The FASD Learning Series is part of the Alberta government’s commitment to programs and services for people affected by FASD and those who support them.

Slide 2

Memory

Memory is perhaps the most central aspect of human thought. Any question about human behaviour, cognition, development, and nature requires an understanding of memory. Our memory makes us who we are, and it is one of the most intimate parts of ourselves.

— G. Radvansky

Slide 3

Session Goals

• Discuss value of evidence based intervention and your role
• Review memory impairments in FASD
• Review research into interventions for memory impairments in FASD
• Discuss some memory interventions used with other populations that may hold promise for FASD
• Consider ways to apply what we know to practice
Slide 4

Research into intervention:

- Issues of research efficacy (does it work in the “lab”), meaningful effectiveness (does it work in real life) and resource feasibility (can we do it) increase the complexity.
- Research derived evidence is still emerging, but does not need to be the only source of evidence.

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Slide 5

INVEST in your intervention efforts

- INVEST:
  - Identify problem and goals
  - Name indicators of success
  - Validate your assumptions
  - Execute program
  - Seek outcomes and understanding
  - Tweak and transfer

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Slide 6

Memory in FASD

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Memory in FASD

I - Identify problem and goals
N - Name indicators of success
V - Validate your assumptions

As we discuss memory ask yourself:
• What might I see behaviourally?
• When could a memory issue be an underlying problem?
• If memory is the ‘problem’, how might that assumption impact the goals I set?

Verbal Memory

• Impaired learning
• Intrusion or perseverative errors
• Adequate retention of learned material
• Retrieval problems
• Impact of weak language skills with more complex tasks
• Impaired on explicit but not implicit memory

(Manji, Pei, Loomes, & Rasmussen, 2009; Pei et al. 2008; Willford et al., 2004; Mattson et al., 1996 and 1998)

Visual Memory

• Spatial memory impairment
• Inadequate internal representations of spatial relations in the environment
• Spatial deficits have been found similar to those with hippocampal lesions
• Better with objects and faces

(e.g. Menj, Pei, Loomes, & Rasmussen, 2009; Hamilton et al., 1993; Streissguth et al., 1984; Uicker and Nadic 1996 and 1998)
Use of strategies

• Shift from visual to verbal strategies seems to occur later for children with an FASD
• This shift is accompanied by development of executive function that may facilitate shift between visual and verbal information
• Even once learned strategy use appears to be less efficient, again implicating executive dysfunction

(Rasmussen, Pei, Manji, Loomes, Andrew, 2009)

Source Memory in FASD

• Like typically developing children, children with an FASD have most difficulty with the internal condition (so same pattern)
• However, children with FASD performed worse overall (so greater difficulty in all areas)
• The pattern of results indicates a general memory deficit in children with FASD as well as a more specific memory impairment in the domain of source monitoring

(Kully-Martens, K., Pei, J., Job, J., & Rasmussen, C.)

Integration of information in memory

• Children with FASD suffer from serious deficits in memory consolidation and organization of complicated material
• Children with FASD struggled with seeing the complex figure as a whole object compared to the control group… this lack of a “gestalt” interfered with consolidation of information and accuracy in recall (Pei, et al., 2011)
Slide 13

Differences in Organization Between Groups

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Slide 14

Memory intervention research
(execute program, seek outcomes, and transfer)

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Slide 15

Memory Intervention Research

- There is a long history of research on interventions to improve memory in children with developmental disabilities.
- Memory difficulties in children can negatively affect language, reading, social skills (Rankin and Hood 2006), self-esteem (Alloway et al. 2009), and performance in school, particularly mathematics (Hitch and McAuley 1991).
- Positive effects of memory interventions for children with Down’s syndrome, learning disabilities, ADHD, acquired brain injury, and FASD
Down’s Syndrome

- Difficulties with short term memory span
- Broadley (1993) tested a memory intervention for children with Down’s syndrome (4-18 years)
- Experimental group: 6 weeks of memory training in rehearsal and organization
  - Control group: no training
  - Similar memory between two groups at pre-test, but Exp group improved on memory after the intervention, but the control group did not.
  - Rehearsal training most effective on rehearsal tasks and organization training most effective on organizational tasks.

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Down’s Syndrome

- Broadley et al. (1994) conducted a follow up study 2 and 8 months later: experimental group still maintained memory improvements!
  - Children who were trained by a keyworker (e.g., teacher, parent) actually had more gains than those trained by an experimenter
  - Keyworker may have had more opportunities to interact with the child

Slide 18

Down’s Syndrome

- Comblain (1994) also found that rehearsal training (intensive 8 week intervention) improved memory span of children and adults with Down’s syndrome.
  - 6 weeks and 6 months after the intervention, the experimental group still showed improvements, but they were lower than their gains immediately after the intervention.
Slide 19

**ADHD**

- Klingberg et al. (2005) examined the effect of a computerized working memory training program (Cogmed) for children with ADHD (aged 7-12)
- 5 week intervention (>20 training sessions)
- Treatment group showed significant gains on measures of visuospatial working memory after the intervention and 3 months later
- Also improved on tests of verbal working memory, inhibition, reasoning, and parent-rated attention

Slide 20

**Brain Injury**

- The Amsterdam Memory and Attention Training for Children (AMAT-c)
  - 18-20 weeks long, 45 minutes/day. Consists of practice and games, as well as memory and attention techniques, done with a trained coach
  - Program improves memory and attention among children with acquired brain injury (Van’t Hooft et al., 2003)
  - Gains are maintained at 6 month follow-up (van’t Hooft et al., 2007)

Slide 21

**FASD**

- Loomes, Rasmussen, Pei et al. (2008) examined whether teaching children with FASD a verbal rehearsal strategy would improve memory span
- Participants: 33 children (19 males and 14 females) with FASD. Age range: 4 to 11 years.
- Children were assigned to two groups:
  - Experimental group (n=17): who received rehearsal training (children were told to whisper items repeatedly in their head)
  - Control group (n=16): who received no training
**Intervention Method**

<table>
<thead>
<tr>
<th></th>
<th>Pretest Day 1</th>
<th>Posttest 1 Day 1</th>
<th>Posttest 2 1 week later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Digit Span</td>
<td>Rehearsal Training</td>
<td>Rehearsal Reminder Digit Span</td>
</tr>
<tr>
<td>Control</td>
<td>Digit Span</td>
<td>Break</td>
<td>Nothing Digit Span</td>
</tr>
</tbody>
</table>

We also recorded behavioral evidence of rehearsal (e.g., whispering, moving lips, or saying the stimuli repeatedly).

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**Rehearsal Results**

<table>
<thead>
<tr>
<th>Session</th>
<th>Pretest</th>
<th>Posttest 1</th>
<th>Posttest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.5</td>
<td>2.75</td>
<td>3.0</td>
</tr>
<tr>
<td>Experimental</td>
<td>3.25</td>
<td>3.5</td>
<td>3.75</td>
</tr>
</tbody>
</table>

Age was not correlated with whether children showed an increase in memory span.

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**Behavioural Results**

<table>
<thead>
<tr>
<th>Session</th>
<th>Pretest</th>
<th>Posttest 1</th>
<th>Posttest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Experimental</td>
<td>0</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
Conclusions

- Rehearsal training is effective in improving memory for numbers among young children with FASD.
- Age was not related to increases in memory span indicating that rehearsal training may be beneficial for children of all ages (even preschool).
- More children in the experimental group showed behavioral evidence of using rehearsal after the intervention.
- Age was not related to behavioral evidence.
- Older children were more able to articulate that they were using rehearsal.

Application

Functional Implications

- "sounds good," particularly when he/she controls the interaction.
- Tendency to dominate interactions and poor reciprocal communication resulting in peer problems.
- Easily lost (even in the school).
- Weak academics.
- May be overwhelmed with work load.
- May find it hard to keep up in class.
- Best with concrete visual tasks.
Functional Implications

• may require support organizing information
• may be misunderstood and feel frustrated by failure to meet expectations
• May have difficulty distinguishing reliable from unreliable sources of information
• May struggle to discriminating actions from intentions
• May not consistently differentiate fact from fantasy

Strategies

• Accommodation and Intervention

Strategies

• Accommodations might include:
  • Decreased content to learn
  • More time for learning
  • Use of concrete visual cues
  • Reconsider challenging lies – work towards solutions
  • Ask questions to evaluate comprehension
  • Proactive external supports (e.g. technology reminders)
  • Reframing expectations
### Slide 31

**Strategies**

- Interventions might include:
  - Strategy training
    - Children with an FASD can use strategies to improve performance
  - In one study 21 strategies were employed
  - Increased repetition and practice during use is needed

### Slide 32

**Metacognitive Strategies**

**Most Children Used:**
- Clarify directions
- Rehearsal
- Touch screen
- Nonverbal memorization
- Substitution
- Lost/Found
- Discriminate whether to memorize or not
- Use of available resources
- Visualisation
- Make safe choices
- Spatial memorization
- Shorten span

**Few Children Used:**
- Elaboration
- Goal setting
- Deep breathing
- Put controller down
- Chunking
- Compare to where they started
- Delay speaking in order to concentrate
- Count on fingers
- Cover screen/eyes

(Hutchinson et al., in preparation)

### Slide 33

**What we are still learning:**

- More about intervention efficacy using scientific methods
- The impact of the many intervention programs currently operating – and how we determine this
- How to effectively merge research findings within larger systems of support (e.g., how can we build strategy training into school system)
What we can do about it:

• Stay informed – seek out conference and learning opportunities
• Seek partnerships – between programs and researchers
• Ask questions – don’t be satisfied by status quo
• See the potential – we can have a positive impact
References


References

References


For information on upcoming sessions in the FASD Learning Series:

www.fasd-cmc.alberta.ca

Please take the time to fill out the online evaluation

Thank you!