

# Similarity- and Rule-based Generalization

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# Relationship between cognitive load and learning

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- ▶ Reduction in capacity for deliberative thought
  - ▶ From deliberative thought to a simpler associative system
    - ▶ Le Pelley, Oakeshott & McLaren (2005)
    - ▶ COVIS (Ashby et al., 1998 et seq.)
  - ▶ Less deliberation
    - ▶ Milton, Wills & Longmore (2008); Milton, Wills & Hodgson (2009); Wills, Longmore & Milton (submitted).
    - ▶ De Houwer & Beckers (2003); Mitchell, De Houwer & Lovibond (2009).
- ▶ Current studies – examples of a reversal in generalization behaviour due to cognitive load; explicable in this way.



# Shanks & Darby (1998)

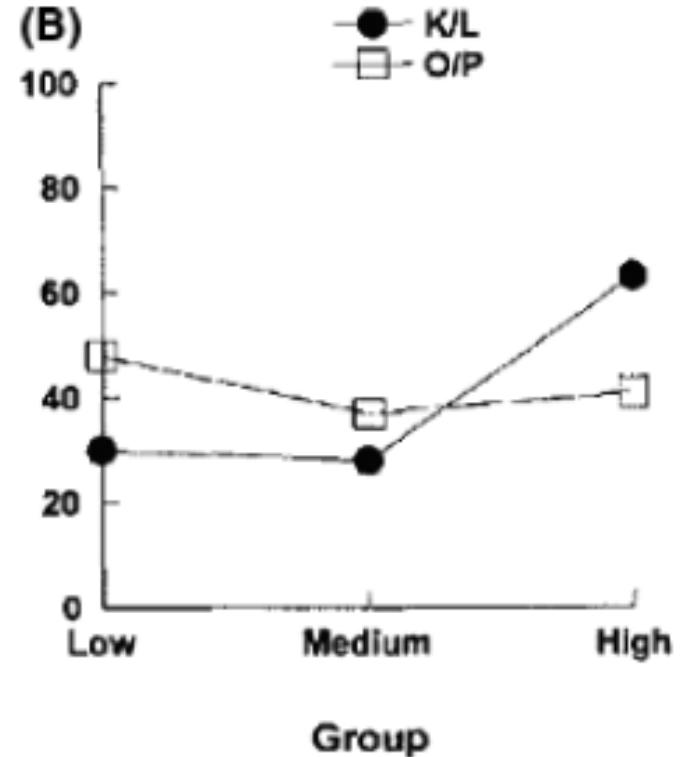
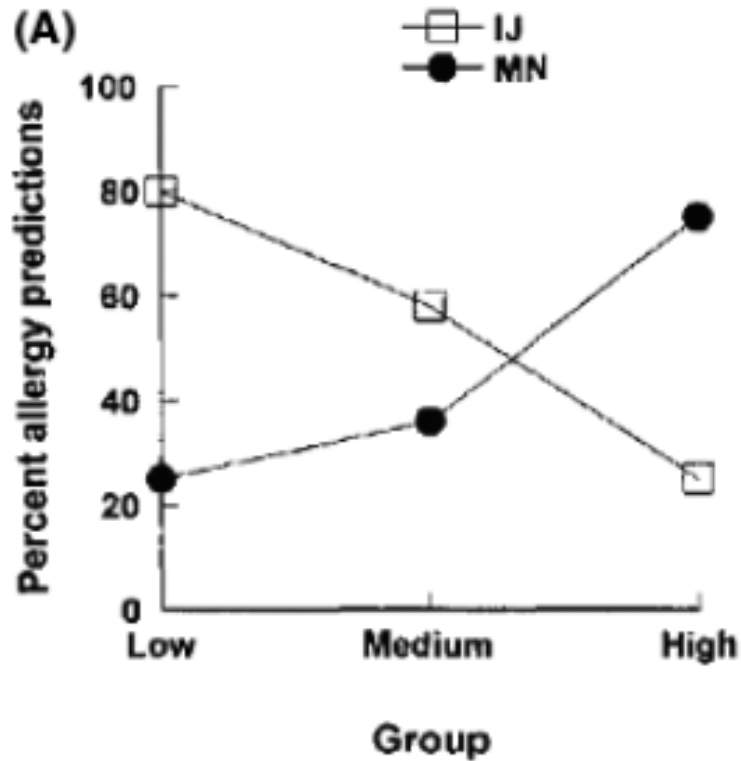
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<u>Training</u>			<u>Test</u>		
A+	B+	AB-	A?	B?	AB?
C-	D-	CD+	C?	D?	CD?
E+	F+	EF-	E?	F?	EF?
G-	H-	GH+	G?	H?	GH?
<b>I+</b>	<b>J+</b>		I?	J?	<b>IJ?</b>
		<b>KL-</b>	<b>K?</b>	<b>L?</b>	KL?
<b>M-</b>	<b>N-</b>		M?	N?	<b>MN?</b>
		<b>OP+</b>	<b>O?</b>	<b>P?</b>	OP?



# Shanks & Darby (1998)

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- ▶ I+ J+ M- N- OP+ KL-
  - ▶ Percentage allergy responses at test
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# Concurrent load task

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6..2..9..1..4..3

Mr. X consumes  
a meal containing  
oranges

C = Reaction    M = no reaction

Correct.  
Mr. X had a reaction

9

The correct response  
to “9” on this trial is  
“1”.



# Some details

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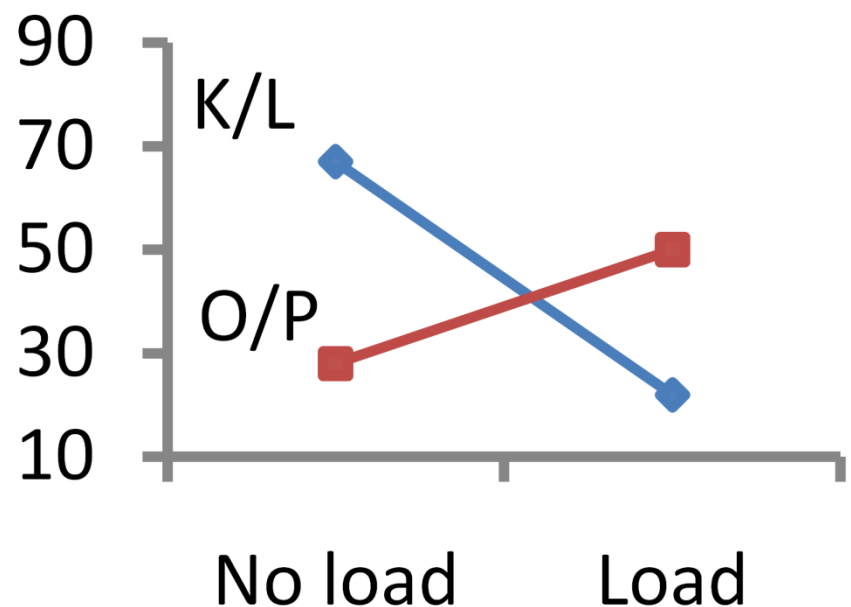
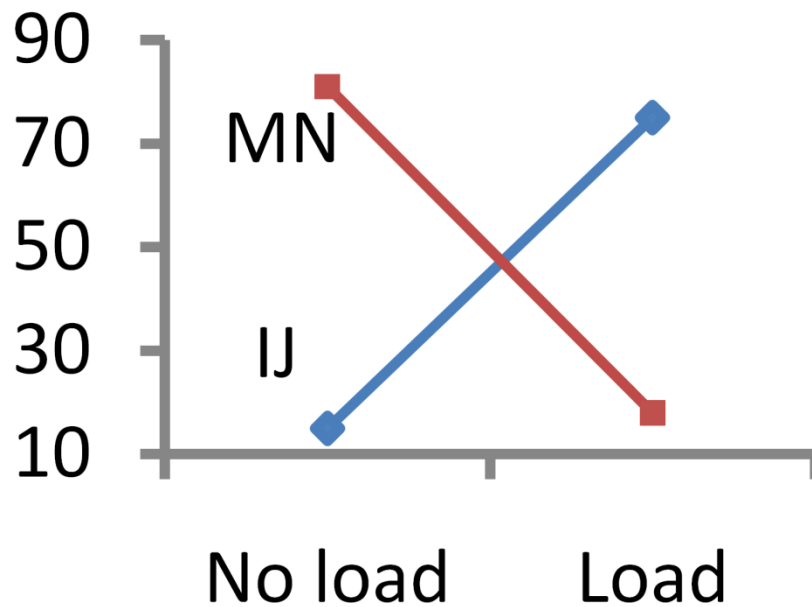
- ▶ 32 participants.
- ▶ Trained to criterion (86%).
- ▶ 7 participants failed to meet criterion within 16 blocks and were excluded.
- ▶ Concurrent load participants took longer (14.2 vs. 9.2 blocks).



# Experiment 1: Concurrent load

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- ▶ I+ J+ M- N- OP+ KL-
- ▶ Percentage allergy responses at test



## Experiment 2: Working memory capacity

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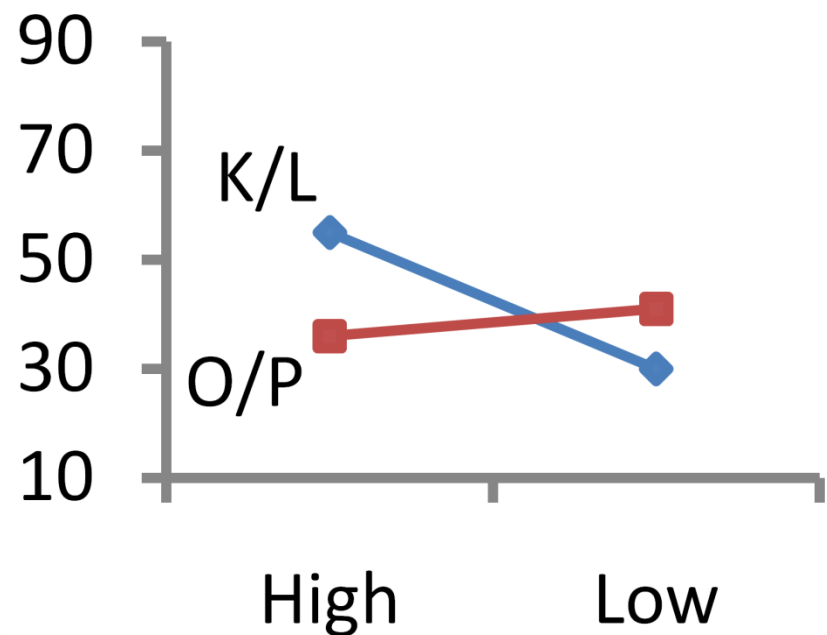
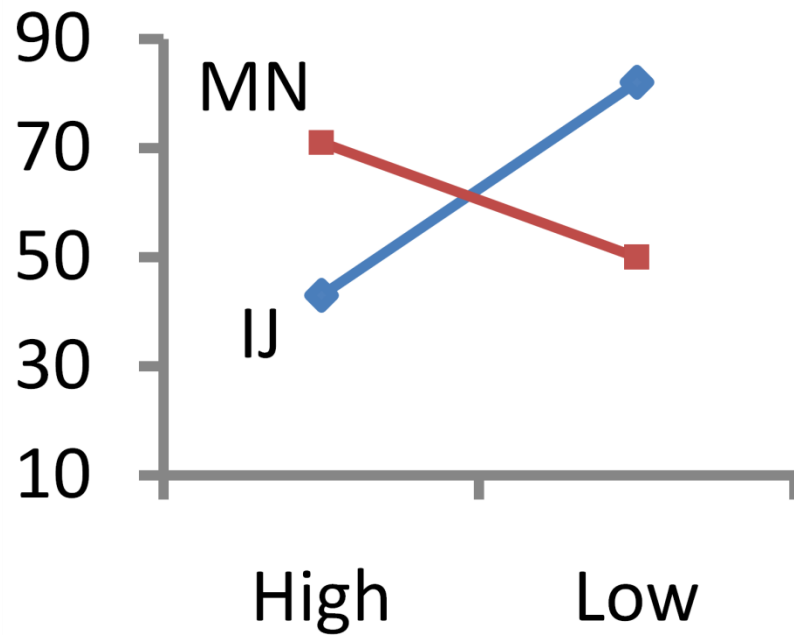
- ▶ No concurrent load task
- ▶ Long, fixed training (16 blocks).
- ▶ Measured working memory capacity, after allergy prediction task.
  - ▶ Used OSPAN. Well validated and widely used measure of working memory capacity
  - ▶  $6+(2 \times 3)=12$  (Y/N), flower,  $4+(6 \times 2)=18$  (Y/N), concrete....
- ▶ Top-third vs. bottom third split on OSPAN



## Experiment 2: Working memory capacity

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- ▶ I+ J+ M- N- OP+ KL-
- ▶ Percentage allergy responses at test



# Summary

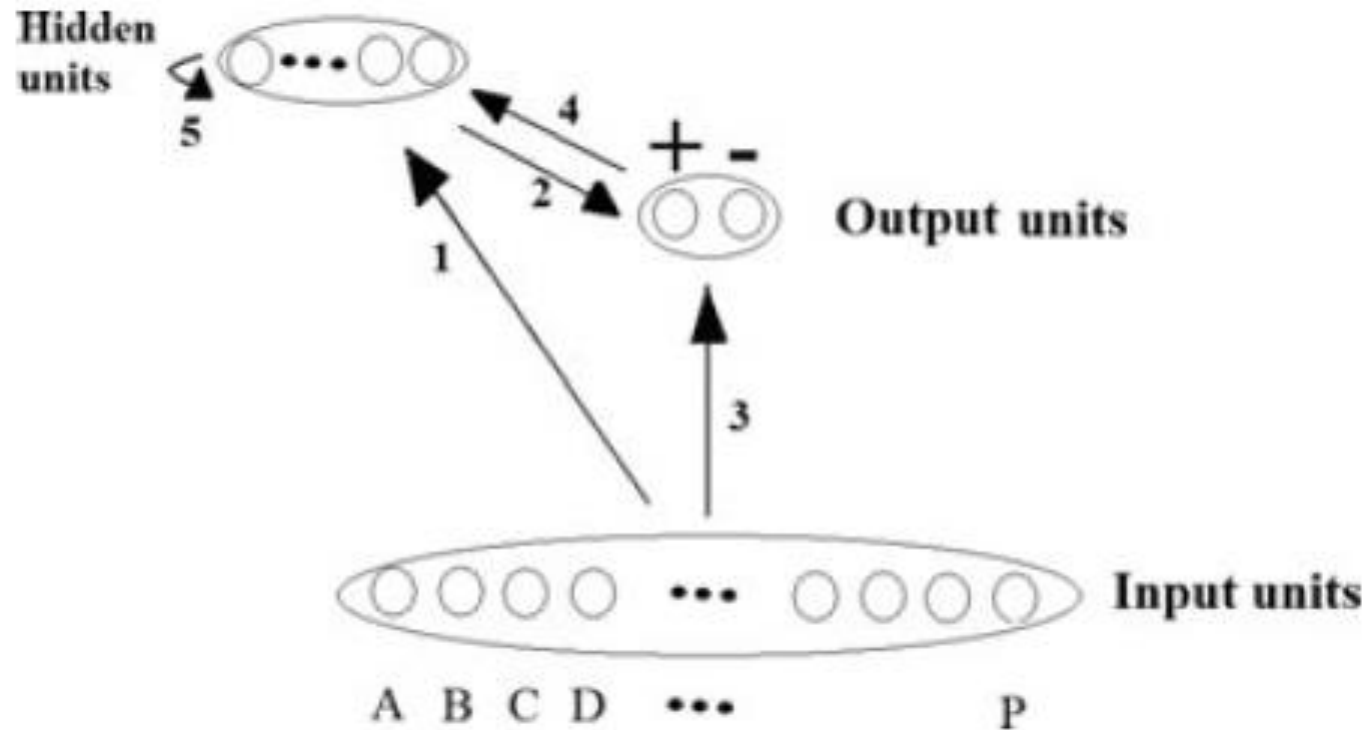
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- ▶ Concurrent load, low WMC lead to generalization on the basis of similarity.
- ▶ Full attention, high WMC lead to generalization on the basis of an anti-similarity rule.
- ▶ Some possible explanations:
  - ▶ Competition between qualitatively different learning systems.
  - ▶ Reduction in extent of deliberative processing.



# Deliberative processing as recurrence

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- ▶ Verguts & Fias (2009)
- ▶ Dehaene et al. (2006)
- ▶ Milton & Wills (2004)

