Making sense of Asperger syndrome
Understanding thinking and memory in Autism Spectrum Disorder/ Asperger syndrome

ASPIA
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What is Asperger syndrome?

- A complex neurological condition
- Functional connectivity between brain regions
- Differences within brain regions
- Brain “wired” differently
- It is a heterogeneous condition. Its presentation varies greatly from person to person.
- Can be viewed as producing strengths as well as impairments

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Wing’s Triad of Impairments

Socialisation
Happé, 1994

Imagination
Restricted and repetitive behaviours and interests

Communication

Wing’s Triad: Social/Communication/Imagination

Foundations

Wing’s Triad: Social/Communication/Imagination

Memory

Pillars

Roof

Theory of Mind
Central Coherence
Executive Function
The amygdala and the limbic system
Enhanced perceptual functioning

Happé, 1994

Restricted and repetitive behaviours and interests
Theory of Mind (ToM)

- ToM is the mental capacity to represent another person's state of mind with one's own mind, to understand the difference between one's own mind and the mind of another person.
- It includes an understanding of different mental states such as emotions, attitudes, changes over time, and other people's perspectives.
- It applies to understanding one's own mental states (theory of own mind) as well as the mental states of other people.

Theory of mind is the capacity to mentally represent mental states, one's own and those of others.

Terms related to ToM

- Mentalising
- ‘Mind-reading’ (in the social sense)
- Mind-blindness (refers to lack of ToM)
- ‘Empathy’ (problematic term)
- Metacognition

Source: Sophie Lind, personal communication 2014

DSM-5

Other definitions for ToM

‘Attribution of mental states to oneself and others as a natural way to make sense of the actions of [others].’

‘Emotional reactions that are appropriate to others’ mental states.’

Baron-Cohen & Belmonte, 2005

Theory of Mind (ToM)

★ Brain development for ToM begins around 6-12 months and is fully developed by 11 or 12

★ People with AS have delayed or under-developed ToM

★ People with AS most likely compensate for impaired ToM in social interaction e.g., through memorising rules to govern social interaction

Theory of Mind

★ From the age of 4 or even earlier, neurotypical individuals intuitively, spontaneously recognise that other people know/feel, and that it’s different to what they themselves know/feel.

★ To ask a person with poor ToM ‘How do you feel?’ may be a meaningless question

★ The reply, ‘I don’t know,’ may literally be the truth

Central Coherence

<table>
<thead>
<tr>
<th>‘Strong’ Central Coherence</th>
<th>Weak Central Coherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeing the whole</td>
<td>Seeing the parts</td>
</tr>
<tr>
<td>Global (big-picture focus)</td>
<td>Detail-focused</td>
</tr>
<tr>
<td>Top-down processing</td>
<td>Bottom-up processing</td>
</tr>
</tbody>
</table>

Gestalt - ‘The whole is other than the parts.’
Central Coherence

- People with ASD are said to have weak central coherence
  - Free of contextual constraints
  - May be a strength - ‘Systemising’ (Baron-Cohen & Belmonte, 2005)
  - Cognitive ‘tunnel vision’ (Tony Attwood)
  - Single stream of attention

Unusual strength | Unusual weakness
--- | ---
memory for word strings | memory for sentences
memory for unrelated items | memory for related items
echoing nonsense | echoing with repair
jigsaw by shape | jigsaw by picture
recognising faces upside-down | recognising faces right-way up

Happé, 1994 p.116, adapted

Executive Functions

- Organisation
- Planning, sequencing
- Working memory
- Inhibition & impulse control
- Self-reflection
- Decision-making
- Time management
- Prioritising
- Understanding complex or abstract concepts
- Flexibility & adaptability
- Control of attention
- Generalising learning

The Amygdala and Limbic System

- Emotion, fight-or-flight survival mechanism
- The limbic system includes the amygdala and is the neural network that processes emotion
- Poor connectivity of amygdala with prefrontal cortex
- Poor emotion management
- Perpetually heightened anxiety state
- Emotion plays a key role in memory and learning
Enhanced Perceptual Functioning

- Sensory experience (incoming sensory data)
- Being fully ‘in the moment’
- Sensory sensitivities: Hypo-sensitivity and/or Hyper-sensitivity
- Sensory integration problems
- Perceptual Memory System (one of the 5 human systems of memory and learning)

Enhanced perception

- Sensory perception, able to perceive details others can’t
  - Colour
  - Movement
  - Shape
- ‘Kahla’ artist: ‘Colin’ photographer: Nola’s ‘colour-blindness’

Sensory Sensitivities

- Hypersensitivity in one or multiple senses
- Triggers ‘fight or flight’, amygdala activation, panic, bypasses prefrontal cortex
- Cognitive and sensory overload

Memory

Thinking + Memory = Learning
5 Major Systems of Human Memory and Learning
Schacter & Tulving (1994)

- Declarative memory (conscious)
  - Episodic Memory (autobiographical, personal experience)
  - Semantic memory (facts, general knowledge)
  - Perceptual Representation System
  - Procedural memory

- Nondeclarative (unconscious)
  - Working memory
  - Semantic memory (facts, general knowledge)
  - Perceptual Representation System
  - Procedural memory

- Long-term memory

- Semantic memory
  - Single-item memory
  - Visual, images, symbols
  - Externally oriented thinking, concrete, literal
  - Personal experiences ‘recorded’ like a movie
  - 3rd person stance instead of 1st person

- Perceptual memory
  - Pure, raw sensory input
  - Enhanced perceptual functioning
  - Sensory sensitivities

- Episodic memory
  - Personal experience
  - Source memory (attribution, context: location, time, emotion)
  - Autonoetic consciousness (mental time travel)
  - Relational memory (memory binding)
  - Simultaneous processing
  - Abstract ‘schemas’
  - Self-referential processing

Schacter & Tulving (1994)
Schacter & Tulving (1994) Human Memory Systems

- Working memory
- Episodic Memory (autobiographical, personal experience)
- Semantic memory (facts, general knowledge)
- Perceptual Representation System
- Procedural memory

Declarative memory (conscious)
Nondeclarative (unconscious)

Long-term memory

Weak Strong Enhanced

Memory differences in AS compared to NT

*NT=neurotypical

Schacter & Tulving (1994)

<table>
<thead>
<tr>
<th>Episodic memory</th>
<th>Semantic memory</th>
<th>Perceptual memory</th>
</tr>
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<tbody>
<tr>
<td>weaker</td>
<td>relied upon for explicit thinking</td>
<td>enhanced</td>
</tr>
<tr>
<td>Theory of mind</td>
<td>One thing at a time</td>
<td>Enhanced perception</td>
</tr>
<tr>
<td>Executive function</td>
<td>Single-item memory</td>
<td>Being in the moment</td>
</tr>
<tr>
<td>Central coherence</td>
<td>Focus on detail at expense of bigger picture</td>
<td>Sensory sensitivities</td>
</tr>
<tr>
<td>the big picture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract reasoning</td>
<td>Concrete, literal, block-&amp;-white thinking</td>
<td></td>
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<tr>
<td>Cognitive flexibility</td>
<td>Train-tracks thinking: rigid, fixed thinking</td>
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<tr>
<td>Relationships between thoughts, concepts, ideas</td>
<td>Rote memory, recall of discrete data and facts</td>
<td></td>
</tr>
<tr>
<td>Subjective time judgements</td>
<td>Time measurement: clocks, calendars</td>
<td></td>
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<tr>
<td>Subjective sense of self</td>
<td>Formulaic thinking, i.e., $a + b = c$</td>
<td></td>
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</tbody>
</table>

Semantic memory

- Semantic memory stores isolated facts and general knowledge without context or the use of organising strategies
- Semantic memory is symbol-based (e.g. language, numbers, pictures)
- Rote memory is a function of the semantic memory system
Semantic memory ... visual thinkers

★ May think predominantly in pictures, numbers, symbols, colours or sounds rather than language (visual thinkers, not verbal thinkers/language processors)

★ Temple Grandin *Thinking in pictures, The woman who thinks like a cow*

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Semantic memory ... visual thinkers

★ In communication, people with AS may be ‘translating’ to and from other modes of thought (e.g. visual, symbols) similar to 2nd language speakers. This takes extra time and effort

★ Compare this to the ‘mental time travel’ function of episodic memory, which is virtually instantaneous

‘It’s absolutely exhausting to say nothing’ - Riley
Episodic memory

- Episodic memory stores personally experienced events, using organisational strategies and abstract thought
- Handles ‘active learning’ (learning through experience), concept development and meaning making

Autonoetic consciousness (self-knowing)
- Self, identity
- Source memory (contextual info encoded at source of memories)
  - Spatial (location, place)
  - Temporal (subjective time)
  - Affect (emotion)

Memory systems

- The episodic memory and semantic memory systems work in tandem to support thinking, memory and learning

Semantic memory ... visual thinkers

Daniel Tammet, synesthesia
https://www.youtube.com/watch?v=Pzd7ReqiQnE
Different ways of knowing
Relying upon semantic memory, including for autobiographical memories, changes the nature of autobiographical memory.

People with AS almost always describe their personal memories as a videotape or movie that they play, pause, rewind, etc., in order to retrieve the memory.

Contrast this kind of memory retrieval with ‘mental time travel’, which is virtually instantaneous in episodic memory.

Neurodiversity

**Implications for teaching and learning**

‘The Learning Ladder’

<table>
<thead>
<tr>
<th>Types of thinking activities</th>
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<tbody>
<tr>
<td>Meaning making</td>
</tr>
<tr>
<td>Concept formation</td>
</tr>
<tr>
<td>Prototype formation (summary representations)</td>
</tr>
<tr>
<td>Categorising, grouping, classifying, sorting</td>
</tr>
<tr>
<td>Naming, labelling</td>
</tr>
<tr>
<td>Memorising facts</td>
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</tbody>
</table>

**Mapping knowledge to new situations in a meaningful way**

**Defining characteristics - visual representation**

- 'Canine'

- Dogs have 4 legs

- This is a cat. This is a dog.

**Full range of possible characteristics, personal experience, emotion, sophisticated understanding**

**Bottom-up info processing** (detail-focus)

**Top-down info processing** (global processing)

**Weak central coherence**

**Strong central coherence**

**Learners on the spectrum...**
Book Review

Teaching university students with autism spectrum disorder: a guide to developing academic capacity and proficiency


Available through Footprint Books www.footprint.com.au
