


Cognitive Impairment in Methamphetamine use

Perspectives from Neuropsychological Practice

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Referral Question

“Client has difficulties with memory. ?ABI due to methamphetamine use, please assess”.

AKA: It must be all the substances

Factors that influence cognition

Acquired Brain Injury but also..

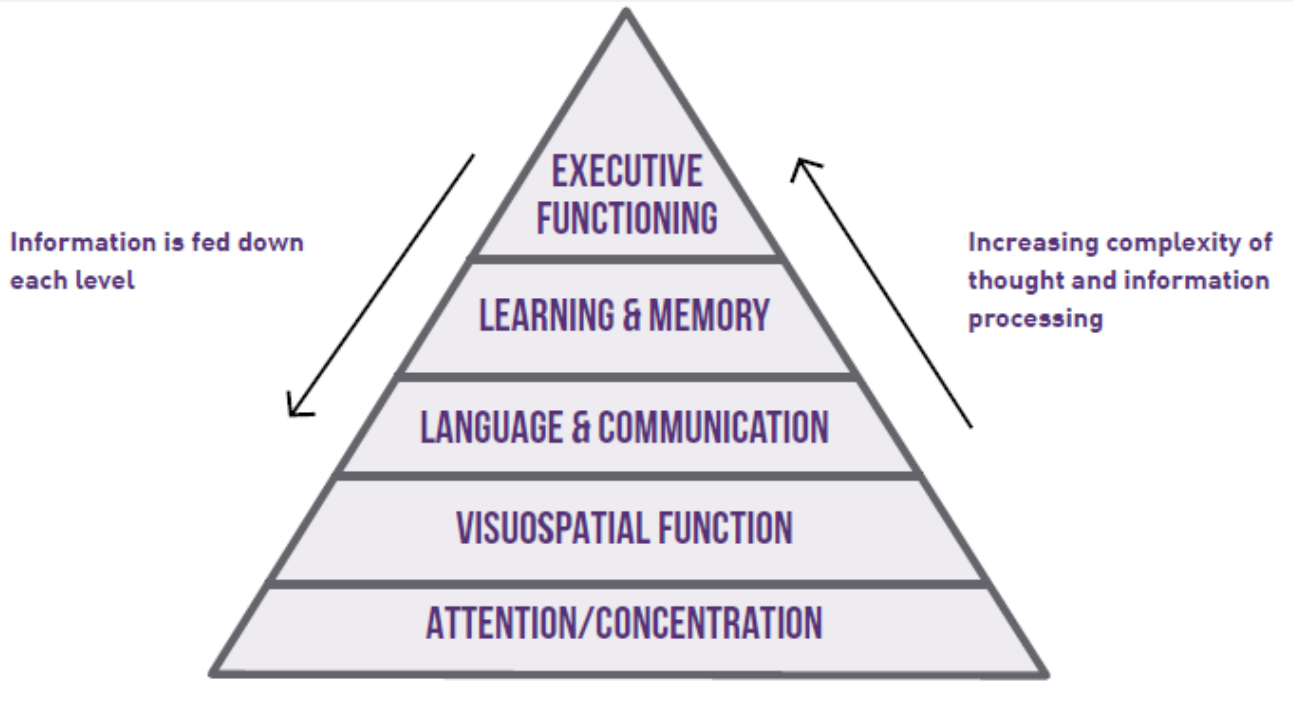
- Sleep
- Nutrition
- Trauma
- Mental Health
- Emotional Distress
- Medical Health
- Environment
- Alcohol & Other Drugs
- Hormones
- Prescribed medications
- Pain
- Metabolic function
- Age & Education
- Culture
- Etc..

Webinar Overview

- Background on Cognition
- Research Issues
- Literature on Methamphetamine use and Cognition
- Strategies & Recommendations

Cognition

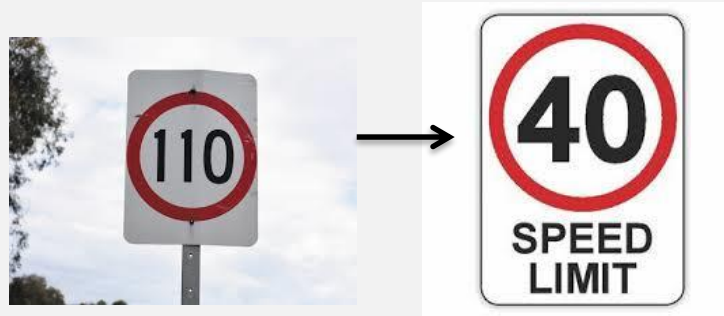
Model of Cognitive Domains



How does impairment present?

Speed of thinking

- Slowed response times
- Easily overwhelmed
- Appear to miss information



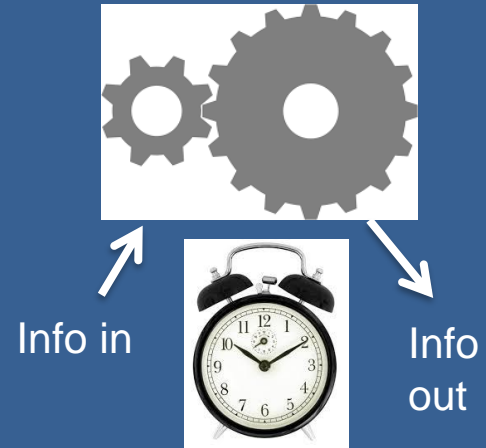
Attention and working memory

AKA “Short term memory”

May present as:

- Poor focus, easily distracted, appear absent minded, doesn't absorb information, 'forget everything', misplace things.
- Loses track of conversations, TV, book (might report difficulties reading)
- Trouble working through problems in mind (ie calculating change, problems with more than one step)
- “Holding onto sand”

How many items can we attend to, juggle and manipulate in our mind at once?



5-9 items only!

Memory Problems

- Forget appointments, conversations, names, events, items etc.
- Vague recall of recent events
 - Remote memory is generally better than recent memory
- Trajectory of changes: Sudden or gradual decline?
- Things to consider:
 - How specific or vague is the reported memory difficulty?
 - How important is the information they are forgetting?
 - How extensive or endorsed is the reported difficulty?

Executive Functioning Problems

- Concrete thinking, inflexibility
 - Has difficulty understanding or following new concepts
 - Unable to generalise, think creatively or generate different solutions to a problem
- Disorganisation and poor planning
 - Chaotic, no system, doesn't think ahead
 - Arrives late or misses appointments
 - Unable to use or generate strategies
- Impulsivity, poor self-monitoring
- Lack of insight

Executive Functioning Problems

Behaviours & emotions

- ↓ frustration tolerance, ↑ irritability, ↑ anger
- ↓ emotional control
 - inappropriate/disproportionate reactions
- Change in emotional responsiveness or expression (flat or elevated)
- Egocentricity or self-centeredness
- ↑ socially inappropriate behaviour

Research Limitations

Problems with Research

- Chicken or the egg?
 - Premorbid factors: Education, trauma, upbringing etc.
 - Most research is cross sectional and so cannot account for these issues
- Clinical Comorbidity
 - Lots of factors that can influence cognitive functioning
- Polysubstance use
 - Generally the norm, rather than the exception
- Limited comparisons with normative data (Hart et al 2012)
 - A statistically significant group difference may still be within normative data!

Methamphetamine & Cognition

Acute or subacute effects

Lots of studies and mixed findings!

- Scott 2007: Meta Analysis
- Hart 2012: Literature Review
- Dean 2013: Literature Review
- Potvin 2018: Meta Analysis
- Basterfield 2019: Meta Analysis

Acute or subacute effects



Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Potvin et al (2018) Meta Analysis

- 1592 MUD and 1820 healthy controls, 44 studies
- Participants had *current* MUD. Studies did not control well for abstinence, mental health, premorbid IQ, trauma, family of origin, other substance use.
- Largest effects in reward or impulse related functions & social cognition.
- Medium effects for attention, executive function, language, verbal learning, visual memory & working memory.
- Small effects in speed of processing & visuospatial functioning
- Findings consistent with Scott (2007)
- Publication bias identified

Cognitive deficits in individuals with methamphetamine use disorder: A meta-analysis

Stéphane Potvin^{a,b,*}, Julie Pelletier^b, Stéphanie Grot^a, Catherine Hébert^a, Alasdair M. Barr^{c,d}, Tania Lecomte^{b,e}

Acute or Subacute effects

Huckens et al (2021)

- Cognitive performance of MA active use vs MA remission vs Controls
- No cognitive deficits in active use group vs controls
 - Excluded major medical conditions, psychosis, mania or alcohol, other substance use
- Poorer memory performance during remission relative to controls.

Dean et al (2018)

- MA group vs controls, matched with premorbid IQ & educational level.
- Cognition worse in MA group than predicted from childhood academic performance vs controls
- Cortical thickness was associated with memory performance in MA group (but no group differences)

Abstinence & Recovery

The relationship between duration of abstinence and gray-matter brain structure in chronic methamphetamine users

Lili Nie^{ab}, Dara G Ghahremani^b, Mark A. Mandelkern^c, Andy C. Dean^b, Wei Luo^d, Anlian Ren^e, Jing Li^g, and Edythe D. London^{bf}

- Nie et al (2021) & Iudicello (2010)
 - Abstinence from MA use associated with increases in brain volume & improved cognition and emotional distress (1 year follow up).
- Basterfield et al (2019) Meta Analysis
 - Meta-analysis of 31 studies exploring NP function following abstinence from MA use (mean of 128 days)
 - Small to moderate group differences in frontostriatal dependant domains: learning efficiency, visual spatial processing, comprehension, knowledge, retrieval fluency, processing speed, & psychomotor speed.
 - No differences in fluid reasoning, short term working memory and, reaction and decision speed.
 - *“Strong statements regarding cognitive functioning in abstinent methamphetamine users are premature given that cross-sectional studies are unable to differentiate cognitive weaknesses that may predate methamphetamine use from those that may be a function of methamphetamine use.”*



Maybe it's not the meth?

Maybe It's Not the Meth: Considering Biopsychosocial Contributors to Cognitive Impairment in Methamphetamine Polydrug Use

OPEN ACCESS

Edited by:
Thiago Vassil Vito,
Pontifical Catholic University of Rio
Grande do Sul, BrazilJames R. Gooden^{1,2,3,4*}, Vanessa Petersen¹, Georgia L. Bolt^{1,2}, Ashlee Curtis^{1,2},
Victoria Manning^{1,2}, Catherine A. Cox¹, Dan I. Lubman^{1,2} and Shalini Arunogiri^{1,2}

- Setting: Turning Point Addiction Neuropsychology Service in Melbourne
- Retrospective casefile audit with data for clinical histories, diagnoses and neuropsychological assessment scores extracted for individuals seen between 2014 and 2019.
- MA poly-drug group (n=40): At least one year of daily/near daily MA use.
 - No other exclusion/inclusion criteria applied.
- Alcohol group (n=27): lifetime history of daily/near daily alcohol use & no other regular illicit substance use.
- Exclusions: invalid test results on neuropsychological assessment.
- Between group comparisons conducted.

MA group characteristics

- MA Group (n=40):
 - Education: Year 10 or less (65%)
 - Psychiatric: Depression (40%), Trauma (37.5%), Anxiety (32.5%), Psychotic Episodes (15%)
 - Developmental: ADHD (15%), Learning Disability (7.5%)
 - Neurological: Concussions (42.5%); TBI (5%), ABI (12.5%), OD (22.5%)
 - Medical: Untreated Hep C (10%)
 - AOD: Daily alcohol (55%), cannabis (57.5%), heroin (17.5%)
 - Mean of 87 st drinks per week (12 per day) during heaviest period

Group Comparisons

- Comparison of daily/near daily Alcohol vs MA groups
- MA group were younger, male, earlier age of onset for AOD use, more OD's, Hep C infection & offending history.
- Polydrug use was the norm in the MA group.
- Equivalent rates of psychiatric, neurodevelopmental, & ABI comorbidity.
- Alcohol group performed worse on overall IQ, psychomotor tracking & semantic verbal fluency.
- Both groups largely in Low Average ranges relative to normative data.

Cognition and Treatment Outcomes

- Cognitive impairment can impact treatment outcomes.
- Multiple studies have found associations between impairment and drop out rates, treatment compliance, treatment retention and use during treatment (e.g. Teichner et al 2002; Bates et al 2006; Dominguez-Salas 2016; Rubenis et al 2017).
- Aspects of executive functioning (e.g. decision making) are particularly implicated.
- In the absence of pharmacotherapies for methamphetamine use we're reliant on psychosocial treatments (Bedi, 2019).
 - Inherently verbal/language based, require working memory, attention and executive abilities to engage.
 - Deficits in verbal learning, working memory or literacy could impact ability to engage in talking based therapies.

Where can you go from here?

Adaptions and strategies



Compensatory Strategies

- Normalise strategy use.
- Strategies need to be individually tailored.
- Play to the person's strengths. Use strengths to compensate for any weaknesses.
- Build on previous strategy use.
- Internal vs external
 - Internal strategies are difficult to apply, so focus on external strategies

Memory

- The more you work with information the more likely you are to remember it
 - E.g. Writing information down / studying
 - Internal memory strategies: Repetition, Staggered Rehearsal, Associations & mnemonics
- Recognition is easier than recall
 - Prompts and cues aid memory
- Forgetting is adaptive
 - We cannot and are not meant to remember everything.
 - Salient or important information gets priority

Compensatory Strategies: Memory

External Strategies



Compensatory Strategies: Info Processing

Speed of thinking

- Pacing is important to avoid missing information
- Adjust sessions accordingly
- Encourage client to:
 - Ask people to slow down
 - Clarify information
 - Summarise back to you



Compensatory Strategies: Info Processing

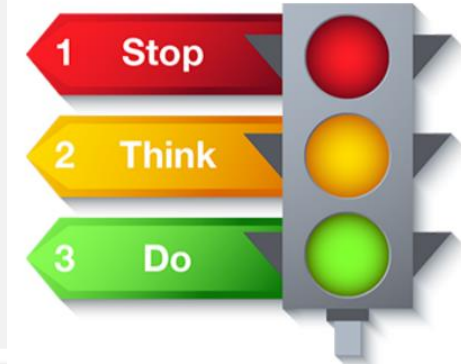
Attention & working memory

- Fatigue management
 - Build rest-breaks into activity / session
 - Consider fatigue levels, e.g. appointment time
- Minimise distractions e.g. quiet space, phones off...
- Write/record information.
- Break down instructions / info into small chunks
- Complete one task at a time



Compensatory Strategies: Executive Functioning

- Concrete thinking and rigidity
 - Use simple language & link it to what the individual knows already
 - Limit number of topics/issues discussed
 - Practice new skills in lots of different situations to encourage generalisation
- Impulsivity
 - Encourage to spend time considering task, checking mistakes, no rushing



Compensatory Strategies: Executive Functioning

Initiation and planning problems:

- Good routines that have structure support executive functioning
- Fewer choices
- Goal planning / structured planning templates. Use the same one over and over again.
- Break task down into small achievable steps.
- Write down steps. Diagram. Flow chart.

Take home messages

1. Our client group faces a huge set of bio-psychosocial challenges, all of which can impact on cognition.
2. Many of the contributors to cognitive impairment are treatable or modifiable while some will predate substance use (e.g. education).
3. For methamphetamine:
 - I. There will be acute and subacute effects on aspects of cognitive functioning.
 - II. Cognition appears to improve with sustained abstinence.
 - III. Recovery will be measured in months & years not weeks.
4. Refrain from labelling (e.g. ABI) especially based on their reported history or if there are multiple unmanaged factors.
5. Consider use of strategies to support functioning and observed impairments

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