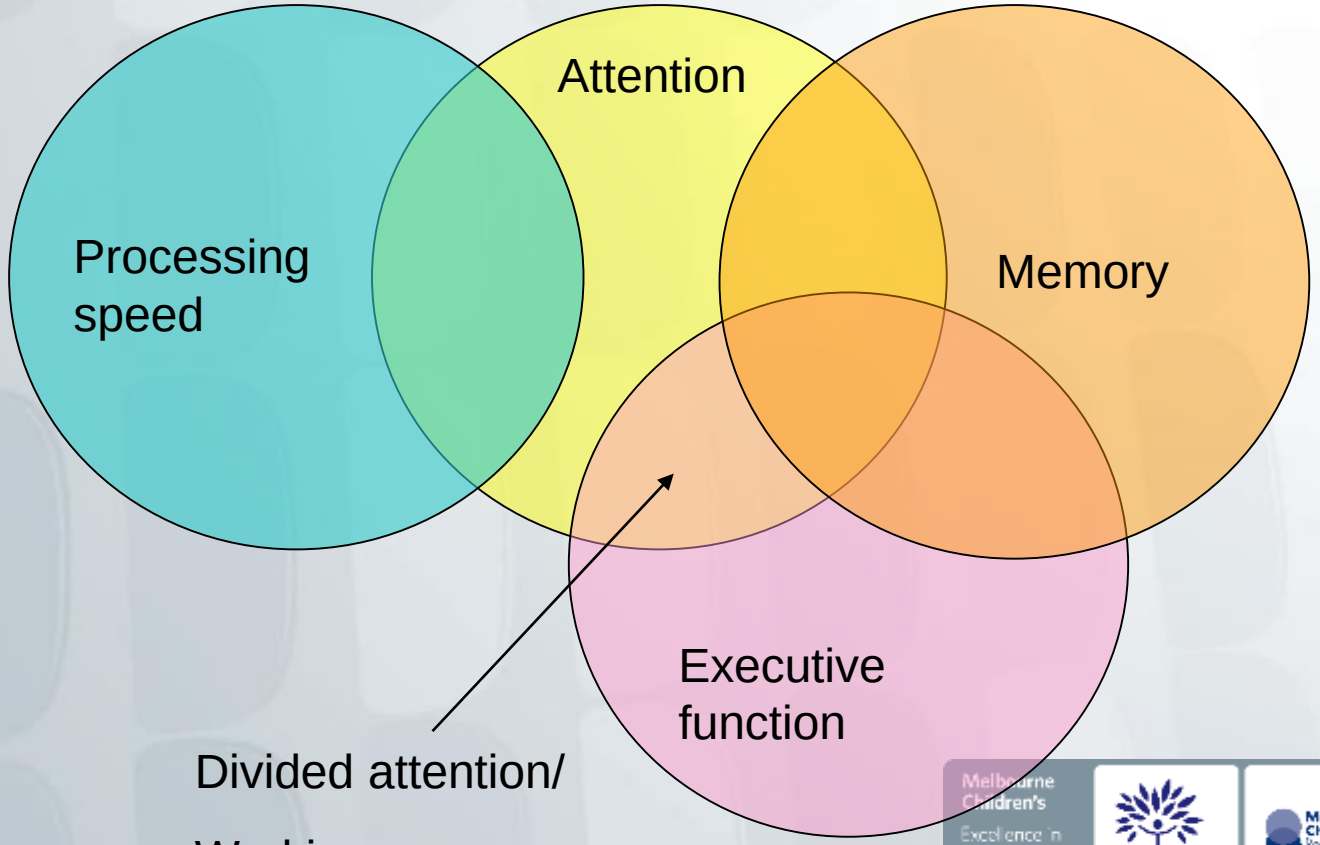
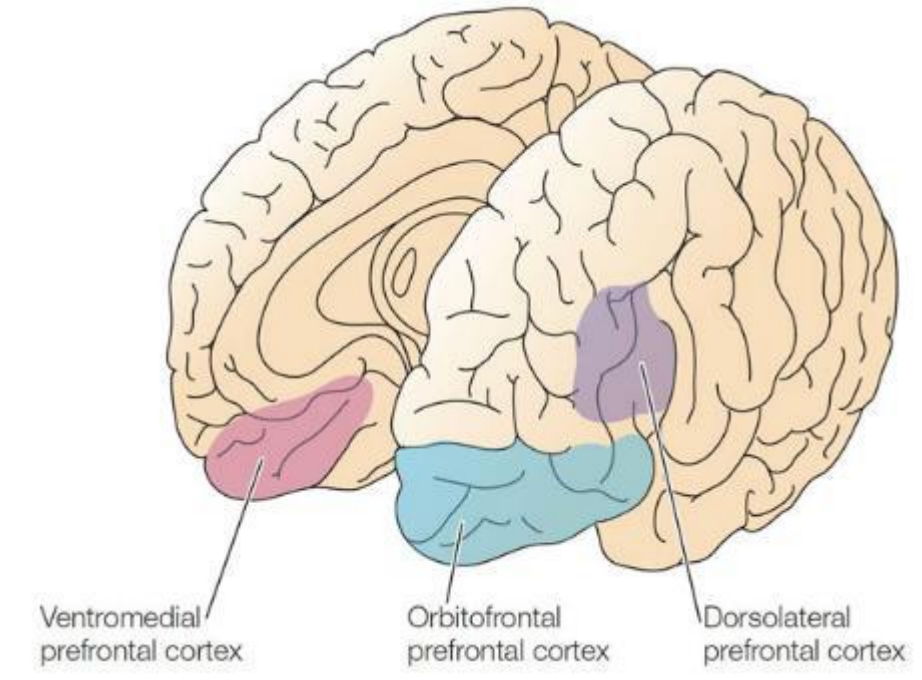
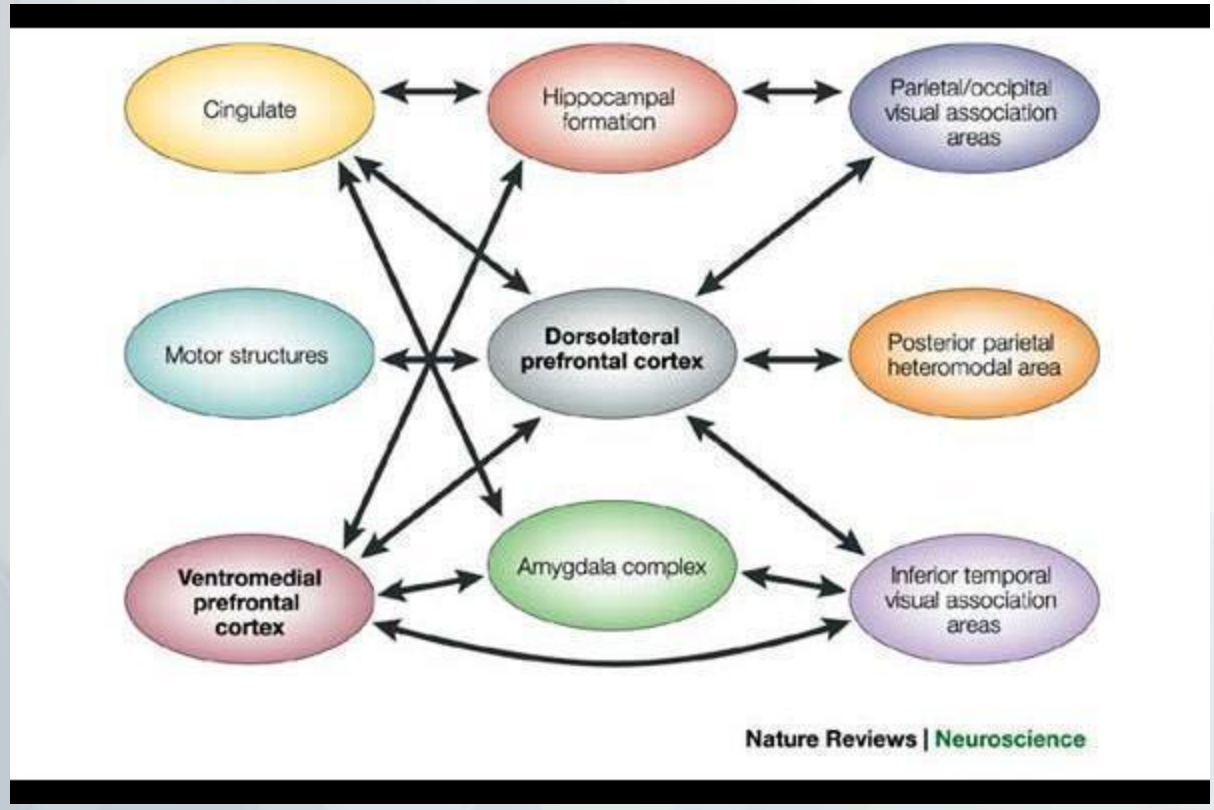
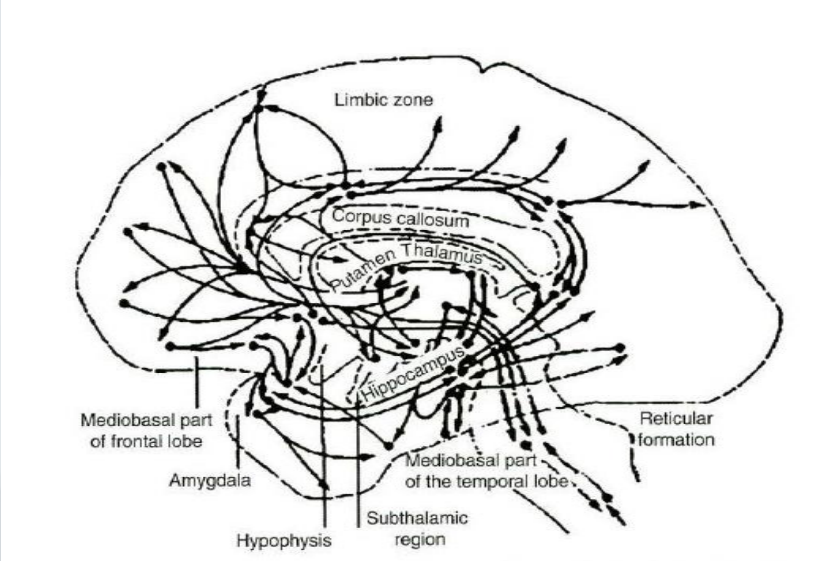
Interrelationship between cognitive processes



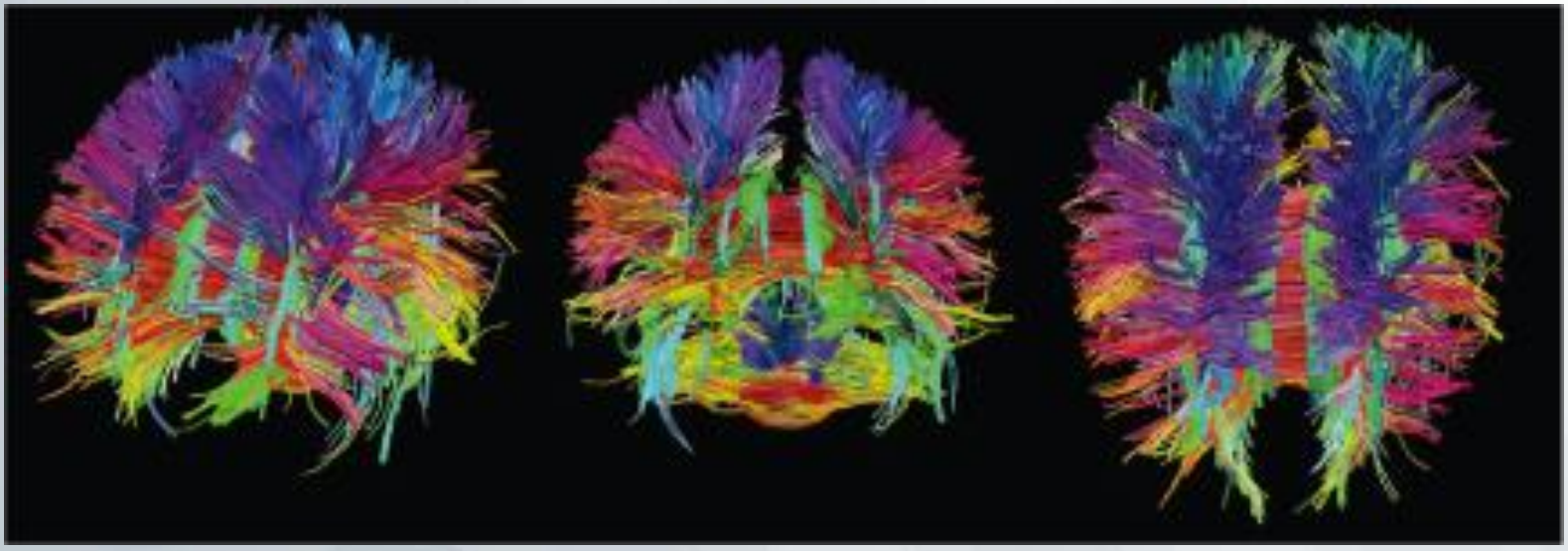
Neural underpinnings




Cingulate
Hippocampal formation
Parietal/occipital visual association areas
Motor structures
Dorsolateral prefrontal cortex
Posterior parietal heteromodal area
Ventromedial prefrontal cortex
Amygdala complex
Inferior temporal visual association areas
Nature Reviews | Neuroscience



The Working Brain, A.R. Luria, 1973



Thompson, P.M., Martin, N.G. & Wright, M.J. (2010)., Imaging Genomics, Current Opinion in Neurology 2010; 23(4):368-73.

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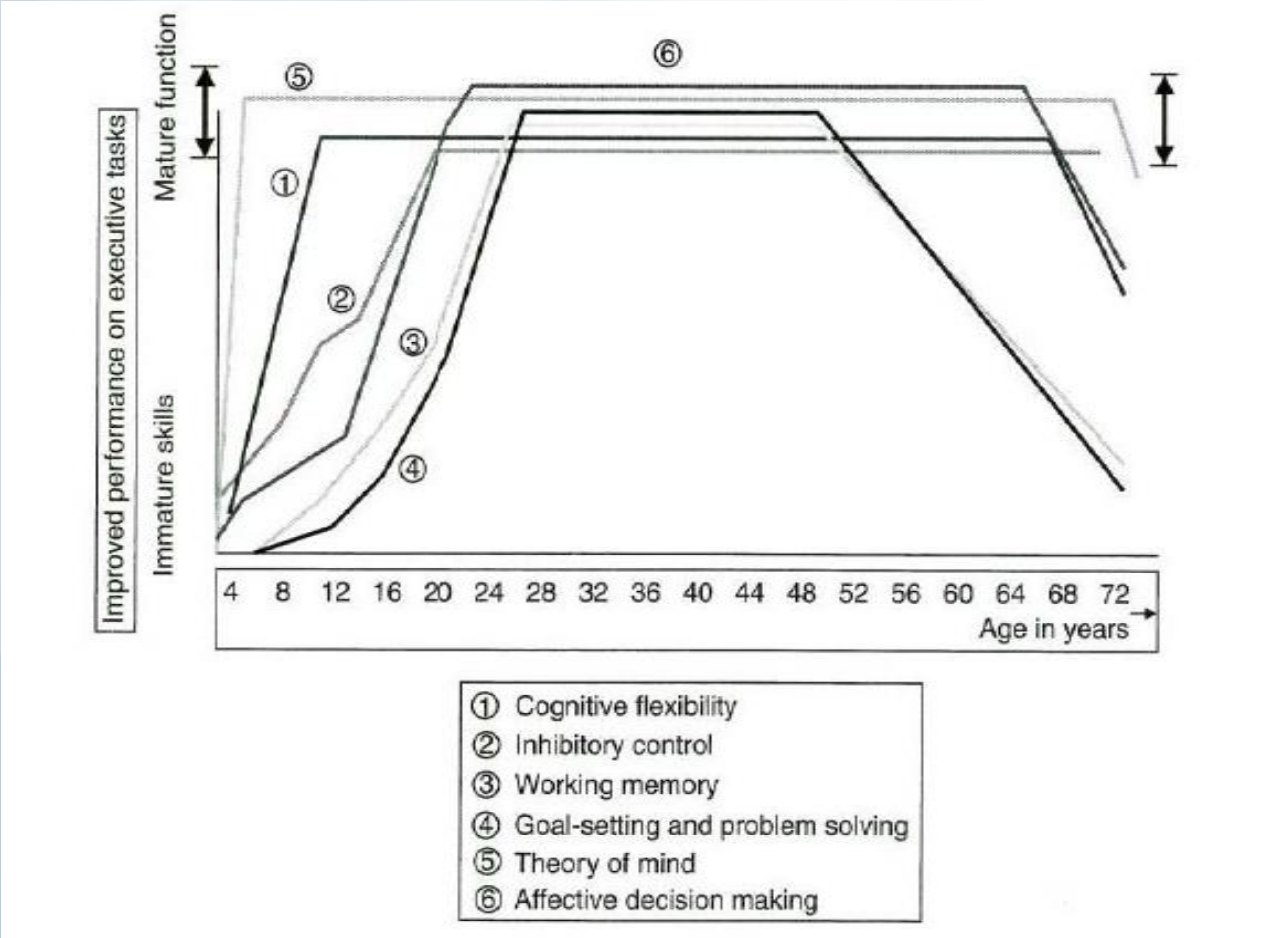
Developmental course

- Well accepted that frontal lobes undergo a spurt in development throughout adolescence
- Not a uniform developmental trajectory for all skills
- Increasing recognition of emergent executive functions in pre-schoolers
- Prolonged past 20 years



From de Luca & Leventer, Developmental trajectories of executive functions across the lifespan, in Anderson, V, Jacobs, R. & Anderson, P. (Eds) Executive functions and the frontal lobe. (2008). Taylor & Francis, New York. P 46


WHO'S THE
BOSS?

Assessment: who, when & what

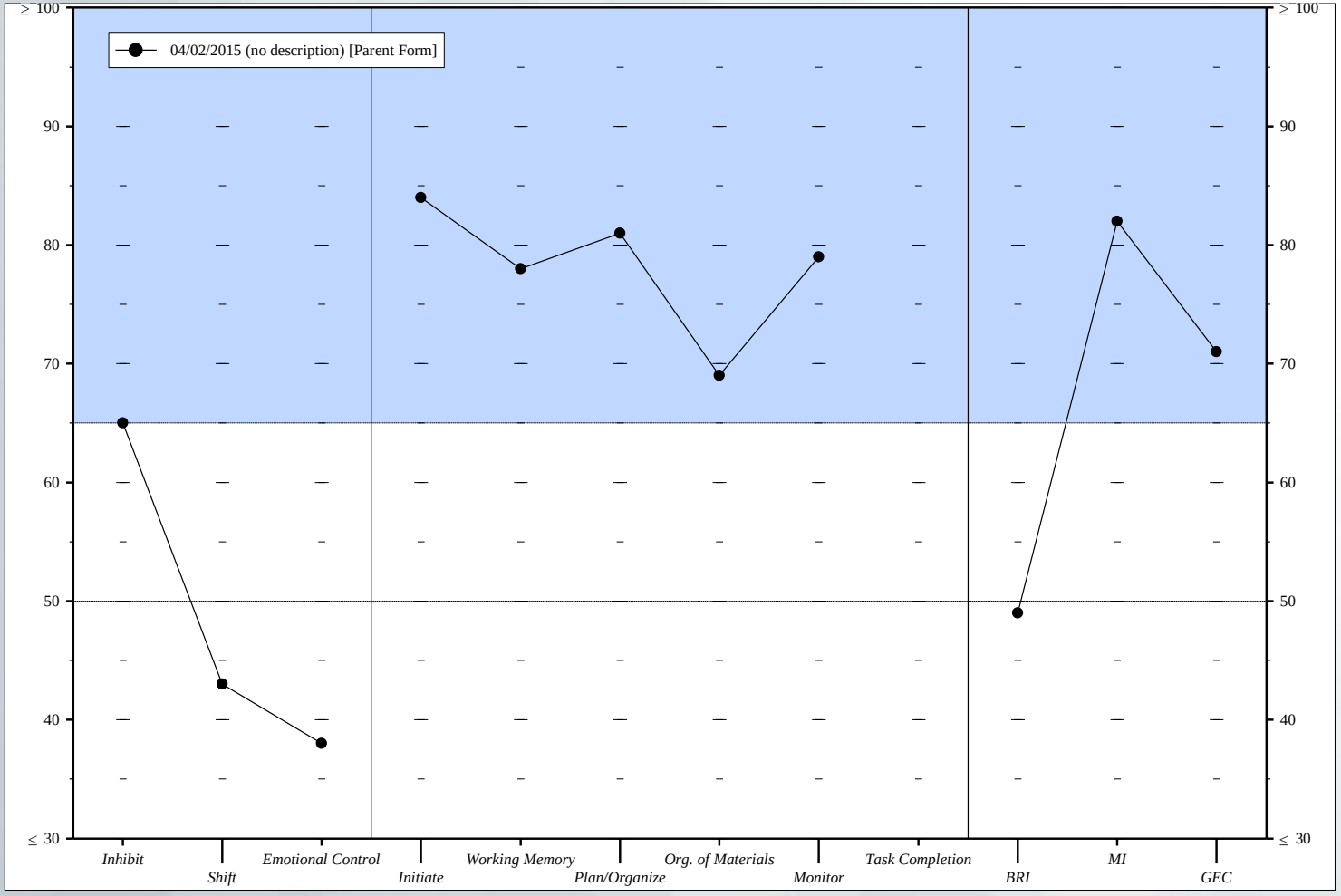
- Psychologist
- Adds to understanding the puzzle
- Often do cognitive assessment
- Often reliant on end point scores
- Some limitations identifying brain – behaviour relationships
- Often utilise the BRIEF as a screen

Behavior Rating Inventory of Executive Function (BRIEF)

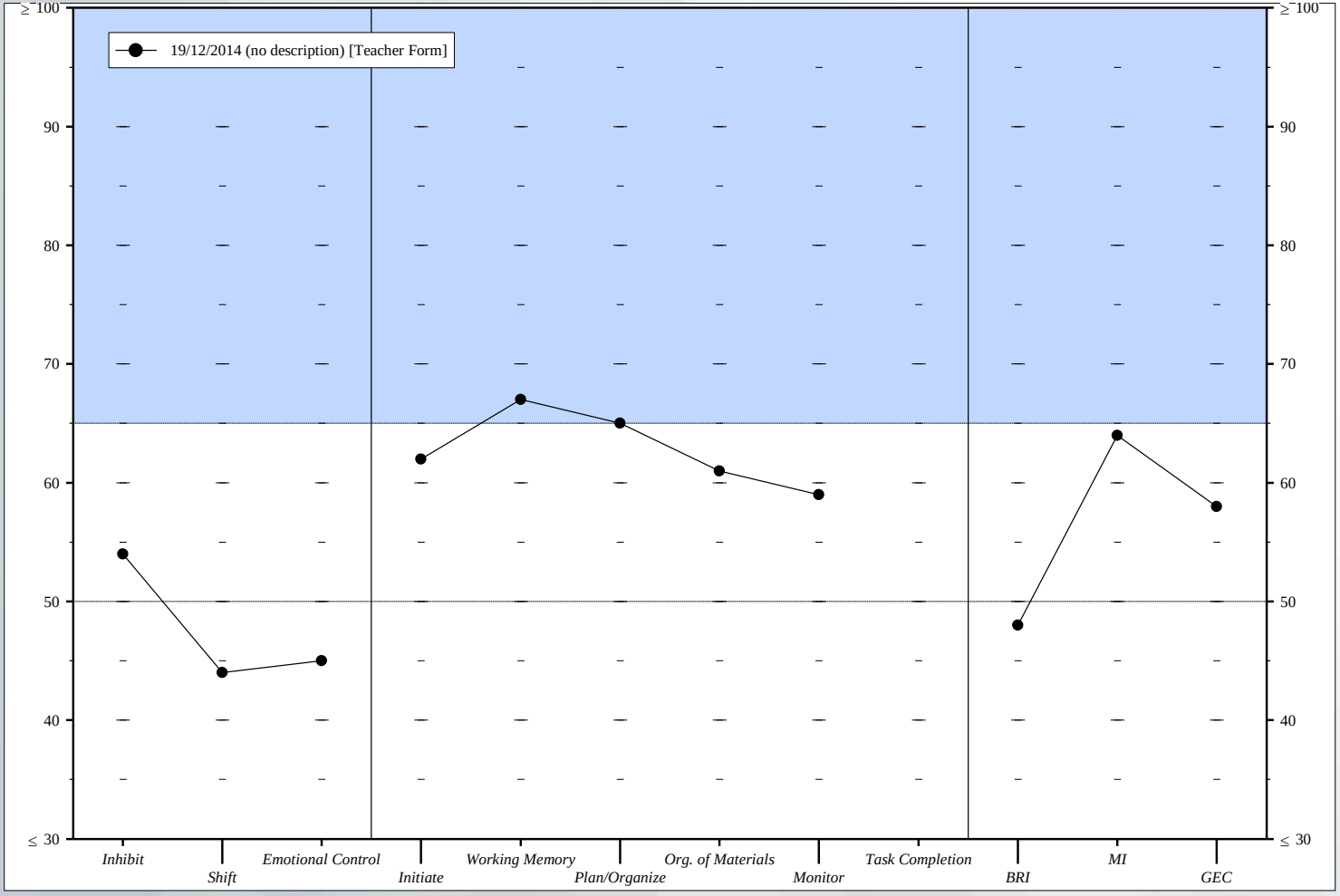
- Parent (5-18 years)
- Self Report (11-18 years)
- Teacher (5-18 years)
- Preschool (2-5 years)

Gioia,G., Isquith, P., Guy, S., Kenworthy, L. (2000). Behavior Rating Inventory of Executive Function. PAR. Florida

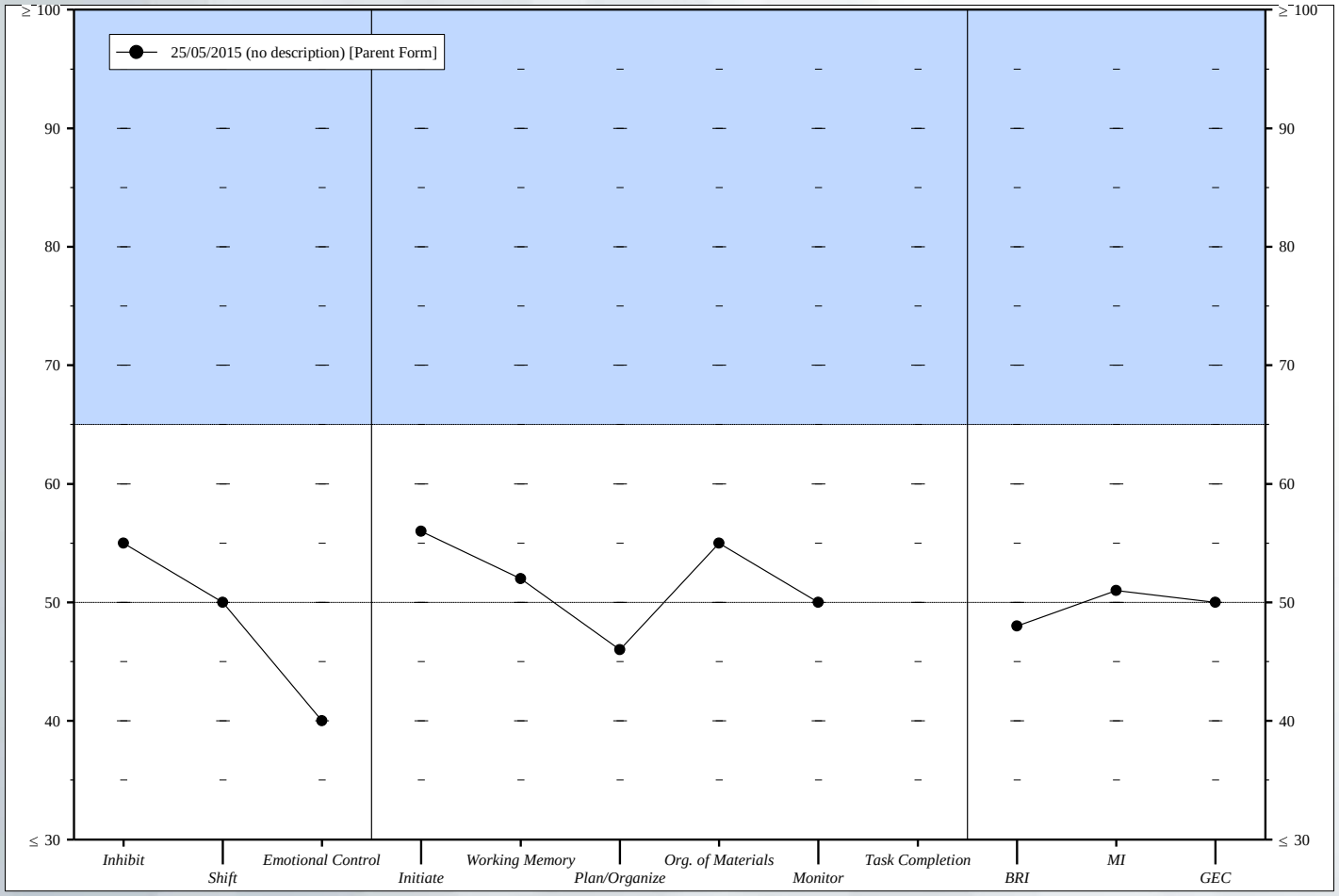
Parent BRIEF (7 year old boy)



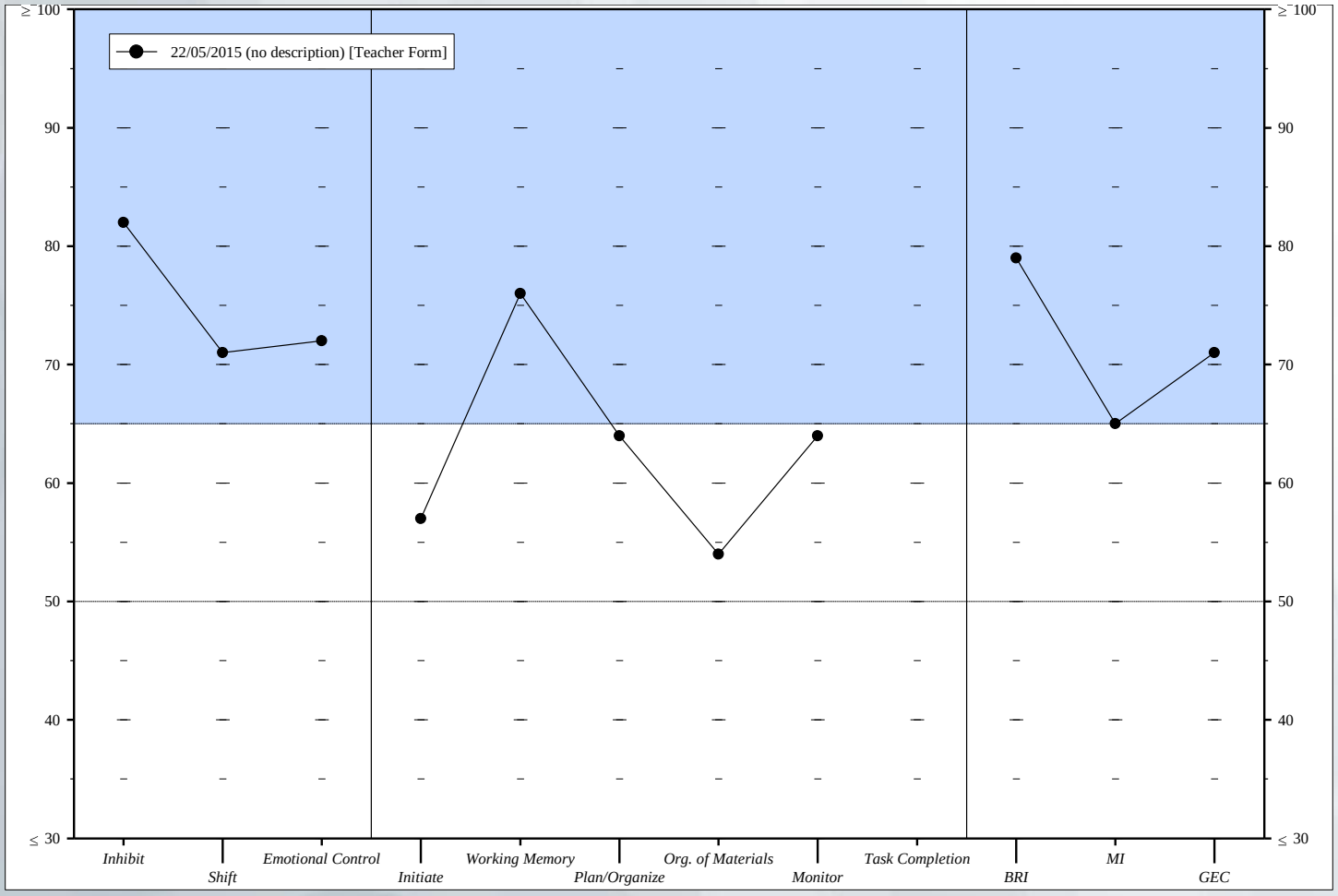
Teacher BRIEF (7 year old boy)



Parent BRIEF (10 year old boy)

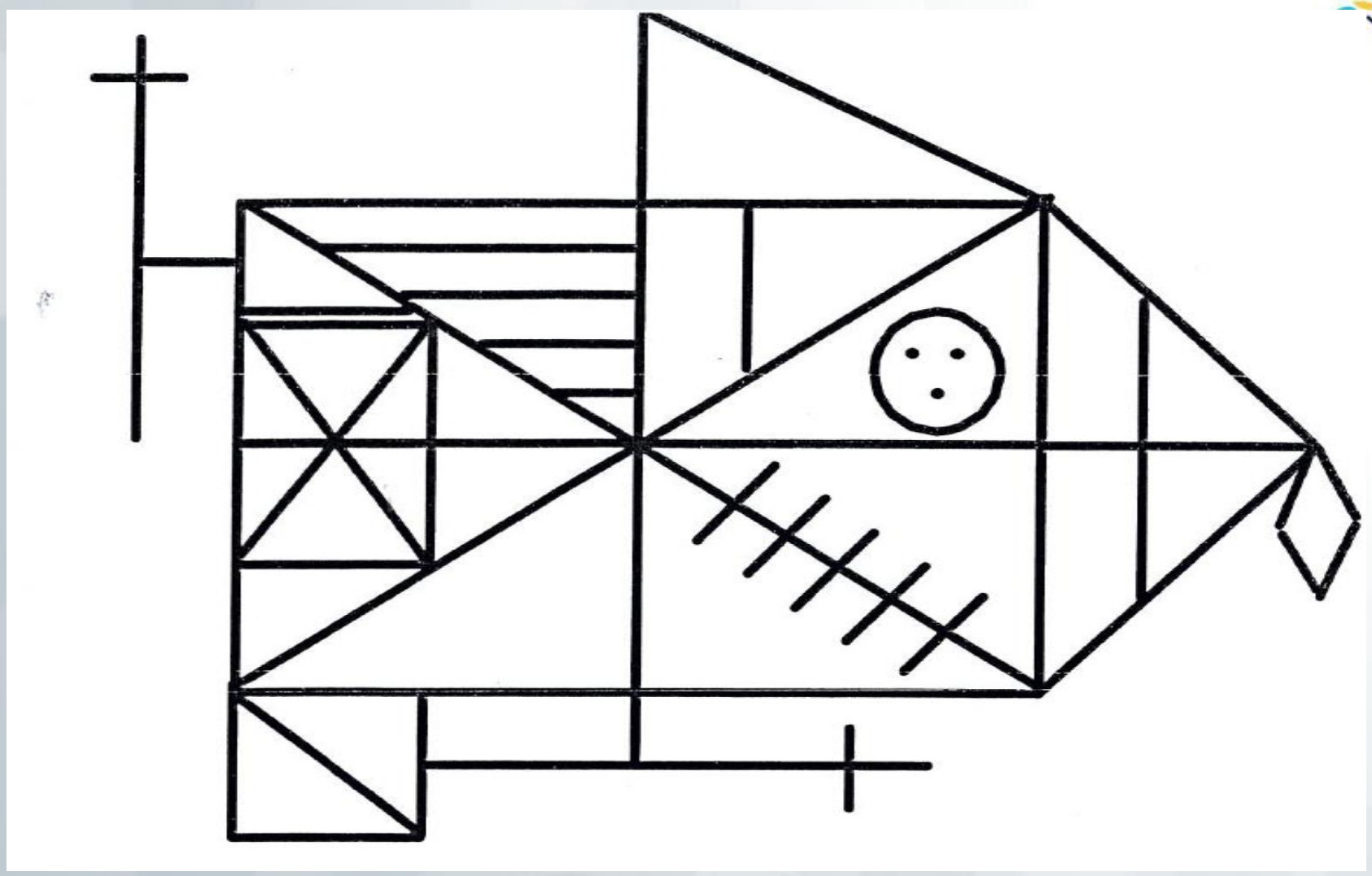


Teacher BRIEF (10 year old boy)



Assessment: who, when & what

- Neuropsychologist
  - Finer-grained analysis
  - Neurological/developmental context
  - Not required in all situations
  - Time consuming, labour intensive and limited resource
  - What does it add?
    - Neurodevelopmental disorders
    - Neurological



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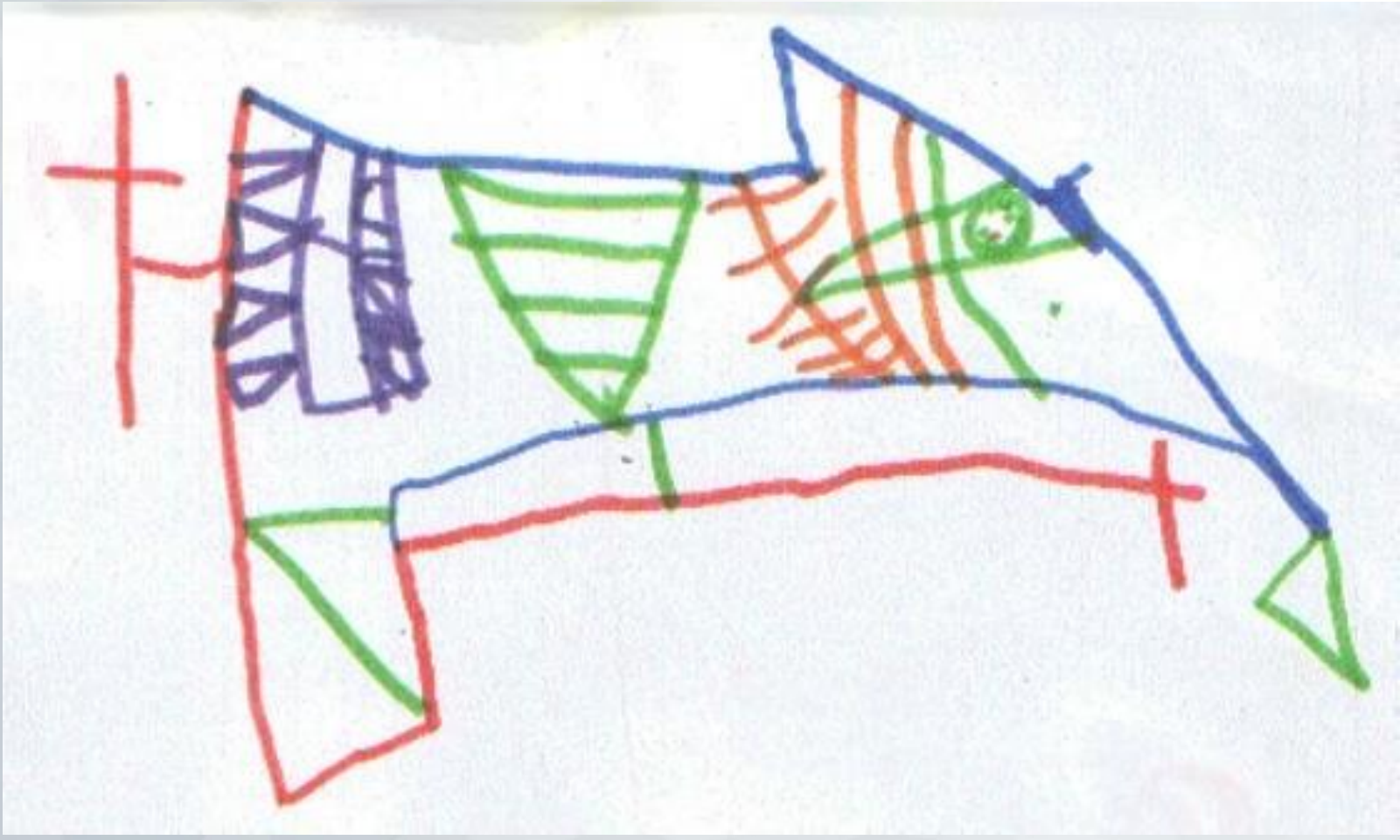
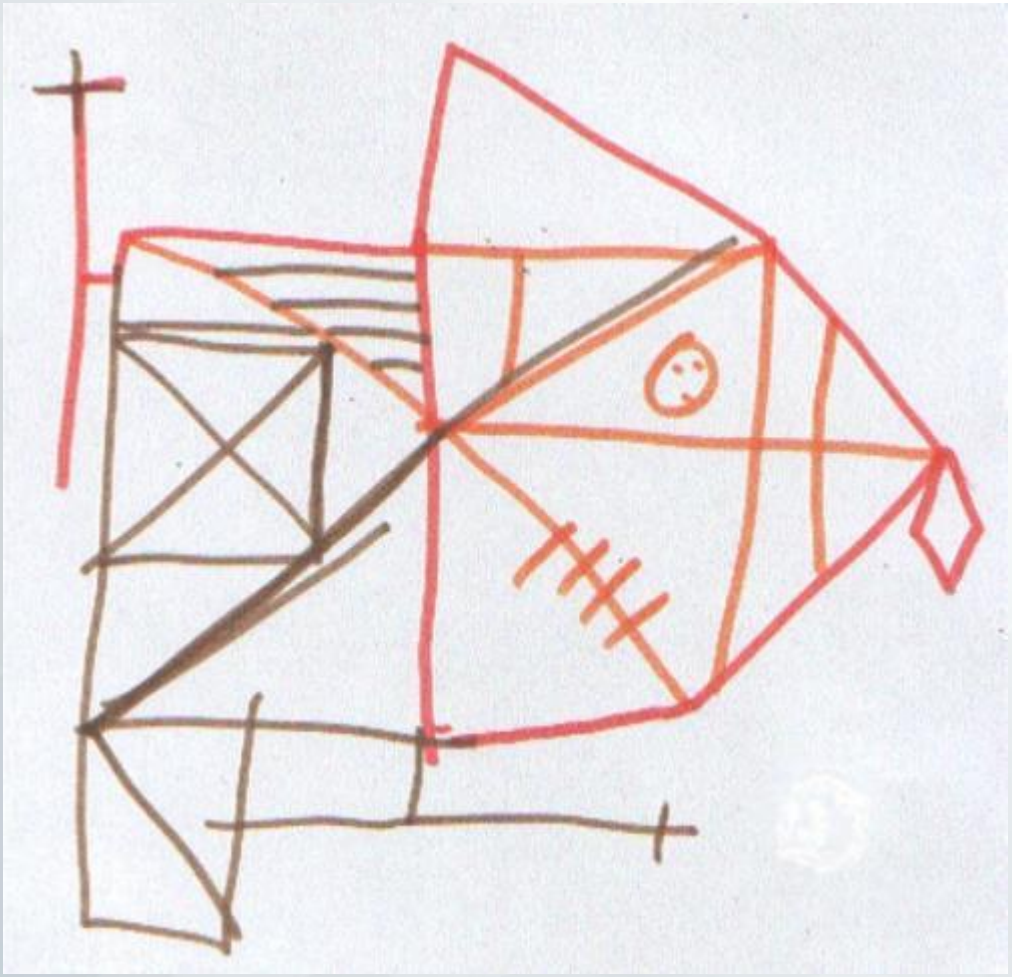
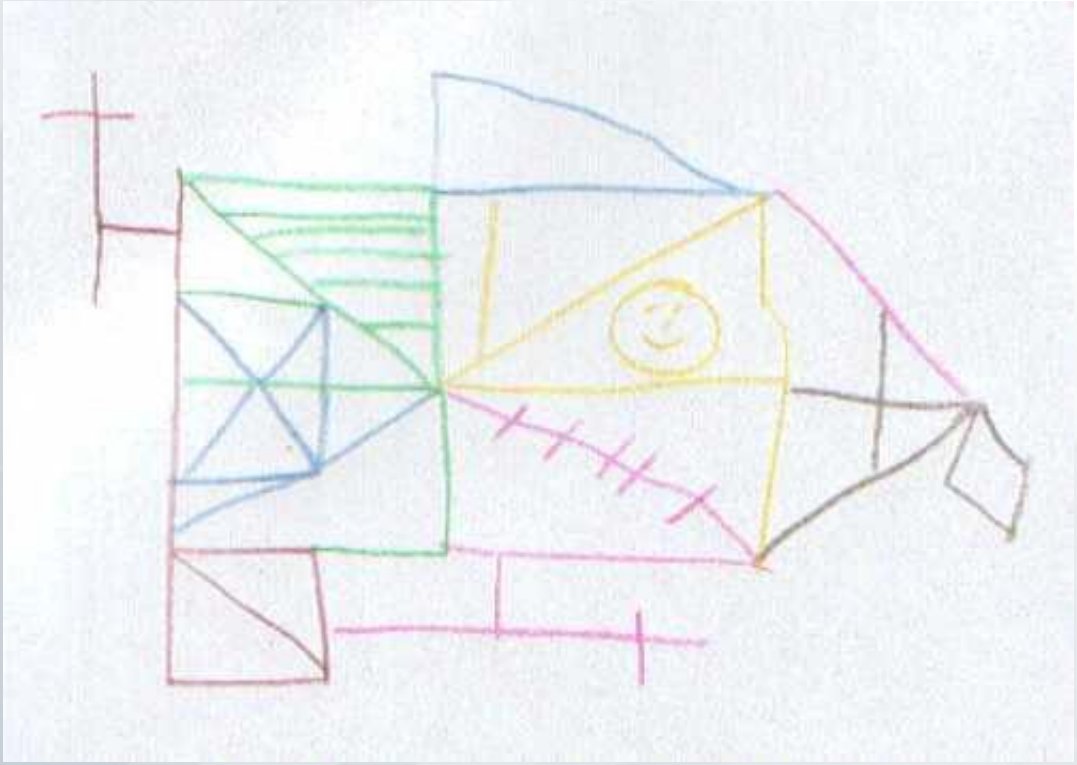
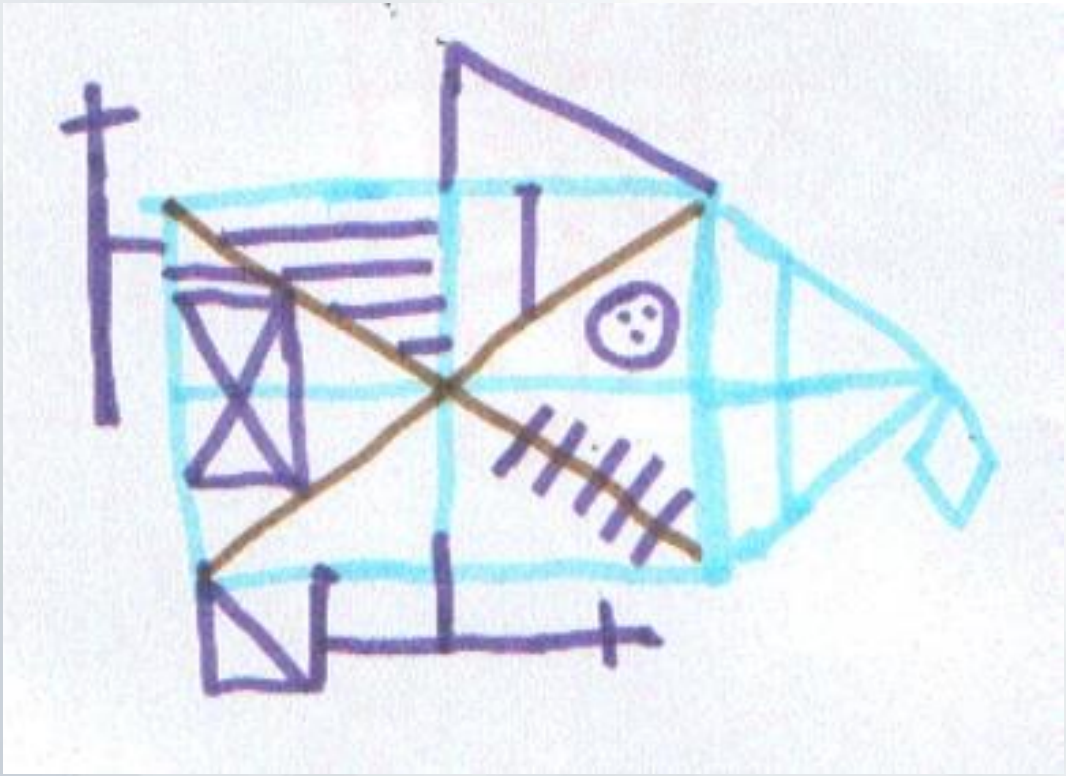
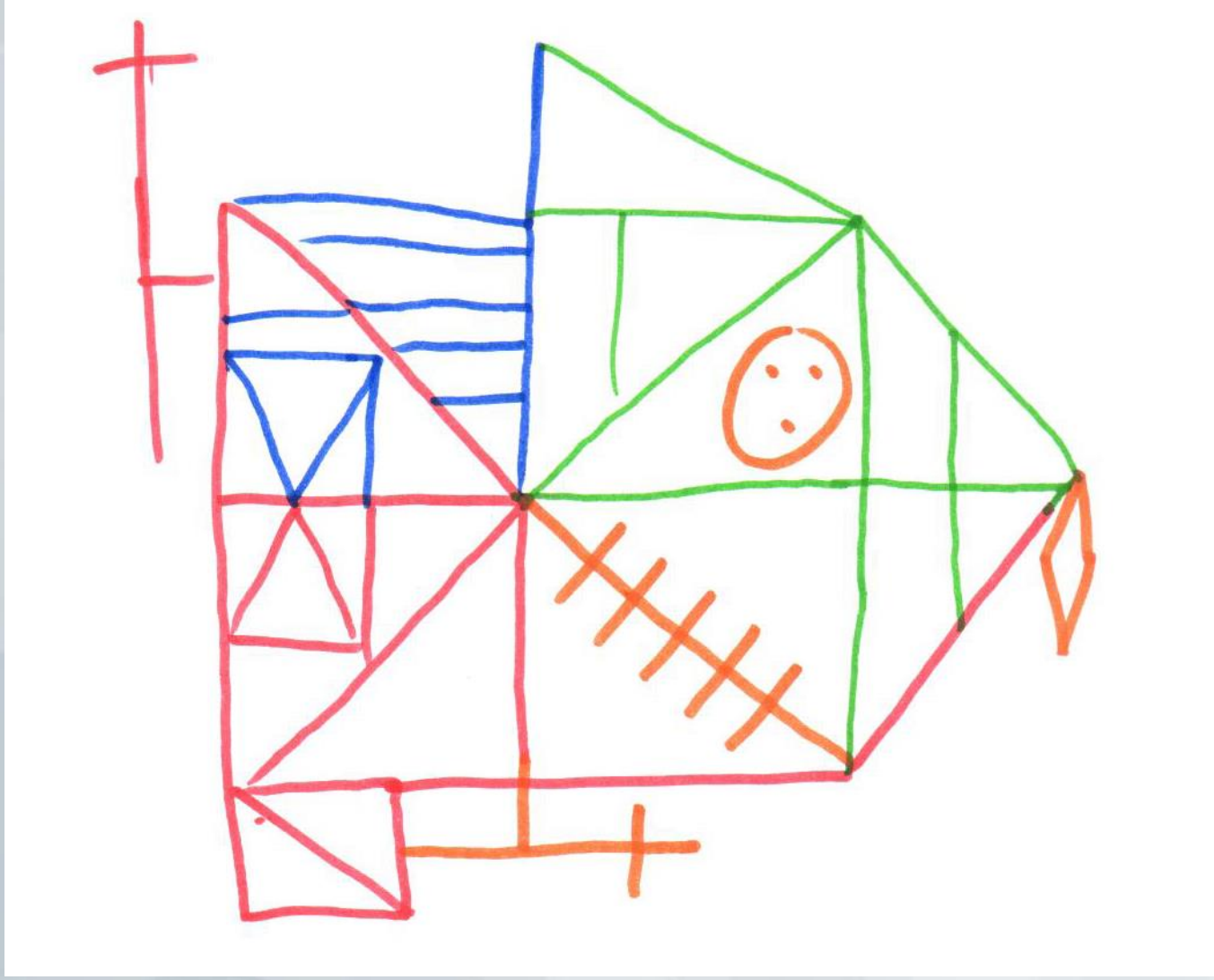


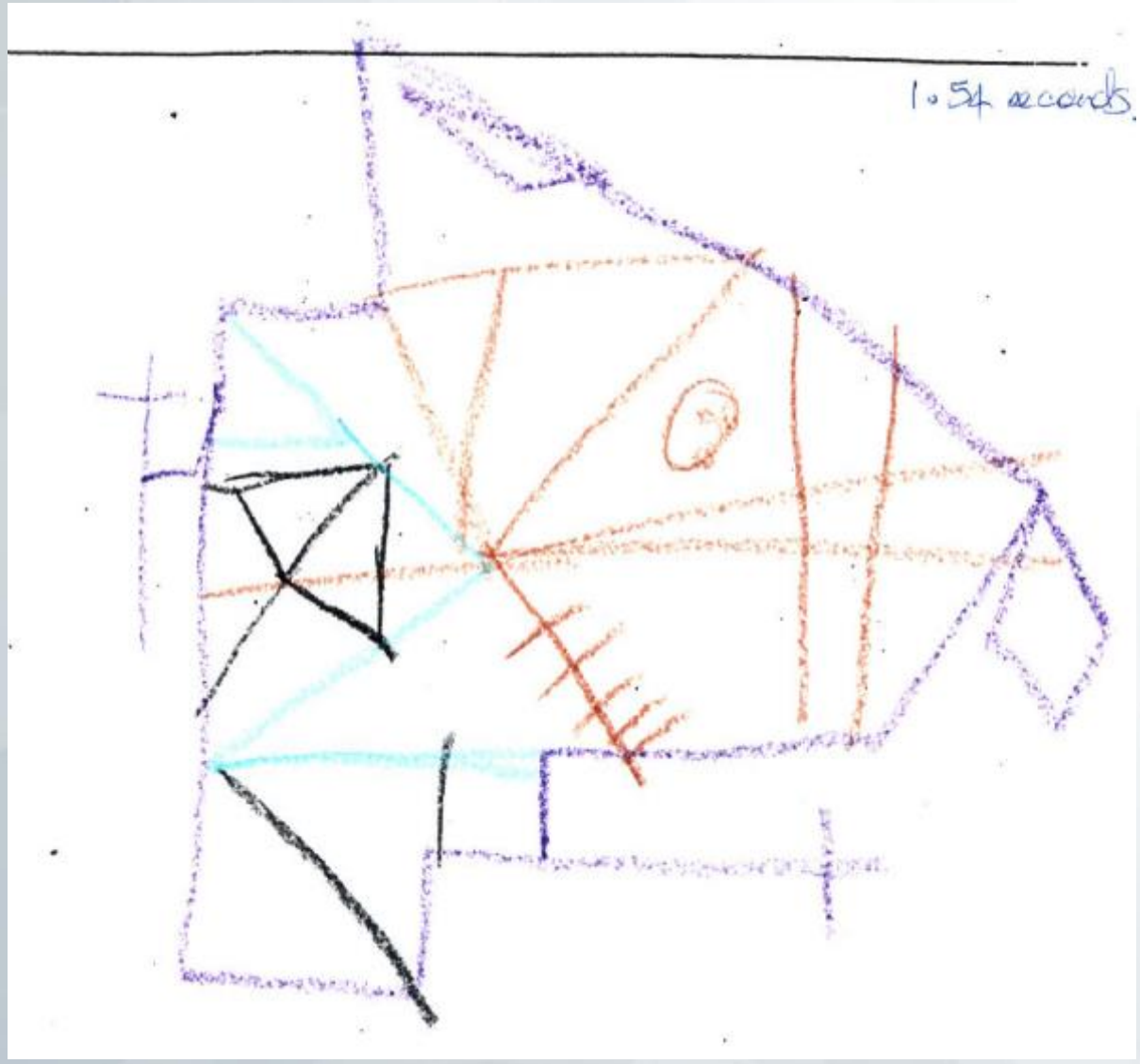








1, 2, 3, 4



1, 2, 3, 4

Clinical analogies

- Manager and workers
- Conductor and orchestra
- Filing cabinet for memory

Secondary implications

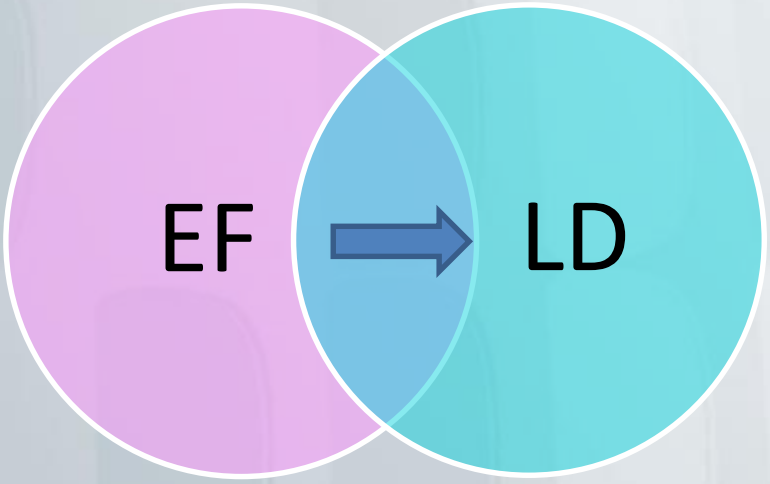
Secondary implications - behavioural

- Depends on insight
- Frustration
- Mood
- Social implications
  - Unreliable
  - Blunt
- Risk taking behaviours
- Lack of responsibility
- Parental distress

Secondary implications – cognitive

- Difficulties starting tasks
- Difficulties staying on task
- Lack of task completion
- Prone to derailment
- Difficulty with multiple demands
- Difficulties with higher-level education
- “Late, lost and unprepared”

Learning difficulties and EF



- Related but not mutually exclusive
- Not just secondary effects in all cases
- Depends on timing of executive impairment
- Depends on type of executive function

Timing, EF and LD

Skills build on foundations

Emerging

↓

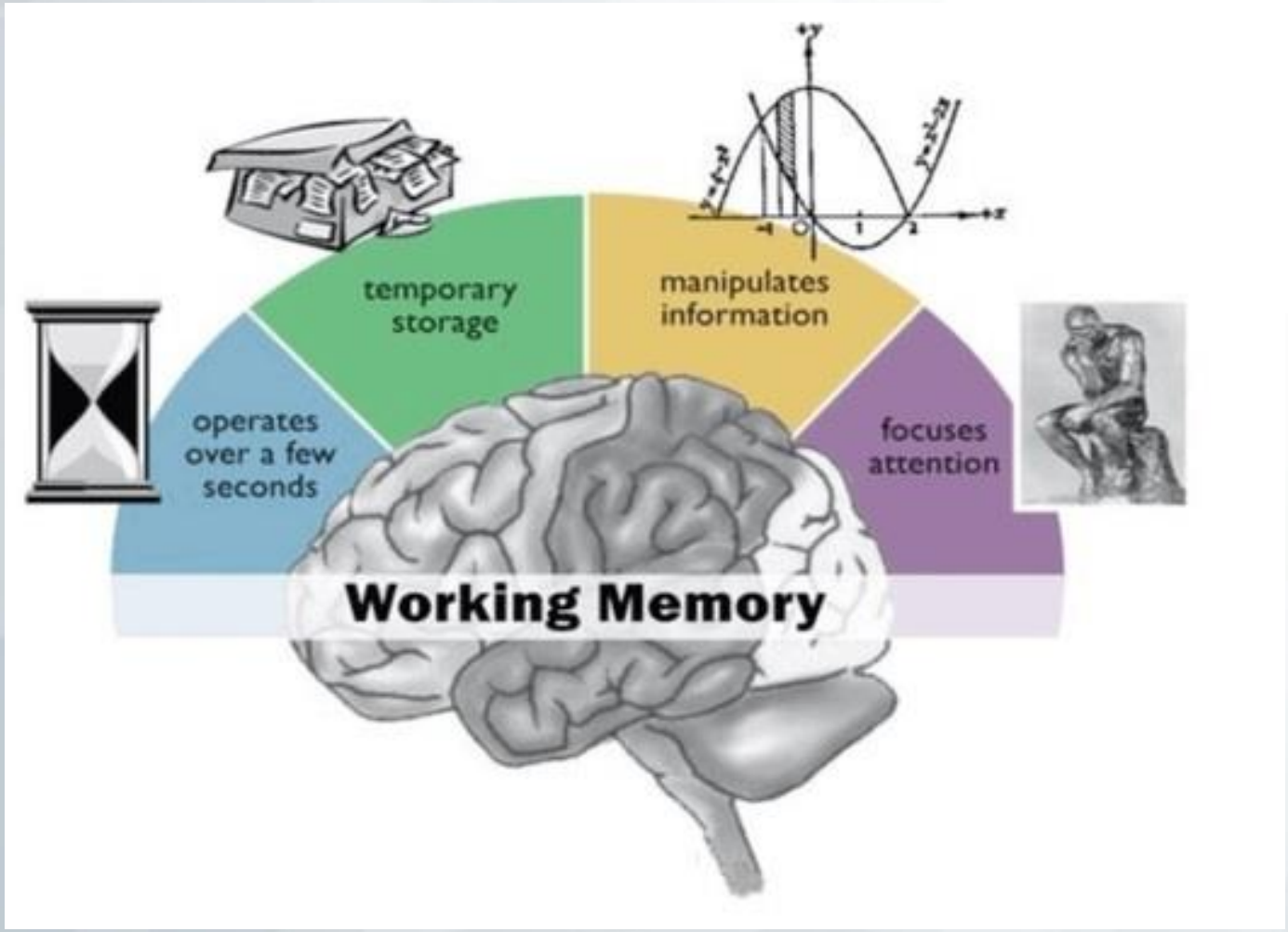
Developing

↓

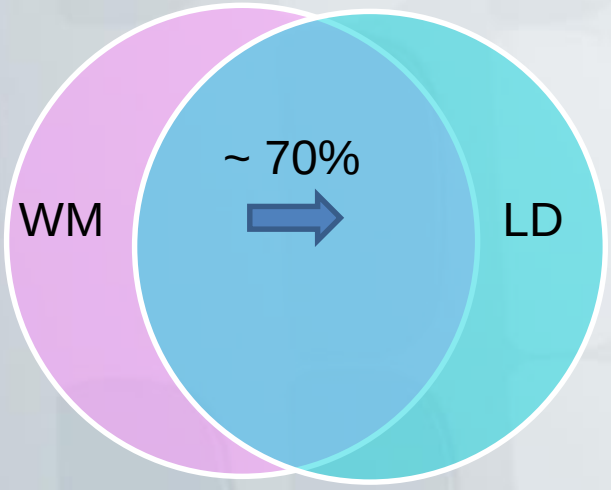
Mature

If EF are impaired early all future milestones are potentially compromised

Type of EF matters


temporary storage
manipulates information
operates over a few seconds
focuses attention
Working Memory

Working memory and LD



- Robust relationship between WM and verbal and numerical LD
- WM is essential for sequential learning
- Decoding and blending building blocks of literacy
- ? Relationship more complex
  - Remediating WM improves WM but not reading

Banales, E., Kohnen, S. & McArthur, G. (2015): Can verbal working memory training improve reading?, Cognitive Neuropsychology

Intervention Research

- General issues about generalizability of effects
  - Within and across executive domains
- Are some aspects of executive function more amenable to change than others?
  - Working memory more so than reasoning and impulsivity?

Clinical Intervention

- Context of dysfunction
- Aetiology
  - Biological factors
  - Mood
  - Stress/Trauma
  - Fatigue
- Generalised or focal deficit

Clinical intervention

- What strengths does a child have to draw on
  - Personal
    - cognitive, social, behavioural
    - are any aspects of executive function preserved?
  - Psycho-social
    - Friends / family
  - Environmental supports
    - school, community

Clinical interventions

Balance between short term needs and long term independence

General principles - cognitive

- Think laterally!
- Set realistic and specific goals
- Structure & routine
  - Supportive aides
- Educate those around the child
- Utilise applied teaching methods
- May need to teach rules explicitly

General principles - cognitive

- Child may not be able to generalise
- Control what you can
  - reduce stress, fatigue and overload
- Transitions are difficult
- Don’t forget everything is connected
  - Flow on effects
    - Cognitive / behavioural

General principles - behaviour

- Make rules explicit
  - Turn taking / interrupting
- Visual cues to activate stop and think
  - Recognise emotions
  - Avoid escalation
- Plan for challenging situations
- Utilise desire for independence
- Immediate feedback
- Model behaviour

Resources - Workbooks

- South West Brain Injury Rehabilitation Service
- Kids' Team Fact Packs
- Revised version available "soon"
- ~$20 per book

- Study Skills
- Helping your child study
- Senior Students
- Goal Setting
- Graphic Organisers

getting ready for school

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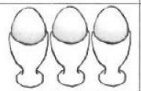
This is a good form to use with younger children who need help with their morning routines. You can change it to suit your needs. Decide the important steps the child needs to do and together make the chart that helps the child. Make sure it is easily seen and that checking the chart becomes part of the morning routine. The child can put a tick in the box when the activity has been completed.

What do I need to do?	Monday	Tuesday	Wednesday	Thursday	Friday
Get out of bed 					
Eat breakfast 					
Clean my teeth 					
Get dressed 					
Lunch in bag 					
Jumper and raincoat in bag  					
Library books and reader in bag 					
Kiss mum and dad goodbye 					
How did I go? 					

homework planning

sample

The student will need to keep a record of what homework is given in each subject. The student could keep this form on his noticeboard or in the front of his folder or diary.

homework planning

Subject	Task	Date Set	Date Due	Date Completed	Mark Received
1. English	Book review: Choose your favourite character and write about their role in the novel		4.3.04	2.3.04	
2. History	Outlaw project: Write about three famous outlaws		27.2.04	25.2.04	
3.					
4.					

assignments: where do I start?

Is this a: Project Speech Poster Story Model Essay

Due Date: _____

I have been asked to write about:

_____

_____

Where can I find the information I need?
Class notes Library Internet Encyclopedia Research (e.g. survey, questionnaire, and observation)

Has my brother/sister done something like this before? Yes/No

Can I look at it their assignment for ideas? Yes/No

What resources/tools do I need
(e.g. paper, cardboard, ruler, magazines, textas)

Use this space to draw a plan of your assignment
(e.g. what will your poster/model look like?)

What information do I know/ have I found?	What else do I need to know? What questions do I need to answer?	By when?

TIMELINE

Task	Date to be completed	Notes/Reminders	Tick when completed
Complete assignment plan			
Start researching			
Finish researching			
Finish first draft			
Give draft to someone to review			
Finish final draft			
Get someone to proof read final draft			
Finish final good copy			
Hand in assignment			

solving problem solving!

What is the problem:

Once the problem has been identified brainstorm the possible solutions

Possible Solution 1:

Positives of solution:

Negatives of solution:

Is this the best solution?
Yes ☐ **No** ☐

Possible Solution 2:

Positives of solution:

Negatives of solution:

Is this the best solution?
Yes ☐ **No** ☐

Possible Solution 3:

Positives of solution:

Negatives of solution:

Is this the best solution?
Yes ☐ **No** ☐

Just do it!

Evaluation - did it work?

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describing behaviour

This form is for parents and teachers to complete when they are identifying and interpreting behaviour. It is helpful if all the teachers involved with the student record this information.

Describe the behaviour (what did the student do?)	What happened first? What happened before the student behaved inappropriately?	What was the consequence? What happened as a result of the behaviour?	What do you think could be done differently next time? What do you think could be contributing to the behaviour?

what's wrong? (you can fold this form in half)

I need help because...

I don't understand

I don't think I can do this

I can't do this

I'm bored

I'm tired

I'm cranky

fold along dotted line.....

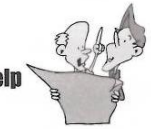
what can I do?

when I am stuck I can...

Look around the room for clues before

Look at the work I've done

Ask the person next to me to help



Put my hand up

Ask the teacher/aide to help me different

Take a break, do something

what I'd like my new teacher to know about me: student

Choose the questions to suit the student. The student can fill in this form.

What things don't I like?	What things do I like?	What things help when I am writing stories?
What things help me to understand better in class?	Here is a picture of me	What things calm me down when I'm getting a bit wound up and angry?

Concluding remarks

- Simple term – complex construct
- Context very important
  - Cognitive / behavioural
  - Psycho-social
  - Developmental
- Thoughtful assessment
- Targeted intervention

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- South West Brain Injury Rehabilitation Service – ph 02 6041 9902 swbirs@swsahs.nsw.gov.au