

TESTBASERAT LÄRANDE: IMPLEMENTERING AV EN EFFEKTIV LÄRSTRATEGI

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Påstående

Kunskaps byggs utifrån antagandet att **kunskap bygger på kunskap** och för att detta ska ske behöver eleverna utveckla **effektiva strategier** för lärande.

Men

de vanligaste lärstrategier som används av elever/studenter också de minst effektiva

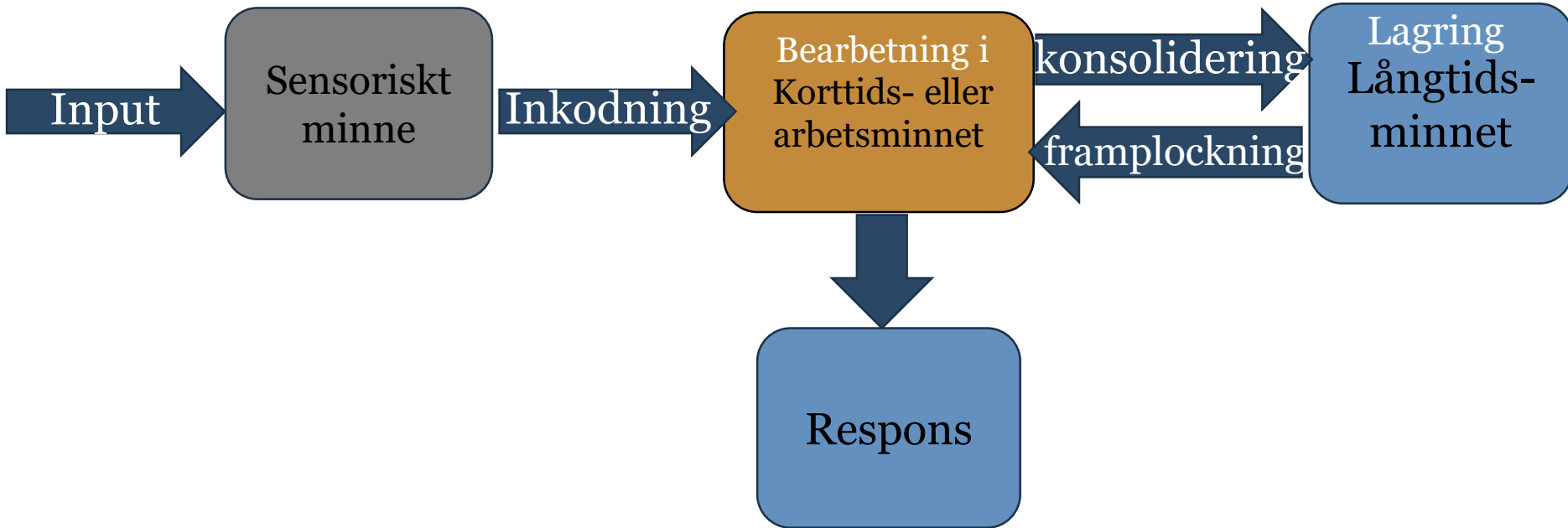


Lärande → Kunskap?

- Informationsbearbetning

- En ständigt pågående process
- Involverar uppmärksamhet och våra minnesfunktioner
- Uppmärksamma, organisera, komma ihåg det du studerat och integrera ny kunskap med tidigare kunskap





Minnessystem som involverar tre **minnesprocesser**

1. Inkodning

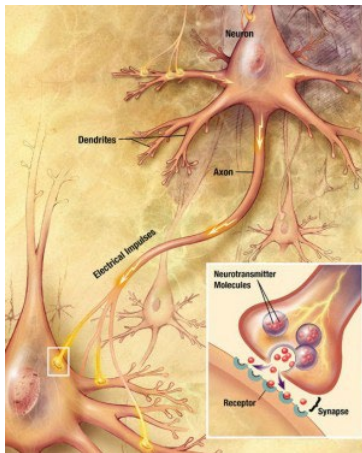
2. Konsolidering >>> Lagring

3. Framplockning >>> respons

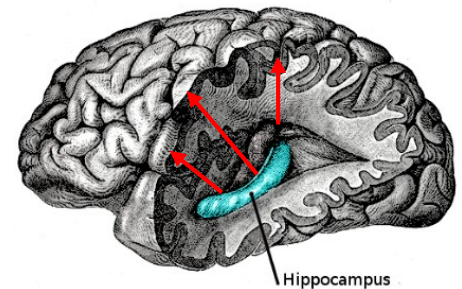


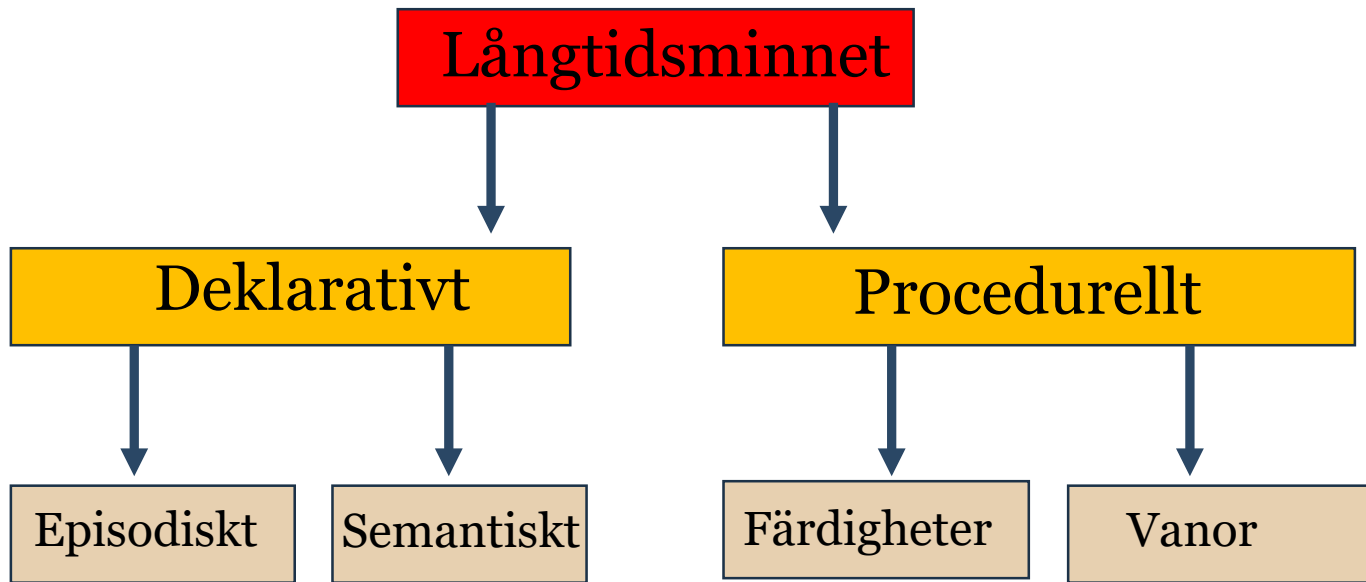
Lagring i långtidsminnet

- Lagringskapacitet– I princip oändligt
 - Synaptisk konsolidering
 - Omstrukturering av existerande synaptiska kopplingar eller skapande av nya
 - systemkonsolidering
 - hippocampus-oberoende minnen skapas över tid
 - Re-konsolidering: Reaktivering av minnesspår



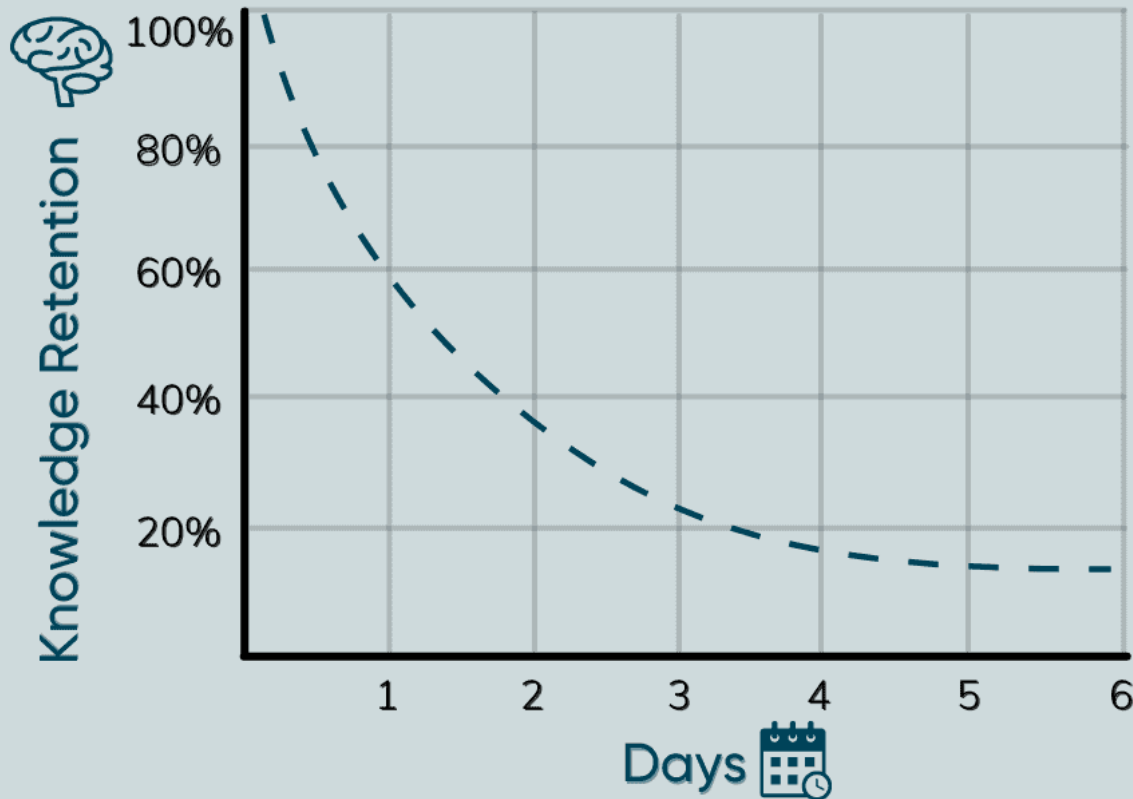
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Glömska

The Ebbinghaus Forgetting Curve



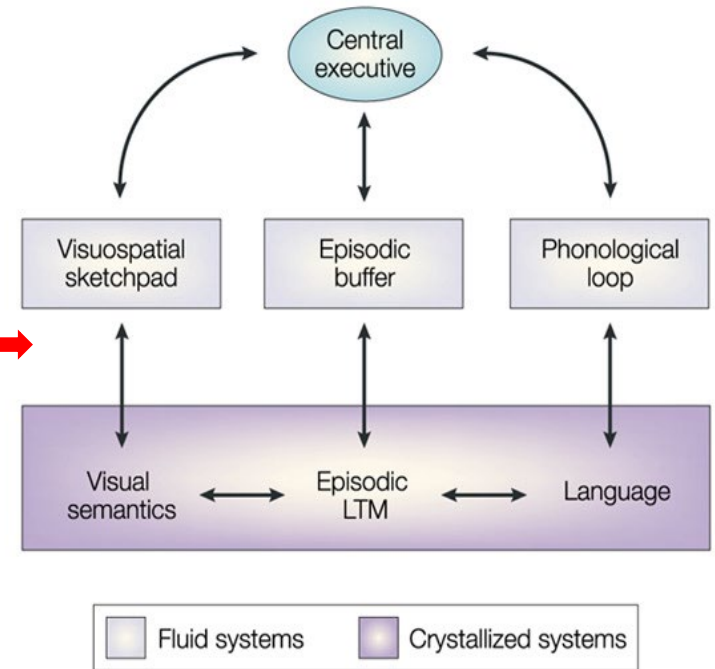
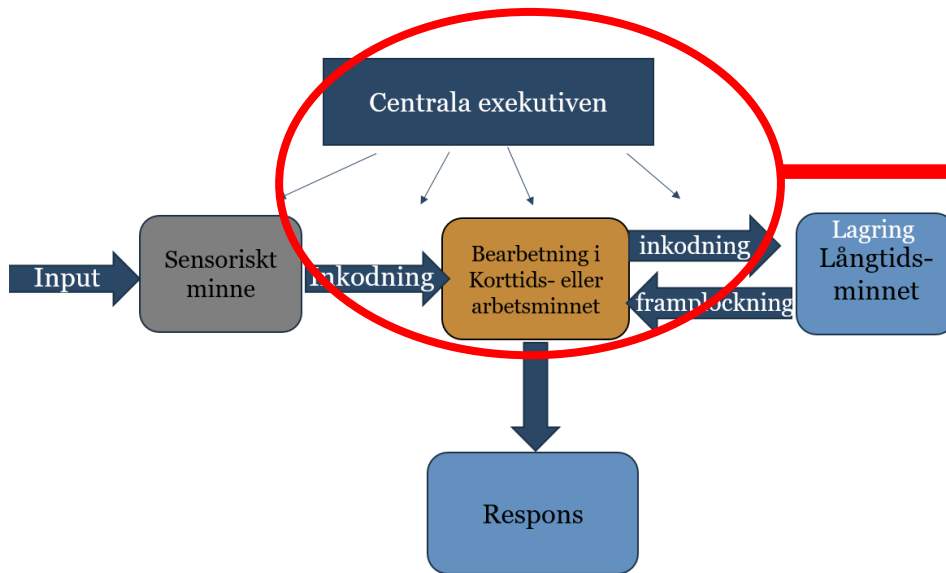
J. Murre, J. M., & Dros, J. (2015). Replication and Analysis of Ebbinghaus' Forgetting Curve. *PLOS ONE*, *10*(7), e0120644. <https://doi.org/10.1371/journal.pone.0120644>



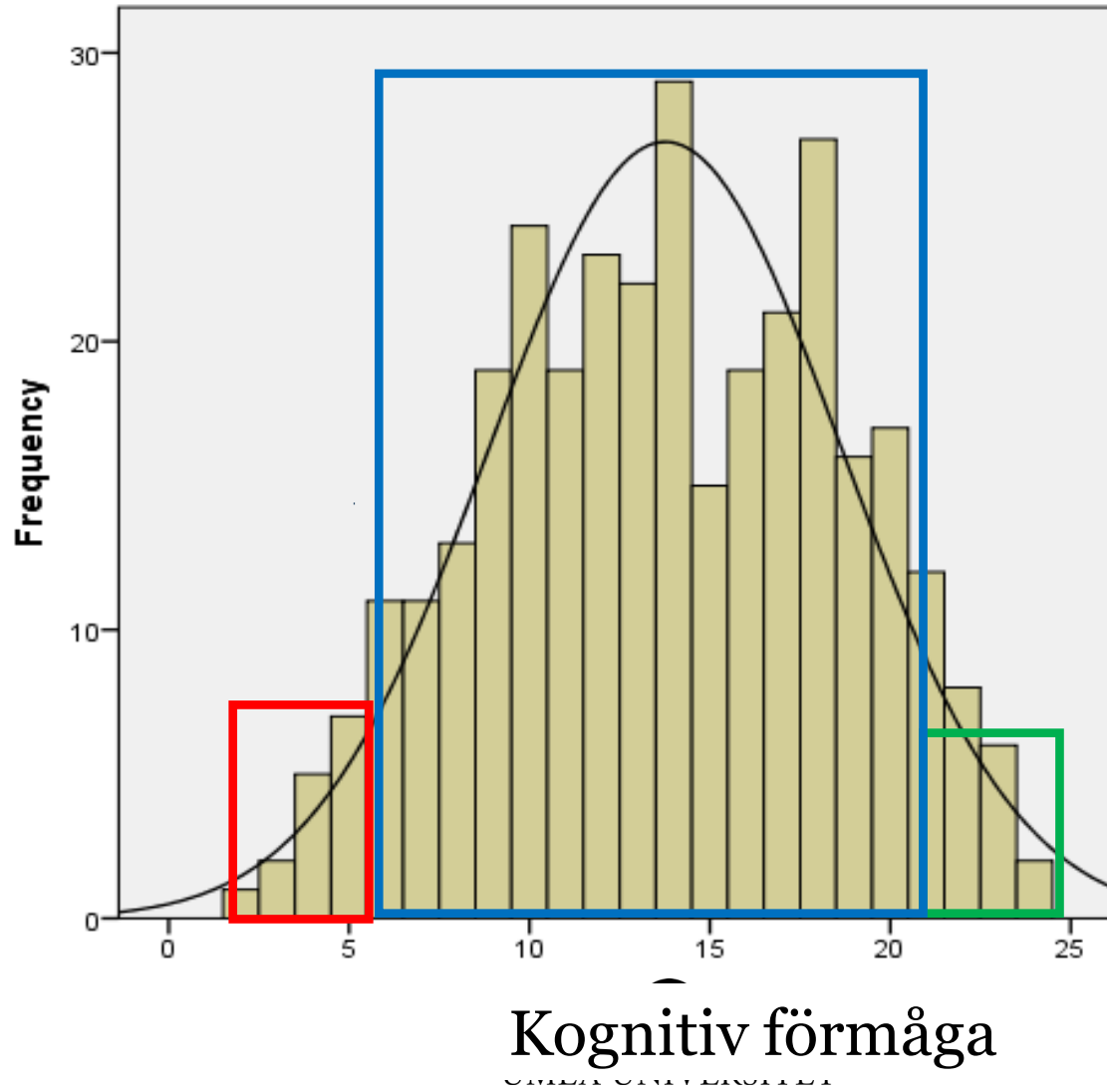
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Ebbinghaus (1885), H. (2013). "Memory: a contribution to experimental psychology." *Annals of neurosciences* **20(4): 155-156.**

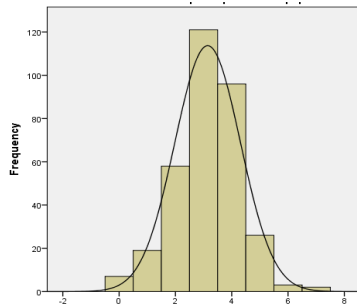
Flaskhalsen för både inkodning och framlockning



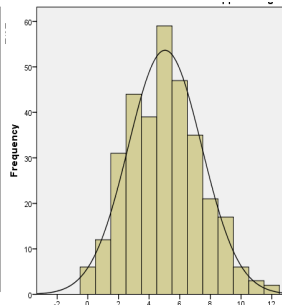
INDIVIDUELLA SKILLNADER



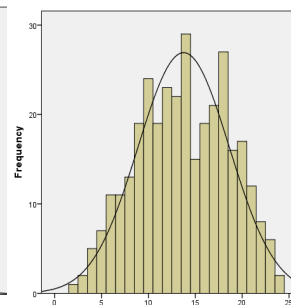
NORMALFÖRDELNING GYMNASIEELEV



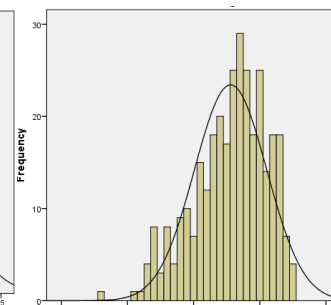
Verbal STM



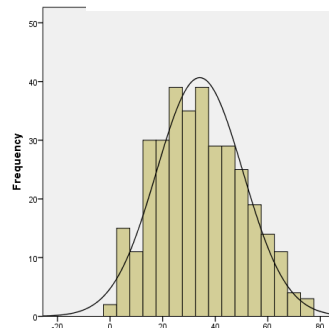
Updating



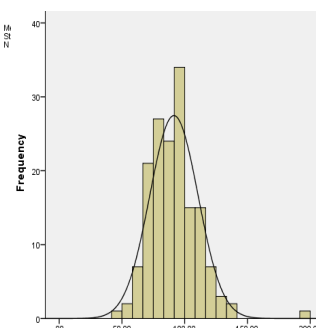
Fluid intelligence



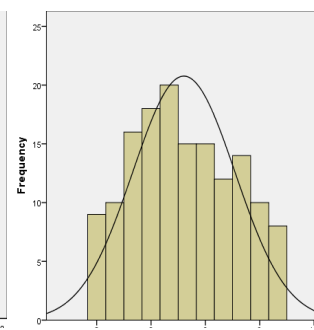
Updating



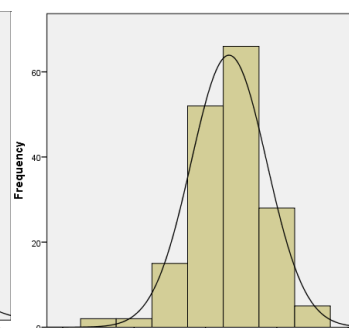
WMC



Processing speed

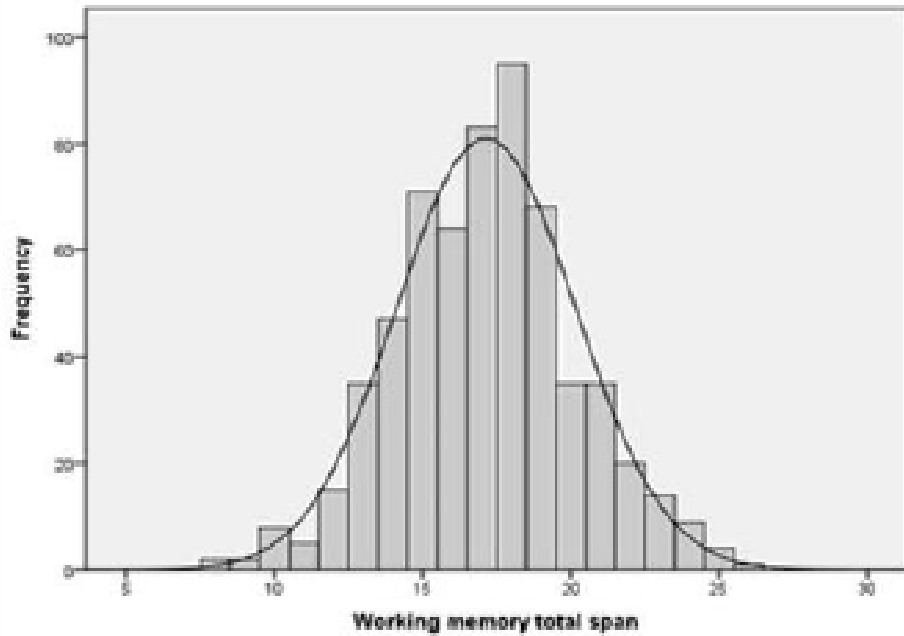


Episodic memory

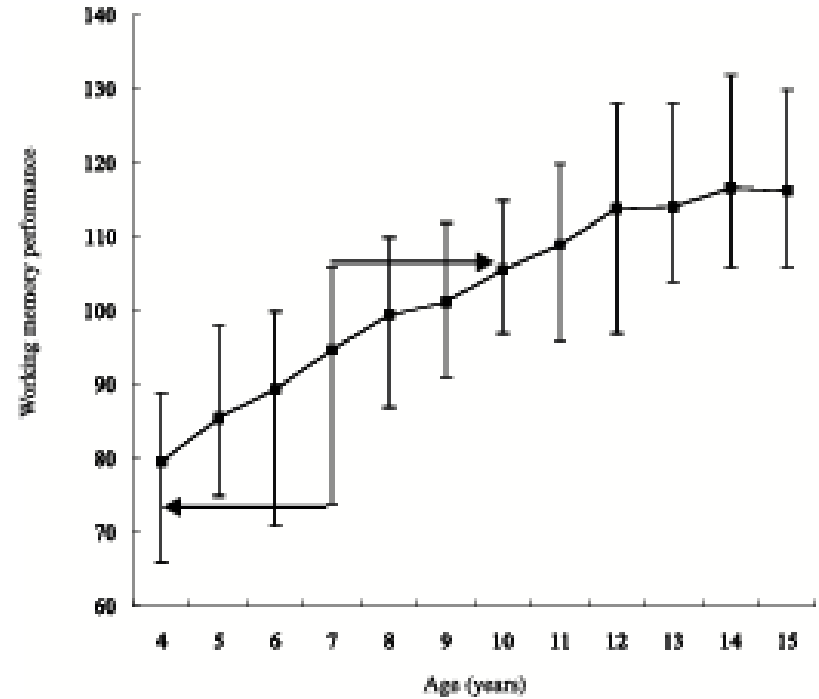


Visual STM





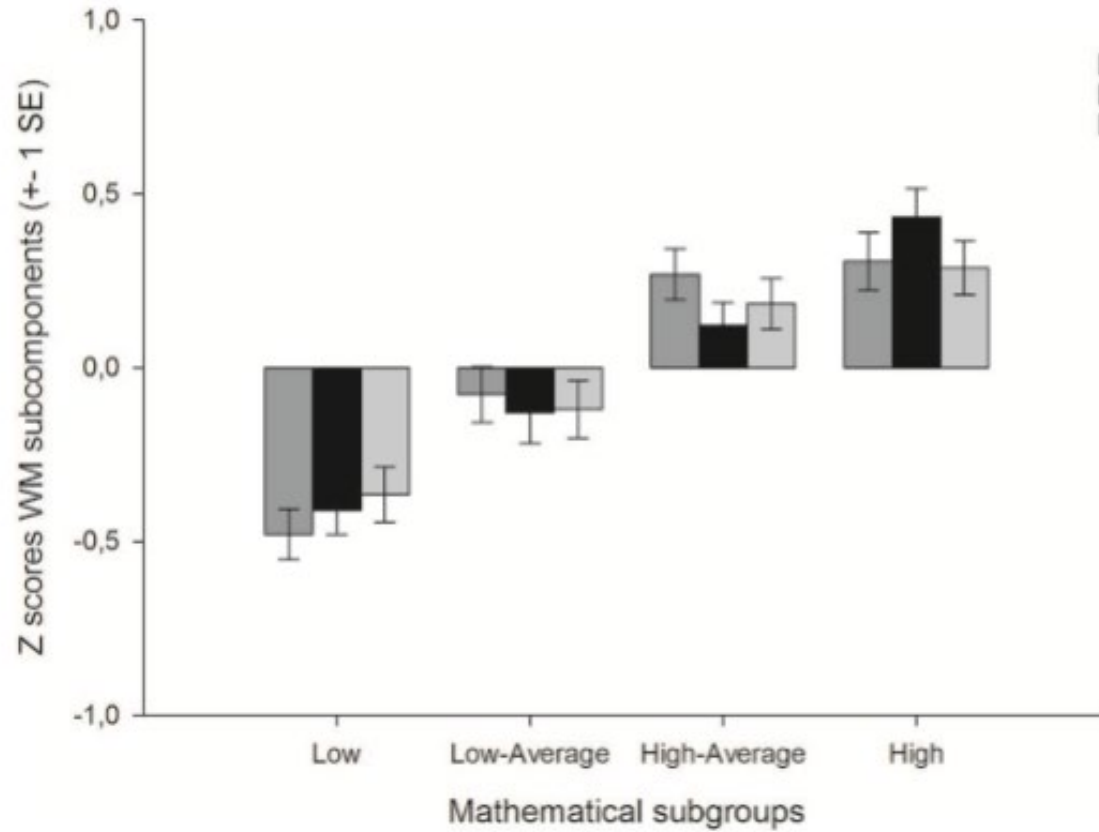
9-10 år



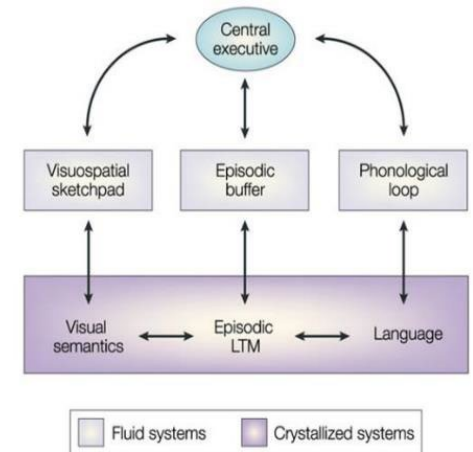


Untangling the Contribution of the Subcomponents of Working Memory to Mathematical Proficiency as Measured by the National Tests: A Study among Swedish Third Graders

Carola Wiklund-Hörnqvist^{1,2*}, Bert Jonsson¹, Johan Korhonen², Hanna Eklöf⁴ and Mikaela Nyroos⁵

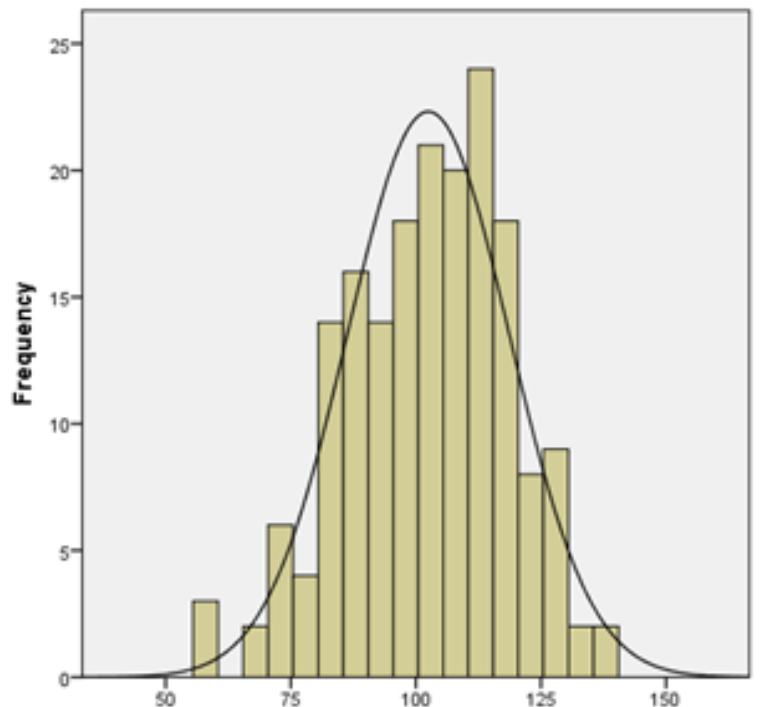


■ Visuo-spatial WM
■ Phonological WM
■ Executive WM



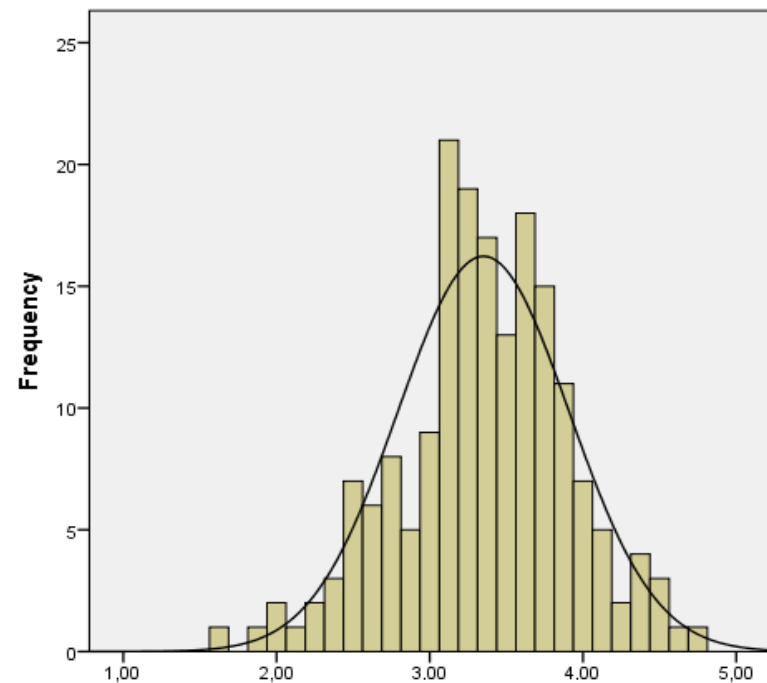
INDIVIDUELLA SKILLNADER I PERSONLIGHET/MOTIVATION

Tycker om att problematisera

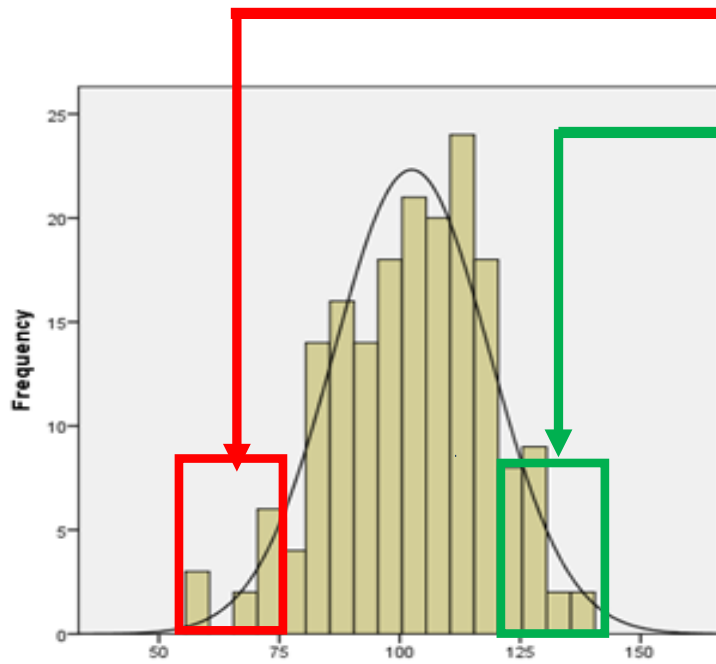


Need For Cognition (NFC)

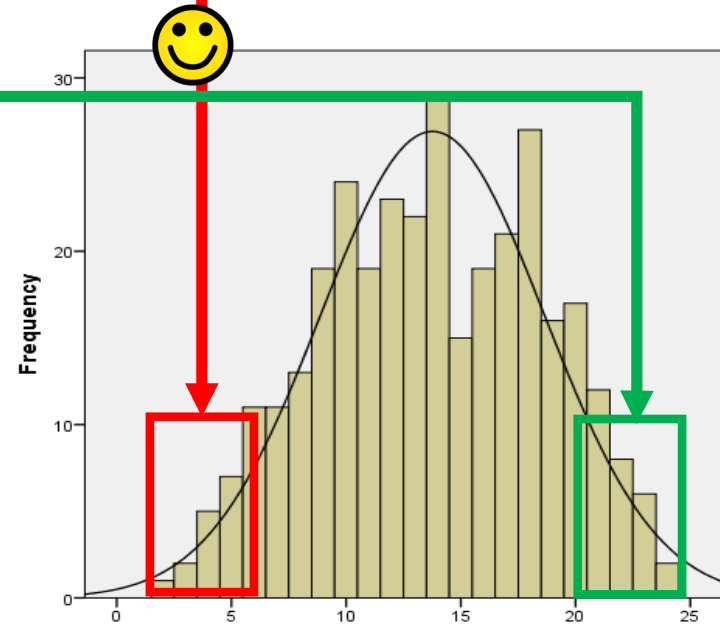
Ställer upp långsiktiga mål



Grit



Inre motivation (NFC)



Kognition



Generiska lärstrategier

Inlärningsstrategi	Beskrivning	Bedömning
Upprepat studerande	Läsa en text om och om igen	Lågeffektiv
Stryka under/över	Stryka under/över ord, meningar	Lågeffektiv
Cramming/ massed practice	Plugga jättemycket på kort tid	Lågeffektivt**

Summering	Summera innehållet från en text	Låg- till medeleffektiv
Begreppskartor	Organisera informationen i hierarkier och kategorier	Medeleffektiv
Inflätat lärande	Alternerar innehåll	Medeleffektivt
Förklarande förhör	Besvara "varför", "hur" och "när"	Medeleffektivt
Visualisering	Skapa inre mentala bilder	Medel- till högeffektiv*
Testbaserat lärande	Framplockning av information från långtidsminnet	Högeffektivt
Distribuerat lärande	Sprida ut sina inlärningsessioner	Högeffektivt



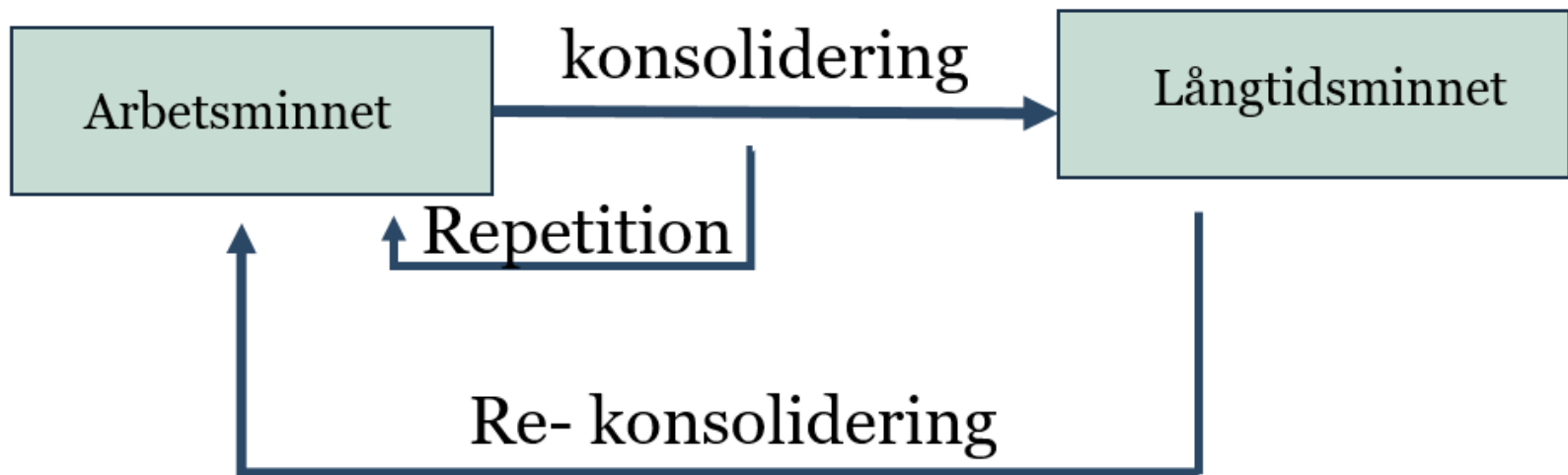
DEN GRUNDLÄGGANDE IDÉN

Hämta information från
långtidsminnet upprepade gånger

“Exercise in repeatedly recalling a thing strengthens the memory” (Aristoteles, ca 310 f.Kr)



TESTBASERAT LÄRANDE (RETRIEVAL PRACTICE):



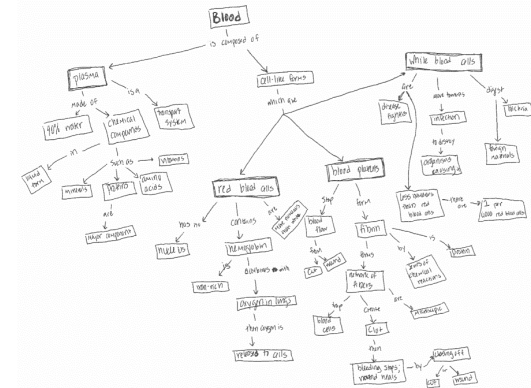
- Karpicke et al (2011) jämförde “testbaserat lärande” med att studera och begreppskartor
- Studenterna läste en text som handlade om blodets uppbyggnad och delades sedan in i fyra oberoende grupper.

1. (Studera) Läste texten en gång

2. (Upprepat studerande) Läste texten fyra gånger

3. (Begrepps kartor) Läste texten och skapade begreppskartor

4. (Testbaserat lärande) Läste texten en gång och fick sedan åtege den två gången efter varandra



- Efter inlärningsfasen: Uppge hur mycket av materialet de trodde att de skulle komma ihåg efter en vecka
- Efter en vecka: Ett summativt papper- och- penna prov
- 14 fakta frågor
- 2 inferensfrågor



Facts:

"What happens when hemoglobin combines with oxygen?"

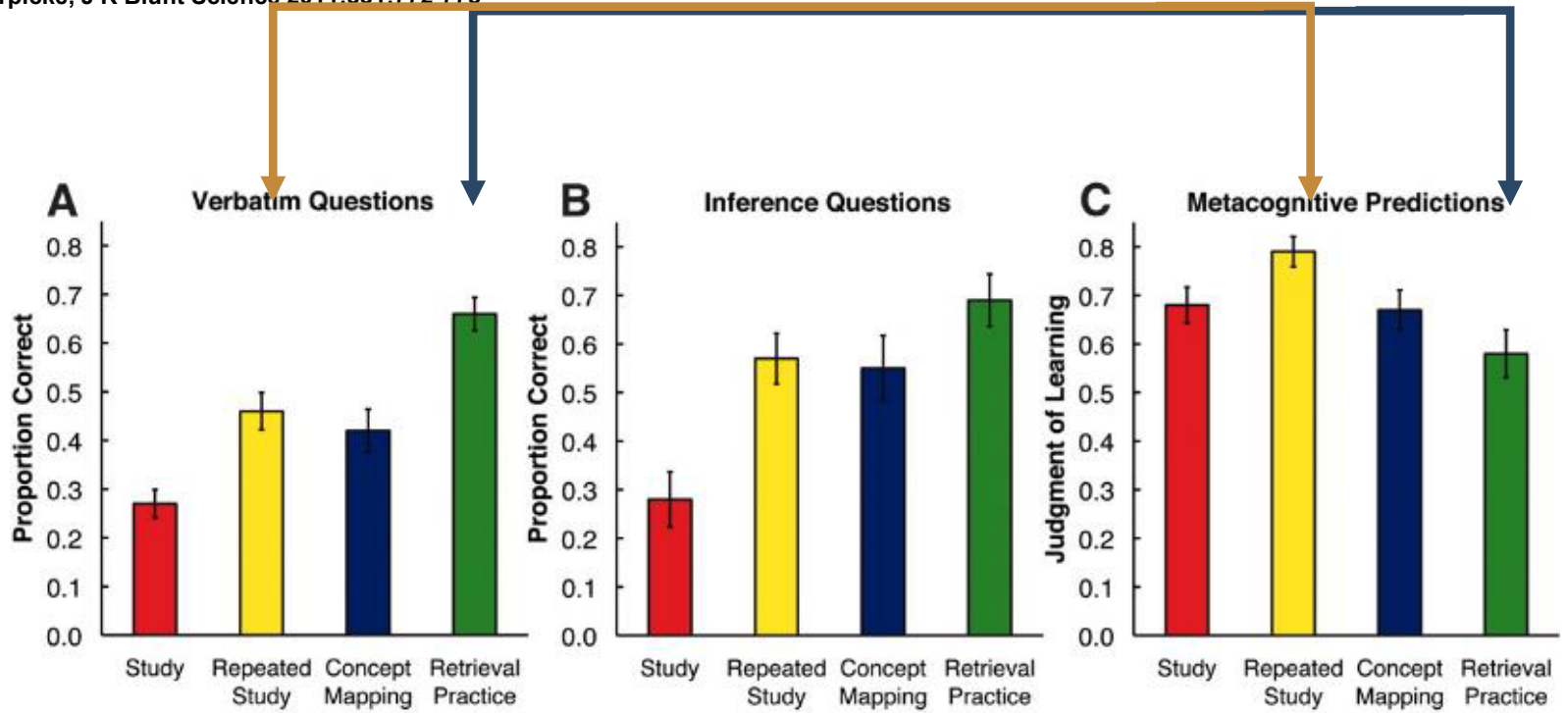
(Answers: Oxygen is released to cells in the body.)

Inference Question:

"What would happen to blood flow from a wound if the body did not have fibrin?"

(Answers: Blood would not clot, because fibrin is needed to form a meshwork of fibers that trap blood cells and aid in clotting.)



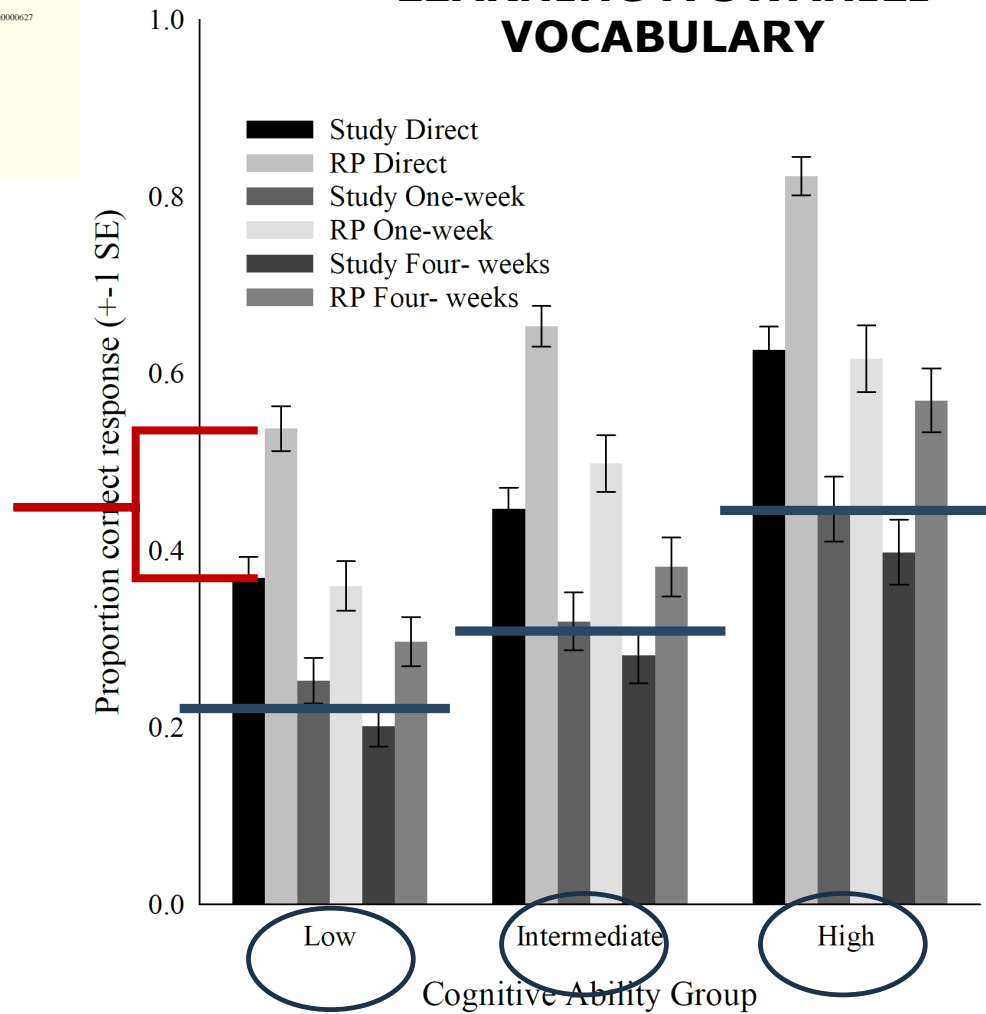


A Learning Method for All: The Testing Effect Is Independent of Cognitive Ability

Bert Jonsson, Carola Wiklund-Hörnqvist, Tova Stenlund, Micael Andersson, and Lars Nyberg
Umeå University



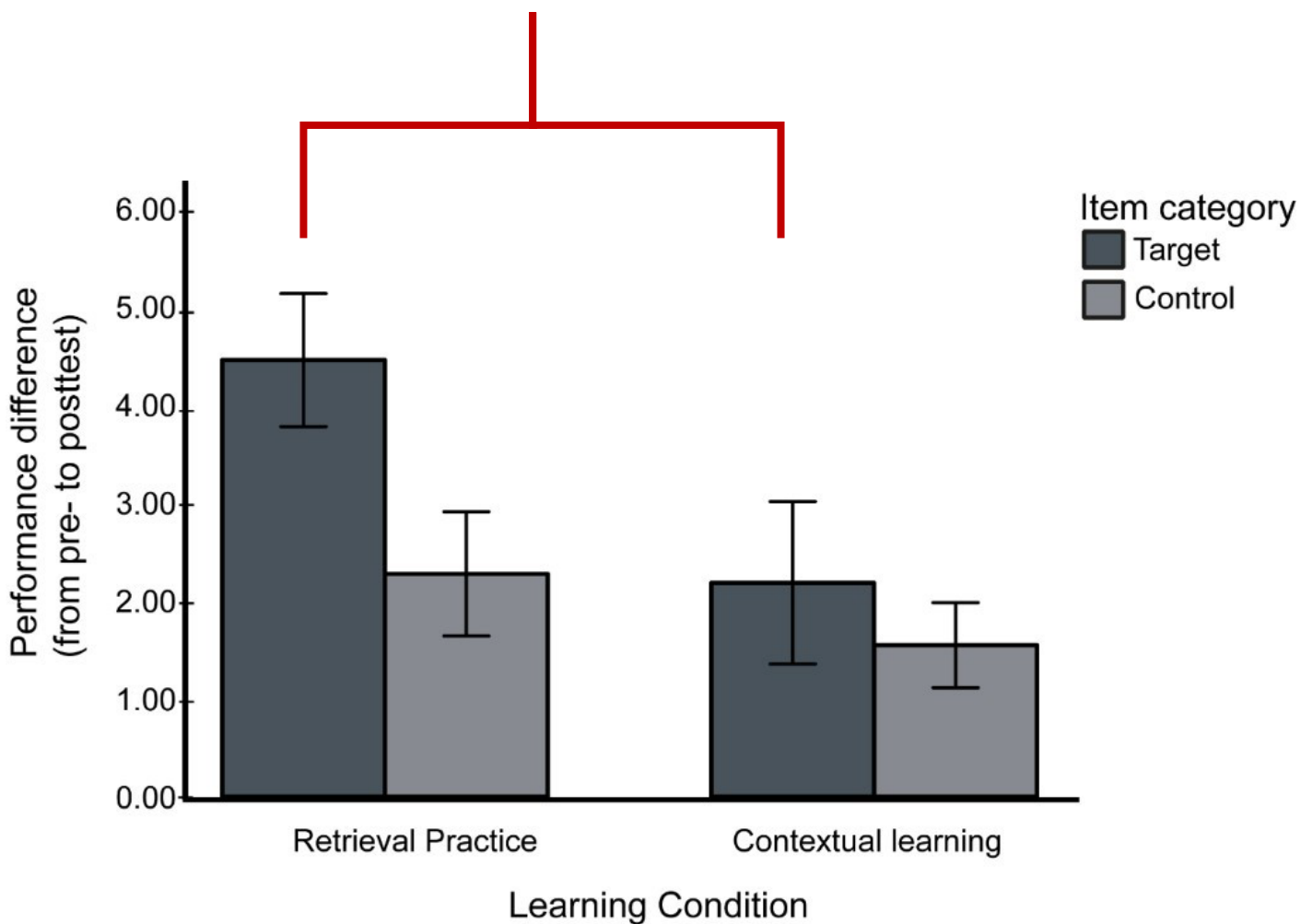
LEARNING A SWAHILI VOCABULARY



Evaluating the Effect of Rich Vocabulary Instruction and Retrieval Practice on the Classroom Vocabulary Skills of Children With (Developmental) Language Disorder

Maria Levlin, Carola Wiklund-Hörnqvist, Olof Sandgren, Sara Karlsson and Bert Jonsson

FÖRÄNDRING I ANTAL KORREKTA SVAR FRÅN FÖR TILL EFTERMÄTNING VID RETRIEVEL PRACTICE OCH KONTEXTUELLT LÄRANDE



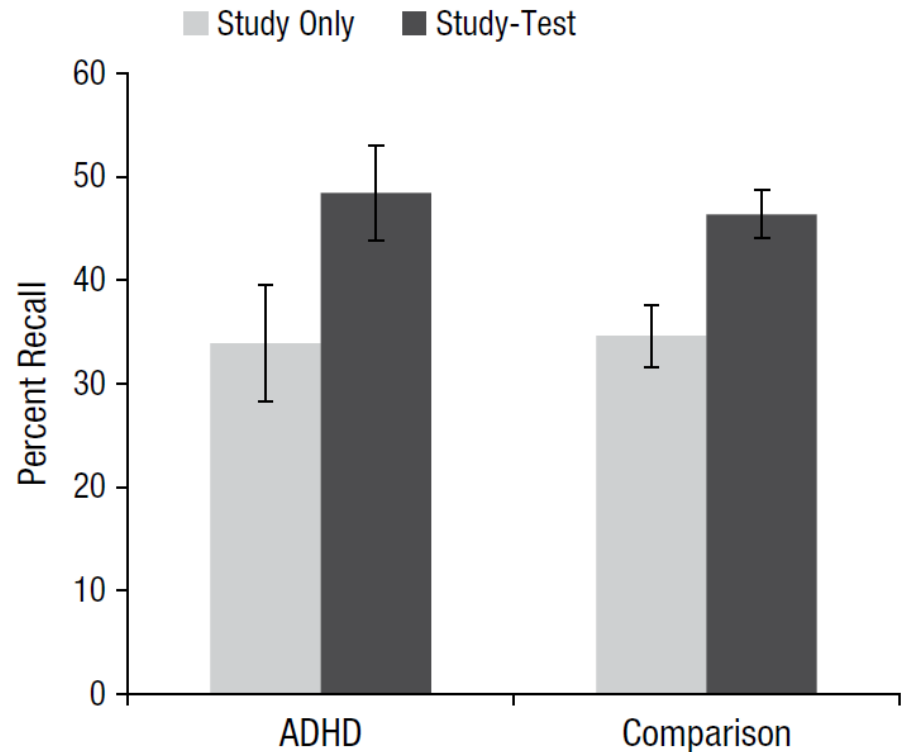
TESTBASERAT LÄRANDE – FUNKERAR DET FÖR ELEVER MED ADHD? (KNOUSE ET AL., 2016; 2020)

Deltagare

- Fastställd ADHD (n=25)
- Matchade ctrl (n=75)

Material & Design (Inomgrupp)

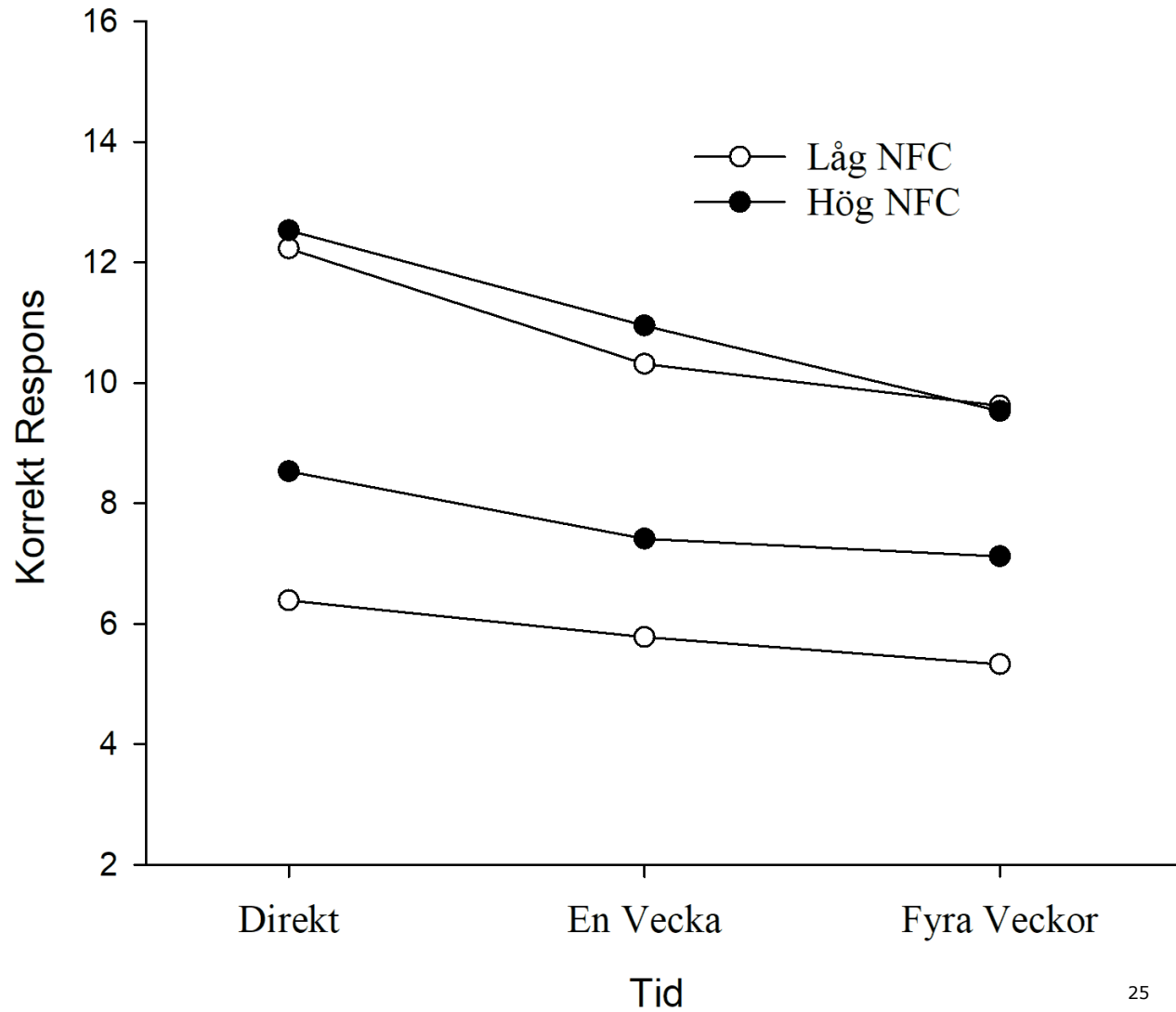
- Lärandematerial:
 - 192 ord/16 kategorier
(48 ord/lista & 8 kategorier)
- Inläring:
 - Studera ordlistor x 8 ggr
 - Studera/Testa x 4/4 ggr
- Test (free recall):
 - 2 dagar senare



Group discussions and test-enhanced learning: individual learning outcomes and personality characteristics

Tova Stenlund^a, Fredrik U. Jönsson^b and Bert Jonsson^a

^aDepartment of Psychology, Umeå University, Umeå, Sweden; ^bDepartment of Psychology, Stockholm University, Stockholm, Sweden



VILKA ÄMNER/ OMRÅDEN PASSAR DET > 500 STUDIER

- Effektivt över olika områden/ämnen;
- **nyckelbegrepp, fakta, prosa, statistik, historia, naturvetenskap, ordförrådsinläring, matematik, kartor** (e.g., Karpicke & Roediger. 2008; Carpenter et al., 2009; Carrier & Pashler, 1992; Lyle & Crawford, 2011; Gossens et al., 2013; Wiklund-Hörnqvist, et al., 2014), vocabulary students with **severe language disorder** (Levlin, M., Wiklund-Hörnqvist, C., et al, 2022).
- Reducerar **mind wandering** (Szpunar, et al., 2018).
- Bättre än andra metoder som **återstudera** (Roediger & Karpicke, 2006), **begreppskartor** (Karpicke & Blunt, 2011) and **gruppdiskussioner** (Stenlund et al., 2017) , **kontextuellt lärande** (Levlin et al. (2022)
- Har bekräftats i **laboratoriestudier, utbildningskontexter** och via **hjärnavbildningsstudier**



REVIEWS/METAANALYSES



Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology

Psychological Science in the Public Interest
14(1) 4–58
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DOI: 10.1177/1529100612453266
<http://pspi.sagepub.com>

John Dunlosky¹, Katherine A. Rawson¹, Elizabeth J. Marsh², Mitchell J. Nathan³, and Daniel T. Willingham⁴

Table 1. Learning Techniques

Technique	Description
1. Elaborative interrogation	Generating an explanation for why an explicitly stated fact or concept is true
2. Self-explanation	Explaining how new information is related to known information, or explaining steps taken during problem solving
3. Summarization	Writing summaries (of various lengths) of to-be-learned texts
4. Highlighting/underlining	Marking potentially important portions of to-be-learned materials while reading
5. Keyword mnemonic	Using keywords and mental imagery to associate verbal materials
6. Imagery for text	Attempting to form mental images of text materials while reading or listening
7. Rereading	Restudying text material again after an initial reading
8. Practice testing	Self-testing or taking practice tests over to-be-learned material
9. Distributed practice	Implementing a schedule of practice that spreads out study activities over time
10. Interleaved practice	Implementing a schedule of practice that mixes different kinds of problems, or a schedule of study that mixes different kinds of material, within a single study session

The Testing Effect in the Psychology Classroom: A Meta-Analytic Perspective

Juliane Schwieren, Jonathan Barenberg and Stephan Dutke

University of Muenster, Institute for Psychology in Education

Psychology Learning & Teaching

0(0) 1–18

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DOI: 10.1177/1475725717695149

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Educational Psychology Review (2021) 33:1409–1453
https://doi.org/10.1007/s10648-021-09595-9

REVIEW ARTICLE



Retrieval Practice Consistently Benefits Student Learning: a Systematic Review of Applied Research in Schools and Classrooms

Pooja K. Agarwal¹  · Ludmila D. Nunes²  · Janell R. Blunt³ 

Accepted: 11 January 2021 / Published online: 14 March 2021

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REVIEW
published: 08 February 2021
doi: 10.3389/feduc.2019.00005



Retrieval Practice in Classroom Settings: A Review of Applied Research

Bruna Fernanda Tolentino Moreira, Tatiana Salazar Silva Pinto, Daniela Siqueira Veloso Starling and Antônio Jaeger*

Department of Psychology, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

Educational Psychology Review (2021) 33:959–987
https://doi.org/10.1007/s10648-020-09572-8

META-ANALYSIS



A Meta-Analytic Review of the Benefit of Spacing out Retrieval Practice Episodes on Retention

Alice Latimier¹  · Hugo Peyre^{1,2,3} · Franck Ramus¹

Accepted: 6 September 2020 / Published online: 7 October 2020

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REVIEWS



The science of effective learning with spacing and retrieval practice

Shana K. Carpenter^{1,2,3} , Steven C. Pan²  and Andrew C. Butler^{4,4} 

Abstract | Research on the psychology of learning has highlighted straightforward ways of enhancing learning. However, effective learning strategies are underused by learners. In this Review, we discuss key research findings on two specific learning strategies: spacing and retrieval practice. We focus on how these strategies enhance learning in various domains across the lifespan, with an emphasis on research in applied educational settings. We also discuss key findings from research on metacognition — learners' awareness and regulation of their own learning. The underuse of effective learning strategies by learners could stem from false beliefs about learning, lack of awareness of effective learning strategies or the counter-intuitive nature of these strategies. Findings in learner metacognition highlight the need to improve learners' subjective mental models of how to learn effectively. Overall, the research discussed in this Review has important implications for the increasingly common situations in which learners must effectively monitor and regulate their own learning.



MINI REVIEW ARTICLE
published: 04 April 2014
doi: 10.3389/fpsyg.2014.00286



Retrieval practice enhances new learning: the forward effect of testing

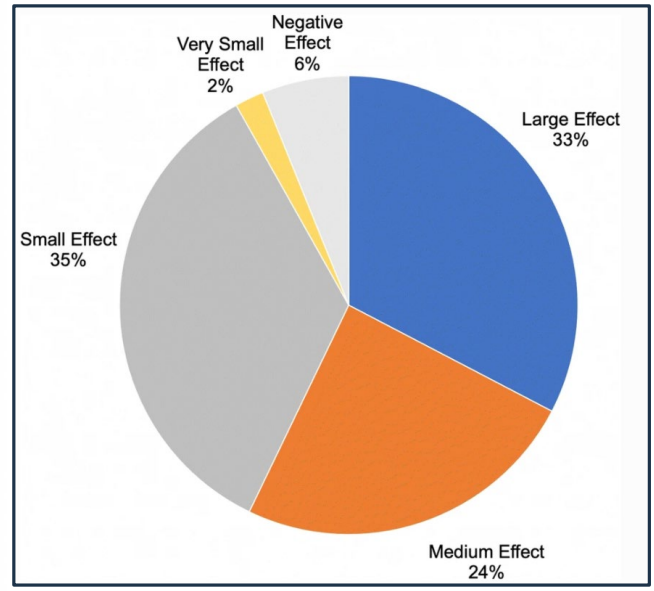
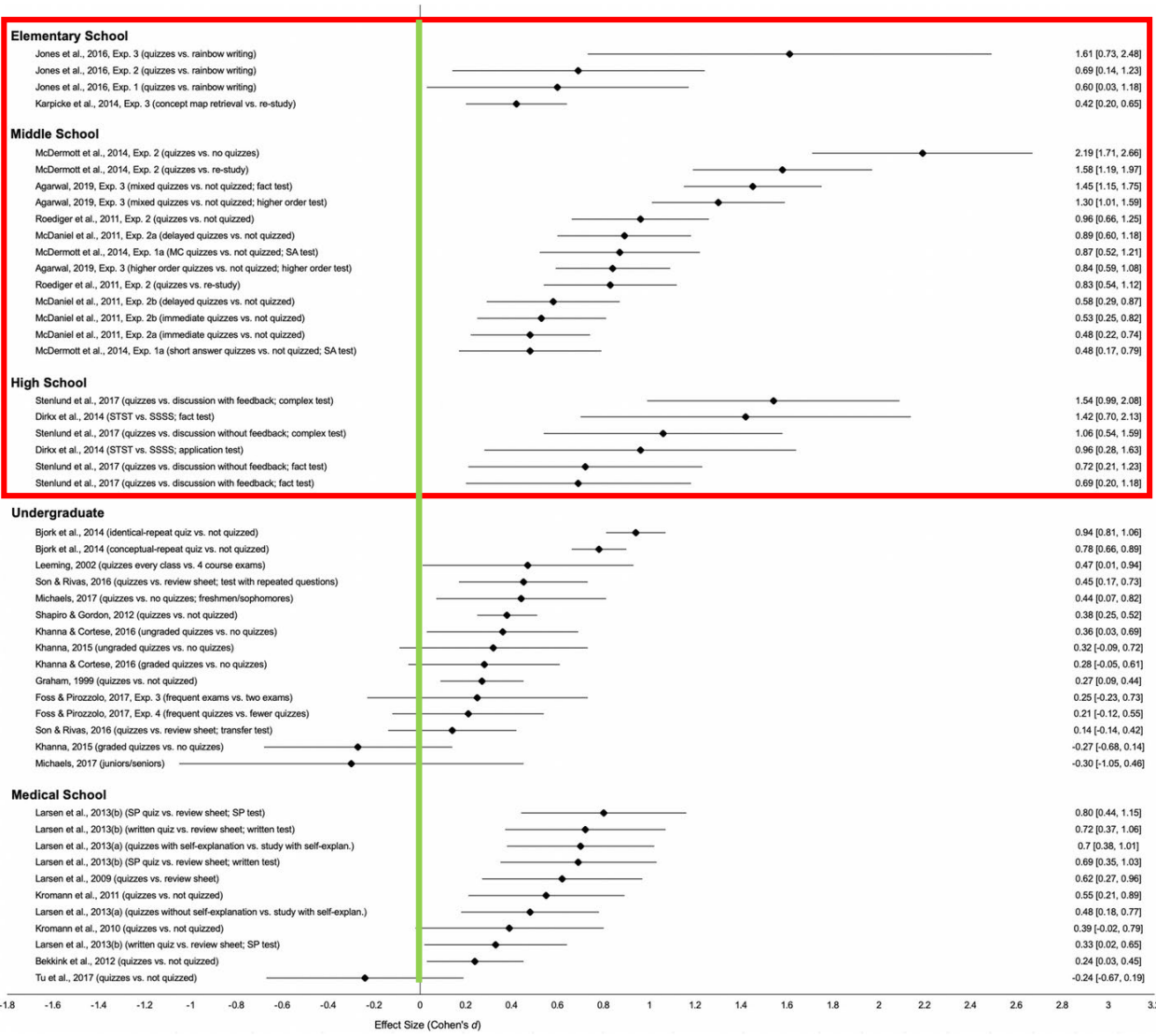
Bernhard Pastötter* and Karl-Heinz T. Bäuml

Department of Experimental Psychology, Regensburg University, Regensburg, Germany



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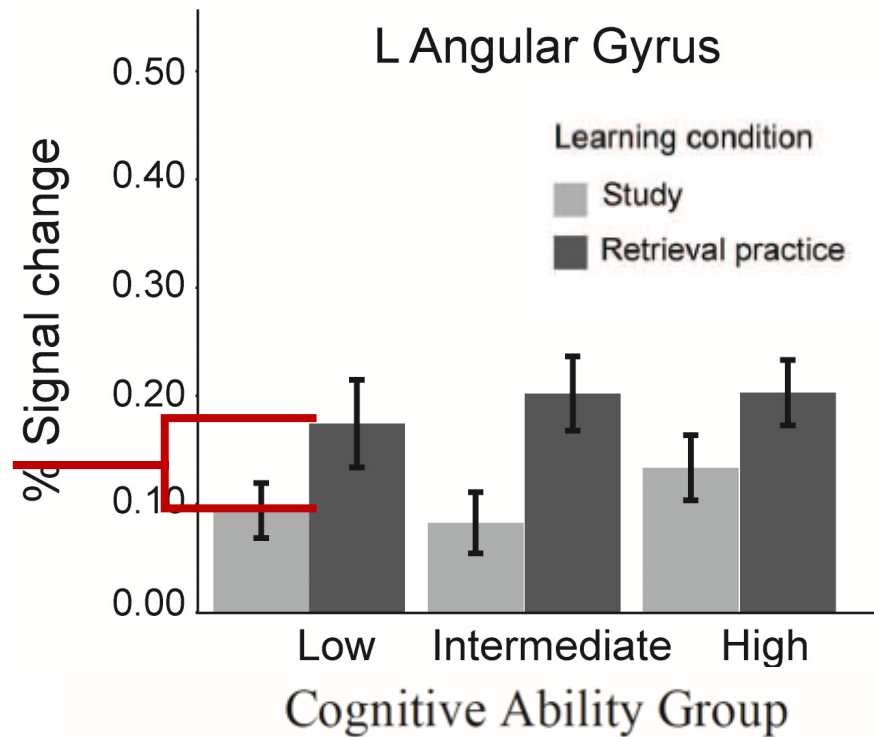
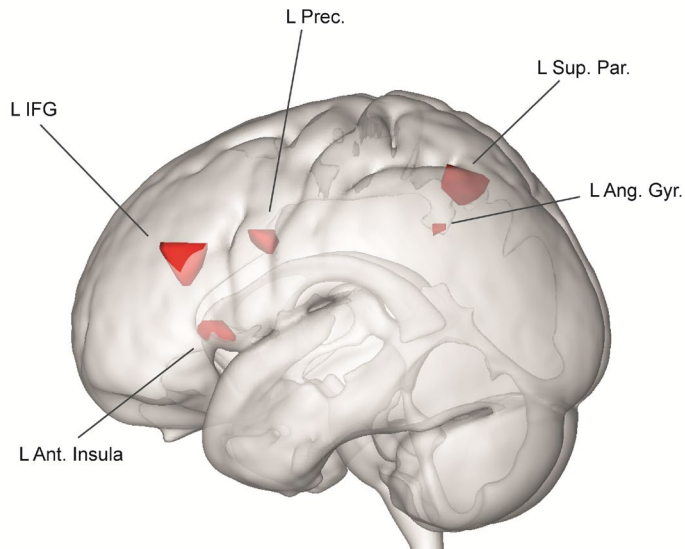
VILKA ÅLDRAR PASSAR DET FÖR?



A Learning Method for All: The Testing Effect Is Independent of Cognitive Ability

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Umeå University

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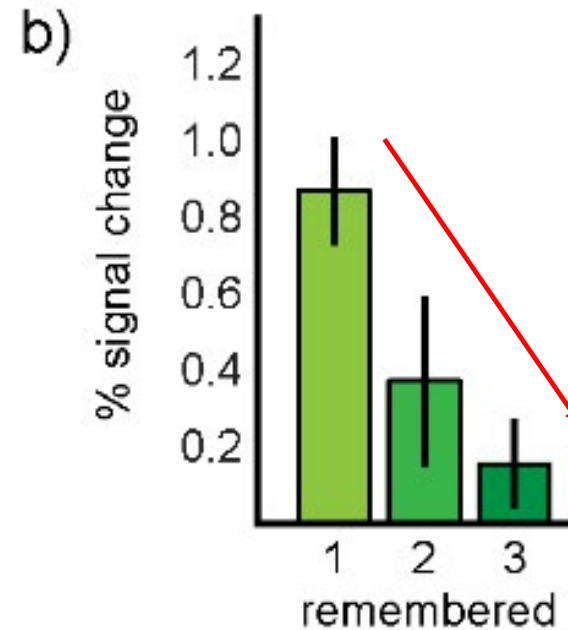
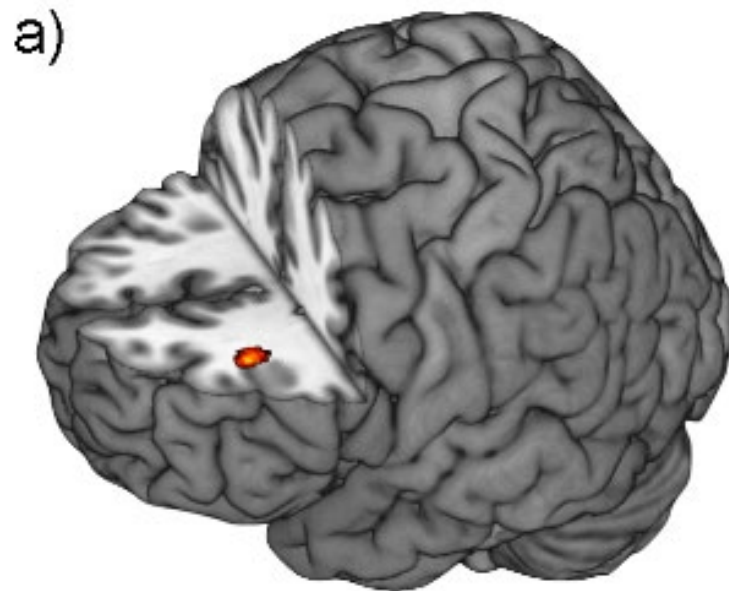
Signalreduktion prefrontal kortex

Behavioral/Cognitive

Lesser Neural Pattern Similarity across Repeated Tests Is Associated with Better Long-Term Memory Retention

Linnea Karlsson Wirebrink,^{1,2,4} Carola Wiklund-Hörnqvist,^{2,4} Johan Eriksson,^{1,2} Micael Andersson,^{1,2} Bert Jonsson,⁴ and Lars Nyberg^{1,2,3}

¹Department of Integrative Medical Biology, ²Umeå Center for Functional Brain Imaging (UFBI), ³Department of Radiation Sciences, and ⁴Department of Psychology, Umeå University, 901 87 Umeå, Sweden



**Aktivering går ner i
exekutiva områden**



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Varför väljer elever ineffektiva lärandestrategier?

1. Good strategies = Enhanced performance
2. Active strategies better than passive strategies



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KUNSKAP OM LÄRSTRATEGIER

- **Elever/studenter** känner ofta inte till att det finns bättre och sämre lärstrategier
- **Lärare** känner vanligtvis inte till vilka lärstrategier som är bra och varför (Hartwig & Dunlosky, 2012; Karpicke et al., 2009; Surma et al., 2018)
- Även om elever får lära sig **bra strategier** så bibehåller många av dem tron egna **dåliga strategier** (Biwer, de Bruin, et al., 2020; Finelli et al., 2018).
- **Kognitivt resurssvagare** tenderar att använda sämre strategier (eller inga alls)
 - tenderar att överskatta sin egen förmåga i högre grad (te x. Ehrlinger et al., 2008).
- **Socioekonomiska** faktorer spelar sannolikt en stor roll



EXEMPEL PÅ AKTIVITETER

**TÄNK: HUR KAN JAG AKTIVERA
INKODNING- FRAMPLOCKNING
PROCESSEN**

