THE NEW INTELLIGENCE: WHY WORKING MEMORY MATTERS AT SCHOOL

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OVERVIEW

- WHAT IS IT?
- HOW DO WE MEASURE IT?
  - Cognitive
  - Behavior
- WHY is Working Memory Important?

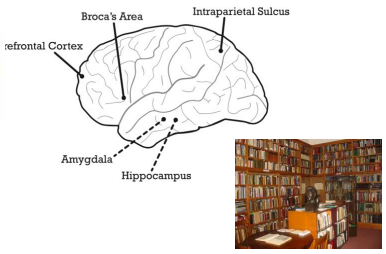
Not short-term memory

- Short-term memory = Remember
- Working memory = Remember + WORK
  - Dog Cat Bat
  - = Short-term memory
  - Dog Cat Bat: RHYME?
  - = WORKing memory

WM and Long-term knowledge

The cat sat on the mat.
Where was the cat sitting?

(3+9)x8=?



Cowan & Alloway (2008) *Development of Memory in Infancy & Childhood*
Swanson & Alloway (2012) *APA Educational Psychology Handbook*

Working Memory: 3 I's

- IMPORTANT
- INDIFFERENT
- IMPROVABLE

WM: IMPORTANT

READING
WRITING
MATH

Alloway et al (2005) *British Journal of Developmental Psychology*
Alloway et al (2004) *J. of Experimental Child Psychology*

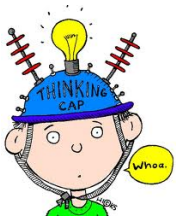
WM: IMPORTANT

READING
SPELLING
MATH

Alloway & Alloway (2010) *J of Experimental Child Psy*

WM: IMPORTANT

- Gifted: NAGC
- High IQ, not all High WM

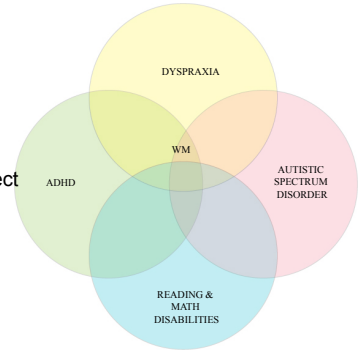


- IQ measures WHAT you know
- WM measures WHAT YOU DO with what you know

Alloway & Elsworth (2012) *Learning & Individual Diff*

WM: IMPORTANT

Additive Effect



Alloway et al (2009) *J. of Learning Disabilities*

Working Memory: Equalizer

- Financial background/ Socio-economic Status
- Mother's educational level

Alloway et al (2005) *British J of Developmental Psychology;*
Alloway, Alloway, & Wootan (2014) *J of Experimental Child Psy*

WM: INDIFFERENT

- Learning Styles
- Verbalizer – Visualizer
- Wholist – Analyist
- Doesn't matter if you have good Working Memory

Alloway, Banner & Smith (2010) *BJEP*

Workshop 1:

Do these students have a working memory problem?

Adam: 12 years old

His teacher views him as a problem student. He is often restless and fidgety and has broken classroom equipment on several occasions.

His work is of a low average standard, with its' quality varying considerably from day to day. His teacher is not sure whether he will reach national average levels in assessments, although she feels sure that he has the abilities to do so.

George: 16 years old

He is well-behaved and popular. His IQ is in the normal range. However, his academic performance is poor in all areas and he is in the lowest ability group in literacy.

He often becomes frustrated by difficulties that he experiences, especially in writing. He does not usually participate in class discussions, and forgets what he wants to say even after he has raised his hand.

Olivia: 7 years old

She is outgoing and is well-liked by her classmates. Her IQ is in the high average range. She has a mature and responsible attitude, and is often chosen by her teacher to run errands.

She is in high-ability groups in both literacy and numeracy, and often helps out less able children within the group, occasionally misguiding them.

At times she is forgetful, and appears to be distracted from work. The teacher often asks her to help organize classroom activities, such as putting out art materials.

HOW DO WE MEASURE WORKING MEMORY?

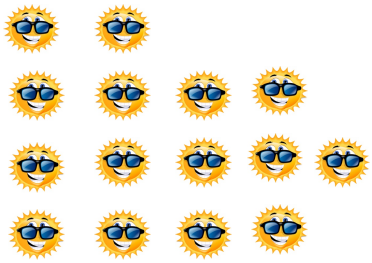
Working Memory: Lifespan

– 5 years

– 10 years

– 15 years

– 60 years



Alloway, TP., & Alloway, RG (2013, *J. of Cognitive Psychology*)

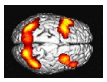
HOW do we measure Working Memory?

- Cognitive Assessments
  - WISC and WAIS: Working Memory Index
    - Digit span: Forward & Backward
  - Stanford-Binet
  - Woodcock-Johnson
  - Limitations
    - Theory
    - Practice

HOW do we measure Working Memory?

Micro ⟷ Macro

Functional Imaging	Cognitive	Behavior

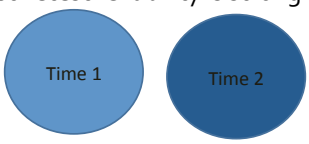


AWMA: Benefits

- AUTOMATED
- WORKING MEMORY
  - Varied Stimuli
  - Pure measure
  - Span procedure
- ASSESSMENT
  - Reliable
  - Valid

Reliability

- Is the AWMA *Consistent?*
- Test-retest reliability is strong (.79 to .90)



Alloway et al. (2006) *Child Development*

Validity: Divergence

- WM is DIFFERENT from IQ
- Range of samples: Verbal & Performance IQ
  - Typically developing students
  - Learning disabilities
    - Dyslexia, Dyscalculica, ADHD, ASD, DCD, Borderline Intellectual functioning
  - Gifted students

Validity: PREDICTIVE

- What do AWMA scores tell us?
- Learning Outcomes
  - Low WM: 98% of students below-average scores
    - Alloway et al., (2009) *Child Development*
  - Students with LD: WM predicts attainment scores 2 years later
    - Alloway (2009) *European J. of Psy Assessment*
  - Longitudinal: WM at 5 years is excellent predictor of attainment scores 6 years later
    - Alloway & Alloway (2010) *J of Experimental Child Psychology*

WORKING MEMORY RATING SCALE

- Classroom Behavior
- 20 items
- Abandons activities before completion

– Not typical Occasionally Fairly typical Very typical

WMRS: Benefits

- Early Screener
- Age-based norms
- Easy Scoring
- Valid

Validity: Convergence

- Confirmatory Factor Analysis: AWMA
  - Cognitive vs. Behavioral functions

Alloway et al. (2008) *Learning & Individual Differences*

Validity: Divergence

- WM behaviors are DIFFERENT from ADHD-behaviors
  - Conners' Teacher Rating Scale
  - Behavior Rating Inventory of Executive Function (BRIEF)
- Both scales only identify 24% of students with WM difficulties (w/o ADHD)

Alloway et al. (2010) *Child Psychiatry & Human Development*

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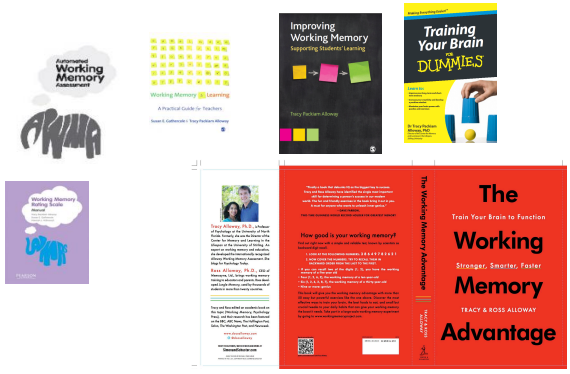

Validity: Content relate

- What is the AWMA measuring?
- Other WM measures
  - WISC: Working Memory Index
    - Classified 90% of low WM students
      - Alloway et al (2008) *Educational Psychology*
  - Working Memory Rating Scale
    - Alloway et al. (2008) *Learning & Individual Differences*