Neuropsychological Assessment in Rehabilitation

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Role of Neuropsychologists

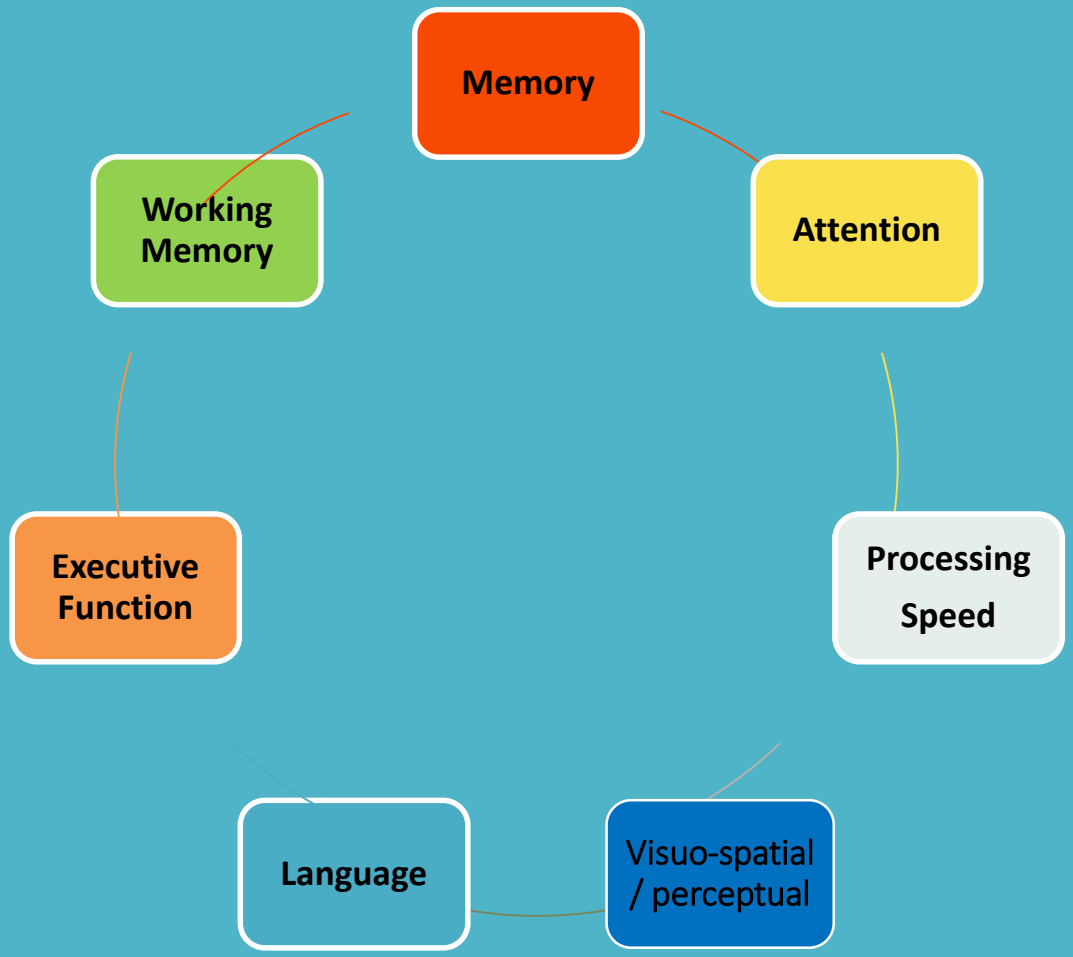
- At its core, neuropsychology involves the understanding of the relationship between brain and behaviour.
- In a clinical rehabilitation setting, identifying the nature of brain–behaviour abnormalities, understanding the consequences on the daily life of the individual and providing evidence based cognitive rehabilitation interventions are basic goals of assessment.
- Therefore, the primary role involves the assessment, diagnosis and management of cognitive and behavioural sequalae following traumatic or acquired brain injury.

Role of Neuropsychologists

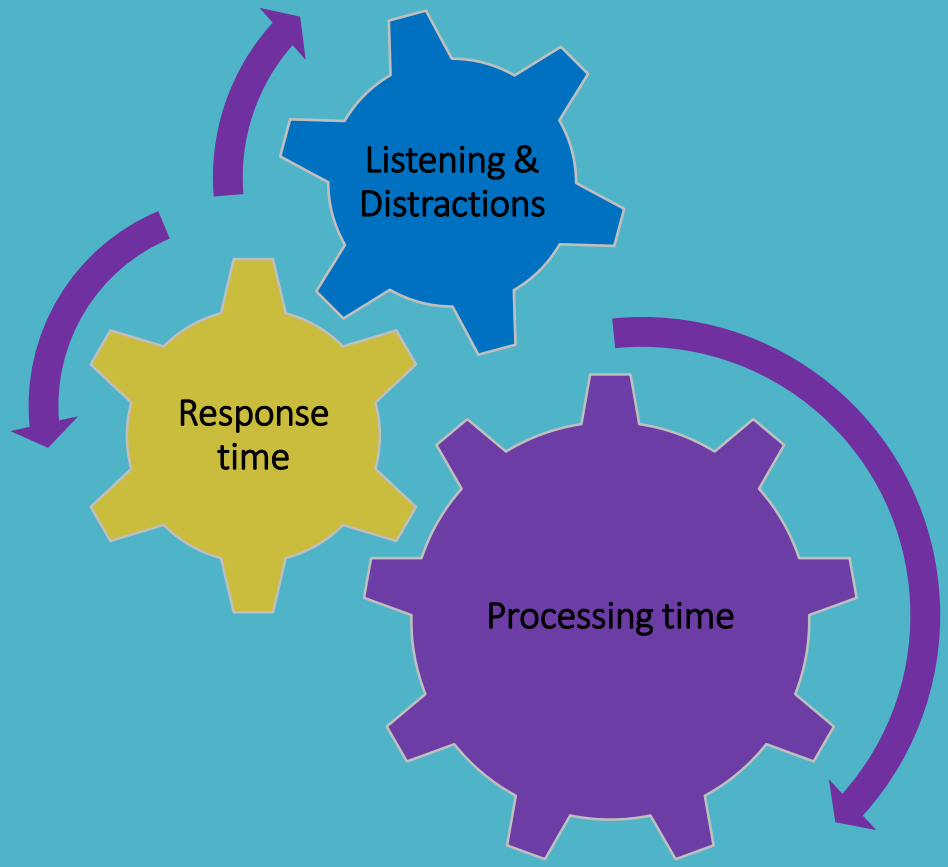
- In addition to the results obtained from standardised assessment measures, conclusions are based on the integration of data from a variety of sources including;

- Patient history including educational, occupational and psychosocial background
- Medical history (e.g. PTA status, radiological findings, medical reports)
- Patient's complaints or lack there of
- Patient's behaviour during testing, on the ward or in the community
- Feedback from significant others (e.g. partner, family, friends).
- Level of function or support requirements

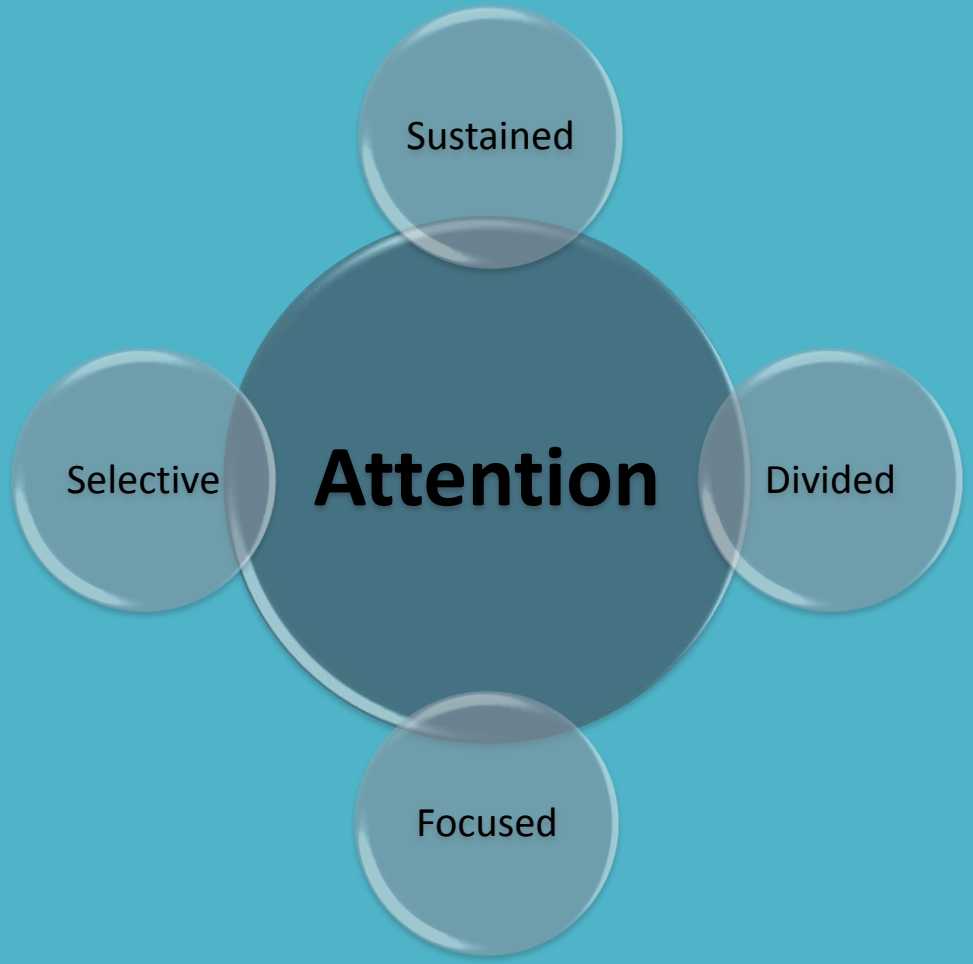
Neuropsychological Domains



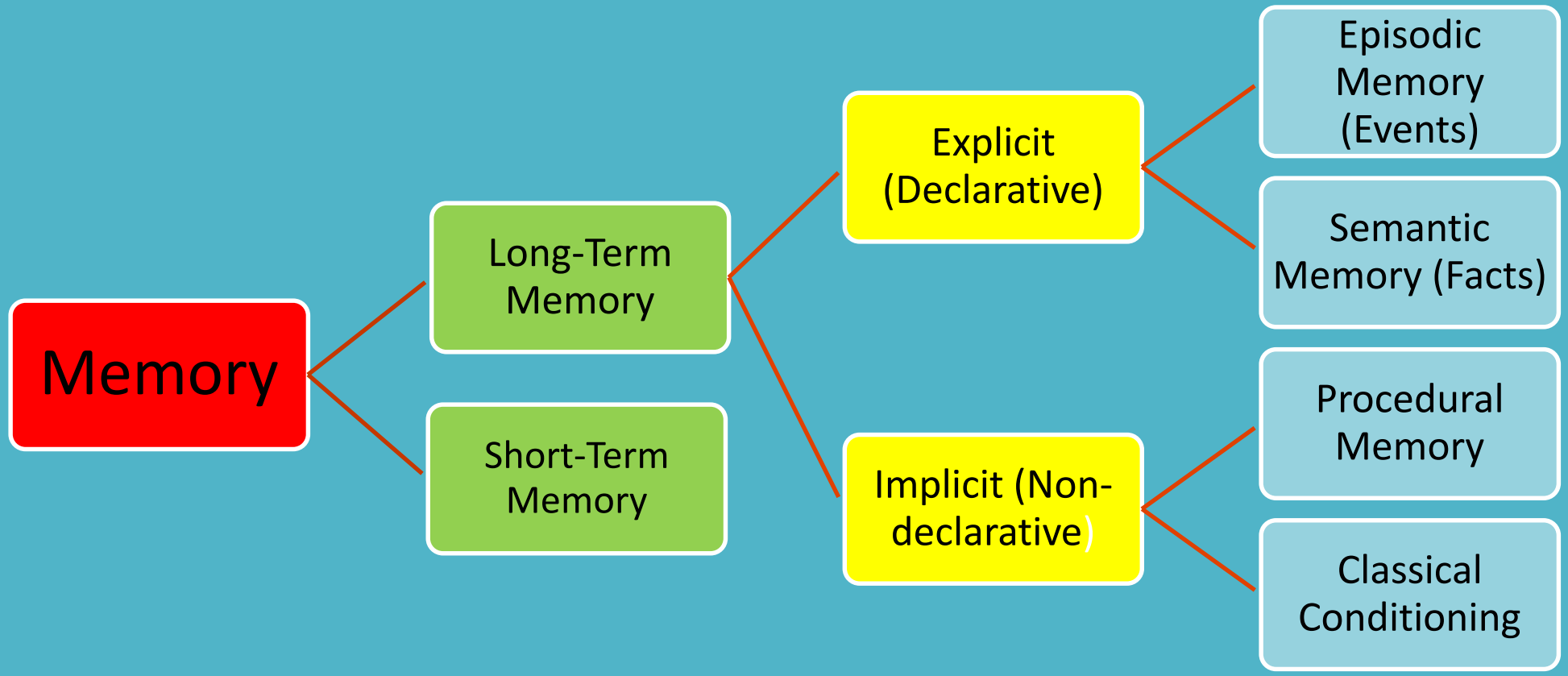
Processing Speed



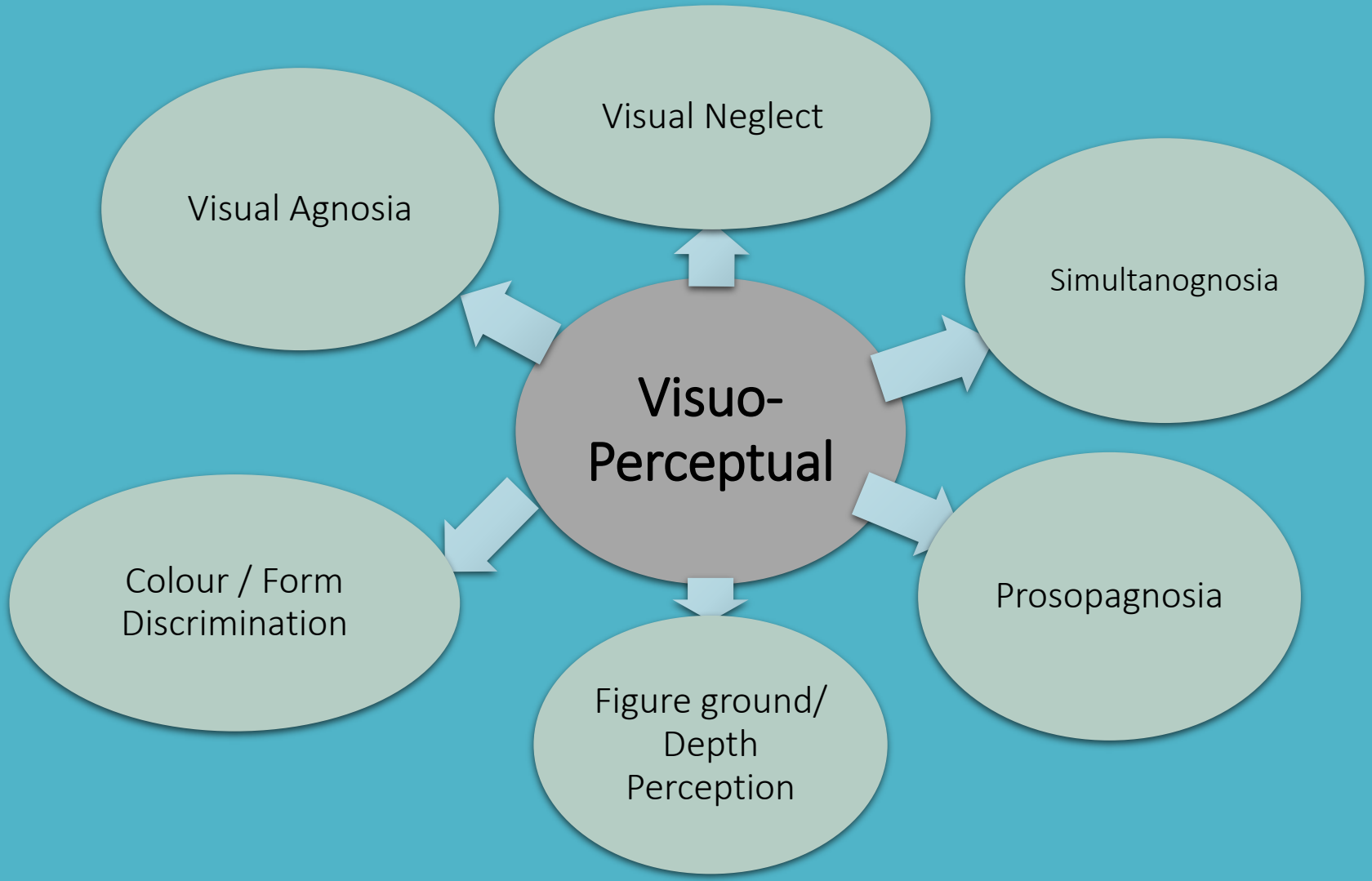
Attention



Memory

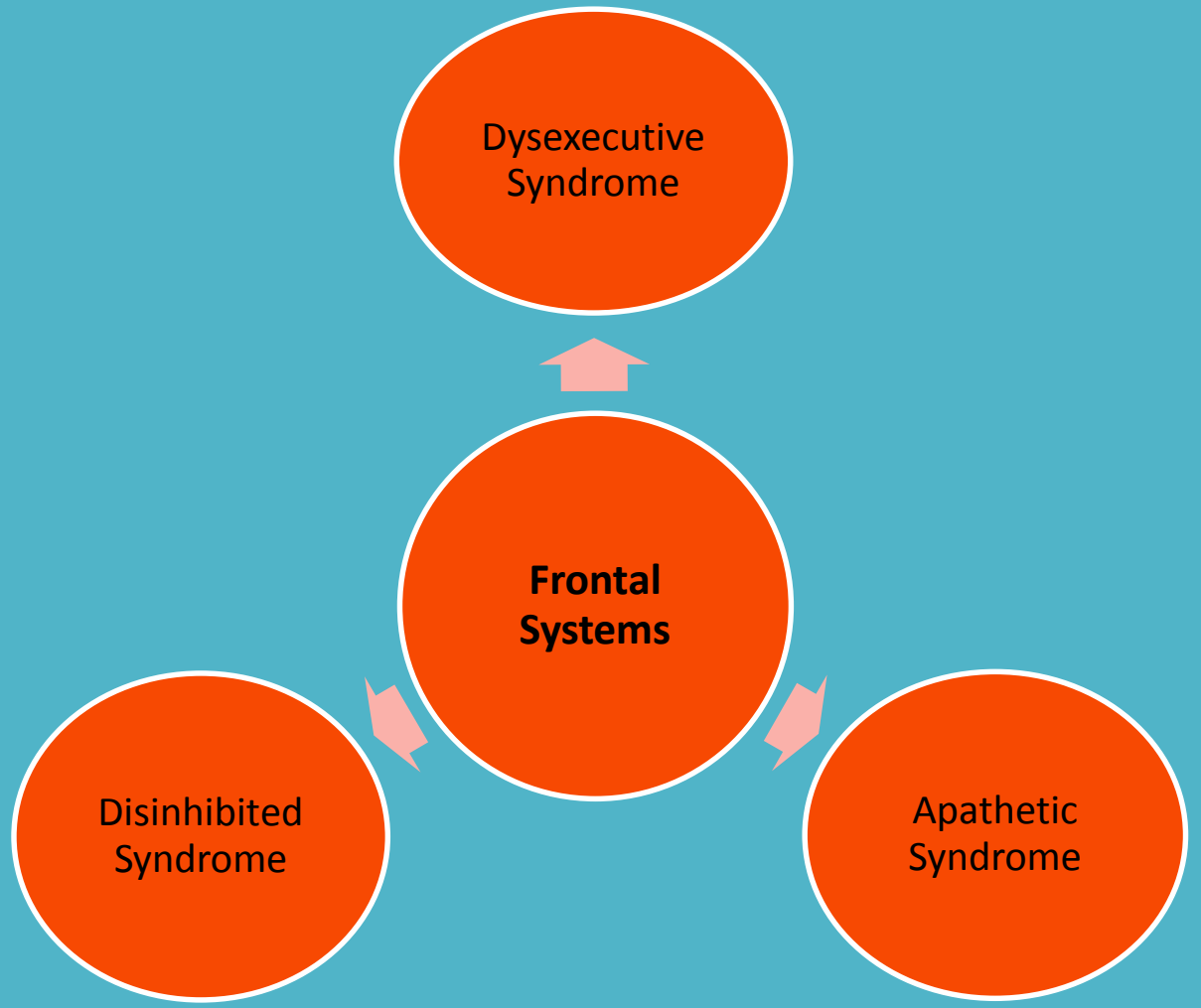

Memory
Long-Term Memory
Short-Term Memory
Explicit (Declarative)
Implicit (Non-declarative)
Episodic Memory (Events)
Semantic Memory (Facts)
Procedural Memory
Classical Conditioning

Visuo-spatial and perceptual functions



Executive function

Specific frontal system syndromes



Purpose of Assessment: What are the referral question/s

Diagnostic

- Determine underlying neurological disorder (e.g. dementia).
- Discriminating between differential diagnosis (e.g. psychiatric vs organic).

Level of function and treatment

- Objective assessment to determine a client's cognitive strengths and weaknesses.

- Clarifying a client's capacity to benefit from rehabilitation interventions (e.g. Can they learn and implement strategies to compensate for their areas of weakness?) and devising a cognitive rehabilitation plan.

- Providing verbal and written feedback to promote insight building and psycho-education to enhance the implementation of compensatory strategies.

COLLABORATIVE THERAPUTIC NEUROPSYCHOLOGOCAL ASSESSMENT (CTNA) (Gorsk & Smith, 2009)

- Feedback is used as a tool to enhance recognition of challenges or problems.

- Clinician's role is to assist the client to make sense of their difficulties by offering them a snapshot of their cognitive, behavioural and emotional functioning.

- Clinician can assist the client to make sense of the test findings and reflect on their performance in the context of their real world.

- Clinician providing feedback in a non-judgmental manner (i.e. curiosity and openness as opposed to coming from a position of information bearer and authority).

5 STEPS OF CTNA FEEDBACK SESSION

1. Set the agenda and introduce the feedback session

2. Develop life implication questions

3. Determine a personal skill profile

4. Discuss individual test results : Feedback about strengths and weaknesses

5. Summarise the relationship between test results, problems, functional performance and patient questions.

Feedback and compensatory strategy guidelines

COGNITIVE DOMAIN	FUNCTIONAL IMPLICATION	COMPENSATORY STRATEGY
<u>ATTENTION</u> You demonstrated mild fluctuations in your ability to concentrate when listening to information. BUT Your ability to attend to fine visual details was a strength.	• You may experience slight difficulty focusing when listening for long periods of time (i.e. during meetings). • You may experience temporary lapses in your attention and miss details, particularly when fatigued. • You are better at identifying important information when reviewing visual material (e.g. reading documents or reviewing spreadsheets / graphs).	• Have regular rest breaks (e.g. 10 minutes after every 1 hour) to avoid becoming fatigued. • Complete demanding tasks earlier in the day when you are most alert, which is usually in the morning. • Reduce external distractions when needing to concentrate (e.g. work in a quiet room). • Take your time and read information a number of times, and use strategies such as highlighting and summarising to further increase you understanding of material

Bennett-Levy, et al. (1994)

- Australian study across 5 centres, N=129 consumers of NPAx services
- 68% received feedback
  - 67% found it to be useful
  - 57 % found it helpful in learning about personal strengths
  - 67 % found it helpful in learning about problem areas
  - 57% found it helpful in learning about what the results mean for everyday life
  - 50% found it helpful in learning about ways to get around problem areas
- 26% received written feedback
- 82% who did not receive a written summary would have liked to

Smith, Wiggins & Gorske (2007)

- Participants (clinicians) were asked to rate perceived effect on patients and families following provision of feedback.
  - Facilitated an open dialogue(72%)
  - helped patients understand their problems (75%)
  - was a positive experience for patients (75%)
  - Resulted in patients being satisfied with the feedback (76%)
  - Resulted in patients being active participants (68%)
  - motivated patients to follow recommendations (52%)
  - resulted in patients and families feeling better (67%)

Fallows & Hilsabeck (2013)

- N=72 veterans (mean age=61) randomised to oral vs oral + written feedback
- Immediate personal interview and phone interview at 1 month post-feedback session
- Better recall of recommendations by the oral + written group at 1 month only
- No difference between groups in adherence to recommendations
- Recommended providing fewer overall recommendations

Meth, Calamia & Tranel (2015)

- N=79 patients and n=36 carers randomised into “letter” and “no letter” groups.
- Feedback letter sent approx. 2 weeks after feedback session
- Contacted by phone 2 months after feedback session and queried about recommendations
- Only carers sent letters had better recall of recommendations than those not sent letters

– 1 versus 2 recommendations!

- No difference for patients
- Improved recall did not translate to better adherence!

- In summary, verbal in addition to written feedback is better to aid recall of recommendations.

- We know that a considerable proportion of clients benefit from feedback, though success varies due to a large number of factors (severity of injury, client's unique strengths and weaknesses, environment, supports etc.).

- However, feedback is not always targeted towards the client, particularly when their cognitive deficits limit them from implementing strategies (e.g. poor recall, insight, self monitoring, judgment).

- Therefore, the primary focus shifts to those providing care, support and therapy (i.e. partners, family, care workers and therapists).

- Recognising the importance of a multi-disciplinary approach to cognitive rehabilitation and the unique contribution of each discipline. .

Patient Care and Planning

➢Emphasis of assessment is centered on the functional implications rather than on measurement (i.e. ecological validity). This involvers providing recommendations and guidance regarding practical issues relating to a client's specific goals.

- ❑ Return to work
- ❑ Return to driving
- ❑ Return to study
- ❑ Independence with activities of daily living
- ❑ Decision making capacity / Management of financial affairs

Return to Work (RTW)

- There is considerable variance in relation to return to work rates following acquired or traumatic brain injury, and this is due to the complex interaction between pre-morbid characteristics, injury factors, impairments, personal and environmental factors.

- Consequently, and not withstanding the methodological limitations, there has been variability within the literature.

- Most research has identified cognitive and physical deficits having a negative impact on RTW; however, **Johnstone et al (2003)** concluded that demographic, injury severity and neuropsychological variables did not predict vocational success, though the delivery of voc rehab could predict RTW.

Return to Work (RTW)

- **Brooks et al (1987)** did not find physical deficits to be related to RTW, though the presence of cognitive, behavioural and personality changes were significantly related to failure to RTW.

- Younger age has been found to be more favourable for RTW following TBI **(Keyser-Marcus et al, 2002, Lexell et al, 2016**) and stroke (**Wozniak et al, 1999**). In addition, individuals with higher pre-injury work status and education tend to return to work in greater percentages than lower status and less educated workers with TBI.

- Studies have further identified that the most significant barriers to employment arise from the environment, with employer flexibility, in addition to support from family and colleagues enabling successful RTW and maintenance (**Kreutzer et al, 2003, Wolfenden et al, 2009).**

Return to Work (RTW)

- Discrepancy in the literature regarding specific neuropsychological test correlates for vocational success has lead to the argument that standardised testing, conducted in distraction free environments with a high degree of external structure, do not generalise well to the ‘real world’.

- However, there has been an evolving focus to develop neuropsychological instruments with greater ecological validity.

- These tests have focused on assessment of attentional processes (Test of Everyday Attention), memory (Rivermead Behavioural Memory Test) and executive functions (Behavioural Assessment of the Dysexecutive Syndrome).

Return to Work (RTW)

➢ **Kalechstein et al, 2003**

- Meta-analysis of 7 studies examining cognitive impairment and employment status.
- Impairments of executive functioning, intellectual functioning and memory showed the strongest association with employment status.
- Psychomotor speed, attention and visuospatial skills were found to be modestly associated with employment status.
- Language showed the smallest degree of association.
- However, the moderating effect of job complexity was not considered in the analysis, neither was age or education level.

Return to Work (RTW)

- **Shames et al (2007)** concluded that injury severity and lack of self awareness appear to be the most significant predictors of RTW following TBI.

- **Ip et al (1995)** identified that the Wechsler Adult Intelligence Scale Revised (WAIS-R) to be the most significant predictor of return to work and school.

- **Machamer et al (2005)**

  - Concluded that neuropsychological tests were useful in predicting post-injury work status, even after controlling for pre-injury factors and injury severity.
  - Found that maintenance of employment was best predicted by Performance IQ score, arrest record and preinjury earnings.

Return to Work (RTW)

- **Andelic et al (2012)** found fewer cognitive limitations significantly associated with employment at 1 year post injury following moderate to severe brain injury.

- **Green et al (2008)**

- Prediction of RTW was stronger at 5 months post injury than at 8 weeks post injury following moderate to severe TBI.
- Performance on tests of memory and executive function at 5 months post injury significantly predicted return to work at 1 year, though performance on attentional tasks did not.

Return to Work (RTW)

➢ Sheerer et al (2002)

- Best predictor of RTW following TBI occurs when neuropsychological testing is performed soon after the resolution of PTA.
- Regardless as to when it is performed, continued presence of deficits is significantly associated with unemployment or decline in the quality of employment relative to preinjury status.
- Authors concluded that the use of neuropsychological testing is strongly supported in the prediction of employment outcome in TBI

Return to Work (RTW)

- In summary, there is clear evidence that neuropsychological tests do predict employment status following acquired or traumatic brain injury.

- However, no individual score can accurately predict performance and the predictive validity of specific tests can be limited.

- Performance on testing can not be interpreted in isolation, though other factors including pre-injury work performance, job stability, past or current substance use, psych, medical, neurological disorders, age, education, voc rehab etc need to be considered.

- In addition, knowledge of a client's unique strengths and weaknesses can guide rehabilitation efforts by focusing on the remediation of these skills.

- Neuropsychological assessment can also act as a valuable tool for identifying high risk individuals and then providing resources for facilitating their transition back to work, particularly when screening measures may not be sensitive enough to detect subtle impairments in cognition.

Return to driving

- Safe driving requires numerous abilities, including intact attention, self regulation, perception, spatial judgment, tracking, reaction time and planning.

- Attempts to predict on-road driving behaviour have been met with mixed success. In addition, attempts to summarise the research has been complicated by the variety of populations samples and methods used.

- Driver inatttention has been shown in healthy controls to be the cause in 78% of crashes and 65% of near crashes in a study by Klauer et al (2006).

- Consequently, in patient groups, performance on measures of attention and divided attention have shown a strong relationship to driving performance (Brouwer, 2002, Lengenfelder et al 2002).

Return to driving

- **Hargrave et al (2012)** examined the predictive utility of the Trail Making B Test on the on road driving performance in 76 participants who were referred after stroke or HI. A cutoff score of 90'' on the test correctly identified 77% of participants who failed the on road driving assessment.

- **Bilokas et al (2011)**

- Examined performance on a neuropsychological test battery to on-road driving performance in 104 ABI patients
- .Battery had 73% sensitivity and 76% specificity in terms of agreement with pass/fail classification on the on-road test.
- 8/9 tests significantly correlated with both on-road outcomes and 'number of interventions (corrections)' administered during the on road assessment.
- Only the RCFT significantly independently predicted the on-road pass/fail.

Return to driving

➢ **Alexandersen et al (2008)**

- 35 patients (TBI & ABI) examined in relation to their performance on neuropsychological measures and on-road driving test.
- Logistic regression found that a model with two variables (CalCap and Digit Symbol subtest) predicted the results of the on-road driving evaluation with an overall accuracy of almost 85%.
- Concluded that the outcome of an on-road driving test is most related to attention, reaction time and processing speed, in combination with cognitive flexibility.

➢ **Cullen et al (2013)**

- Supported processing speed and cognitive flexibility as predictors for return to driving after TBI.
- Scores on Trail Making A & B were significantly better in participants who had returned to driving than those who had not.

Return to driving

➢**Cullen et al (2014)**

- Identified that only the FIM score at rehabilitation admission following TBI was associated with return to driving.

- GCS (within 24 hours of admission) and DRS (at admission) were not significant predictors.

- FIM score had a sensitivity of 72% and a specificity of 73% with respect to return to driving.

Return to driving

Ross (2015)

Two outcome groups N = 208

'Pass' Group **N = 137** Did not require lessons and only 1 required an on road driving assessment

'Rehabilitation ' Group **N = 71** Needed lessons and one or more on road assessments.

- 67 returned to driving

- 4 had licence suspended

Return to driving

- Significant variable as to who will pass an on road driving assessment
- Duration of Post traumatic amnesia
- GCS score
- Presence of physical injury
- Gender
- Reaction time

- When combined the variables, correctly classified 88 % of the pass cases and 71 % of the rehabilitation cases.

Return to driving

- In summary, on-road driving assessments are the ‘gold standard’ in determining when one should return to driving.

- Poor performance on neuropsychological measures particularly those that examine divided attention, reaction time and perceptual deficits may be able to provide a guide as to whether a client requires referral for an on-road driving assessment, particularly when significant deficits are exhibited.

- In addition, severity indicators including GCS and PTA duration are further variables that can guide management particularly following TBI.

Questions ?