A Review of Best Practices In the Field of Human Learning with Respect to Behavioral Interventions to Enhance Cognition

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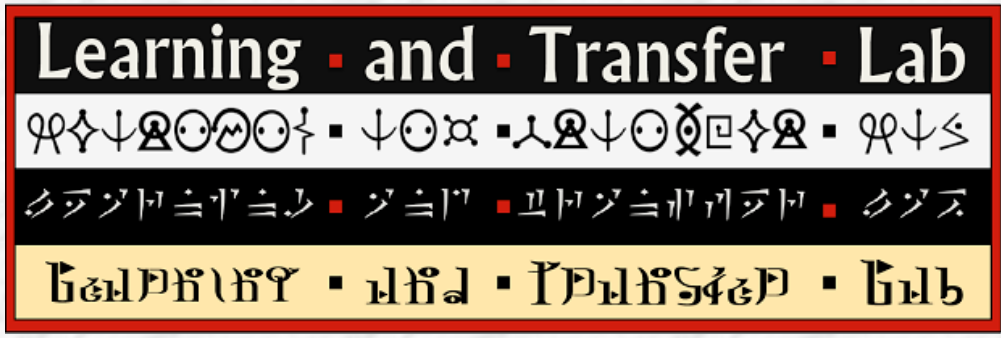

Learning

- the acquisition of new knowledge, skills, or responses that arise via experience or practice, and which result in a relatively permanent change in the state of the learner

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relatively permanent change…

→ Increases in aggression?

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Variable	Content	Baseline	4 mins after play
Aggressive feelings**	Violent	61.65 (10.21)	71.80 (15.62)
	Nonviolent	63.69 (10.98)	65.46 (13.45)
Aggressive thoughts**	Violent	4.93 (1.81)	6.41 (2.22)
	Nonviolent	5.76 (2.10)	4.63 (2.16)
Heart rate**	Violent	76.76 (14.84)	86.80 (20.16)
	Nonviolent	78.15 (13.18)	77.93 (9.45)

relatively permanent change…

→ Increases in aggression?

Variable	Content	Baseline	4 mins after play	9 mins after play
Aggressive feelings**	Violent	61.65 (10.21)	71.80 (15.62)	62.77 (9.41)
	Nonviolent	63.69 (10.98)	65.46 (13.45)	62.06 (12.93)
Aggressive thoughts**	Violent	4.93 (1.81)	6.41 (2.22)	5.09 (2.02)
	Nonviolent	5.76 (2.10)	4.63 (2.16)	5.83 (2.03)
Heart rate**	Violent	76.76 (14.84)	86.80 (20.16)	82.31 (16.85)
	Nonviolent	78.15 (13.18)	77.93 (9.45)	74.39 (9.51)

Best Practices…

- In producing learning
- In producing generalization of learning
- In doing experiments to show generalization of learning

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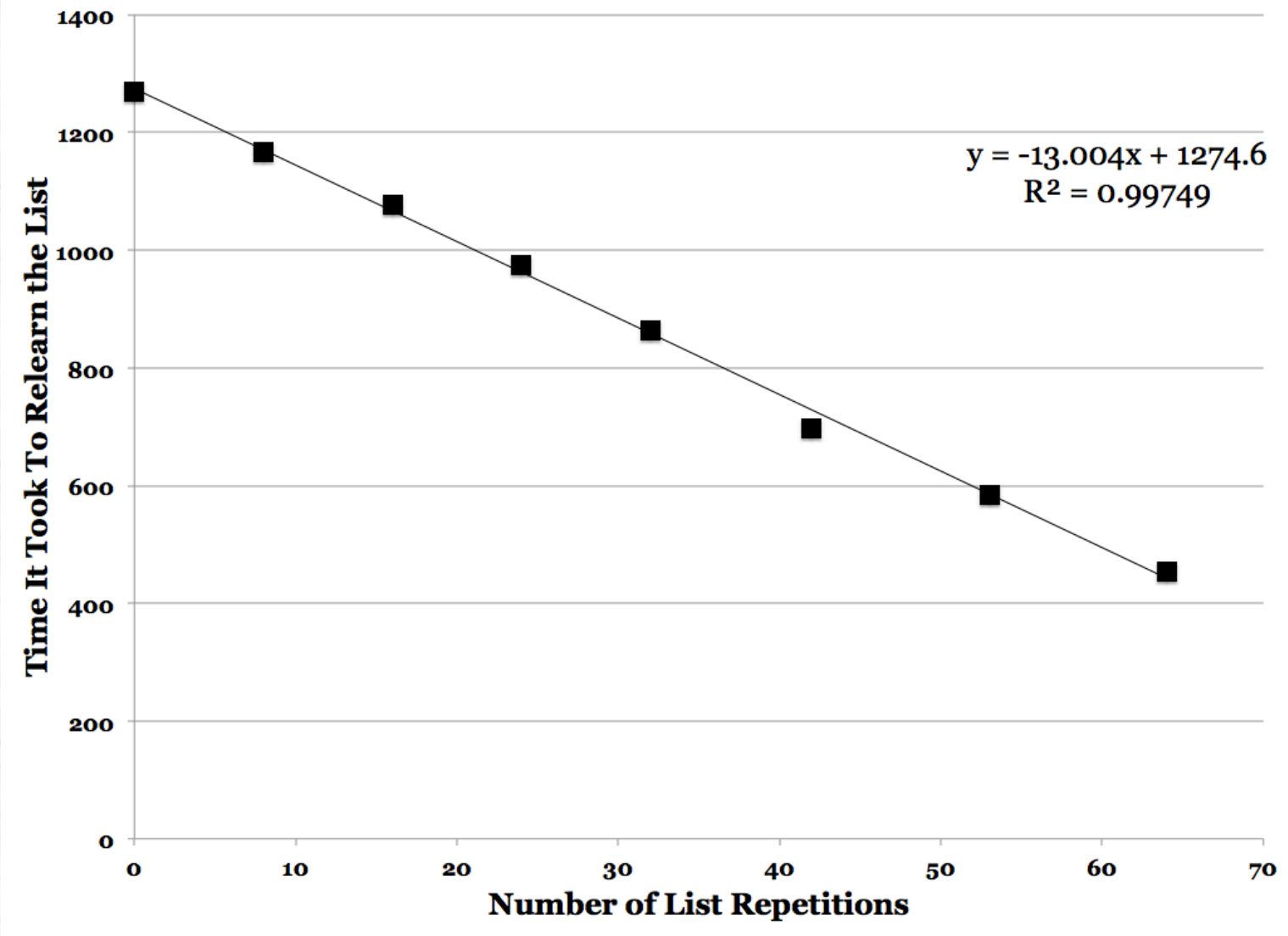
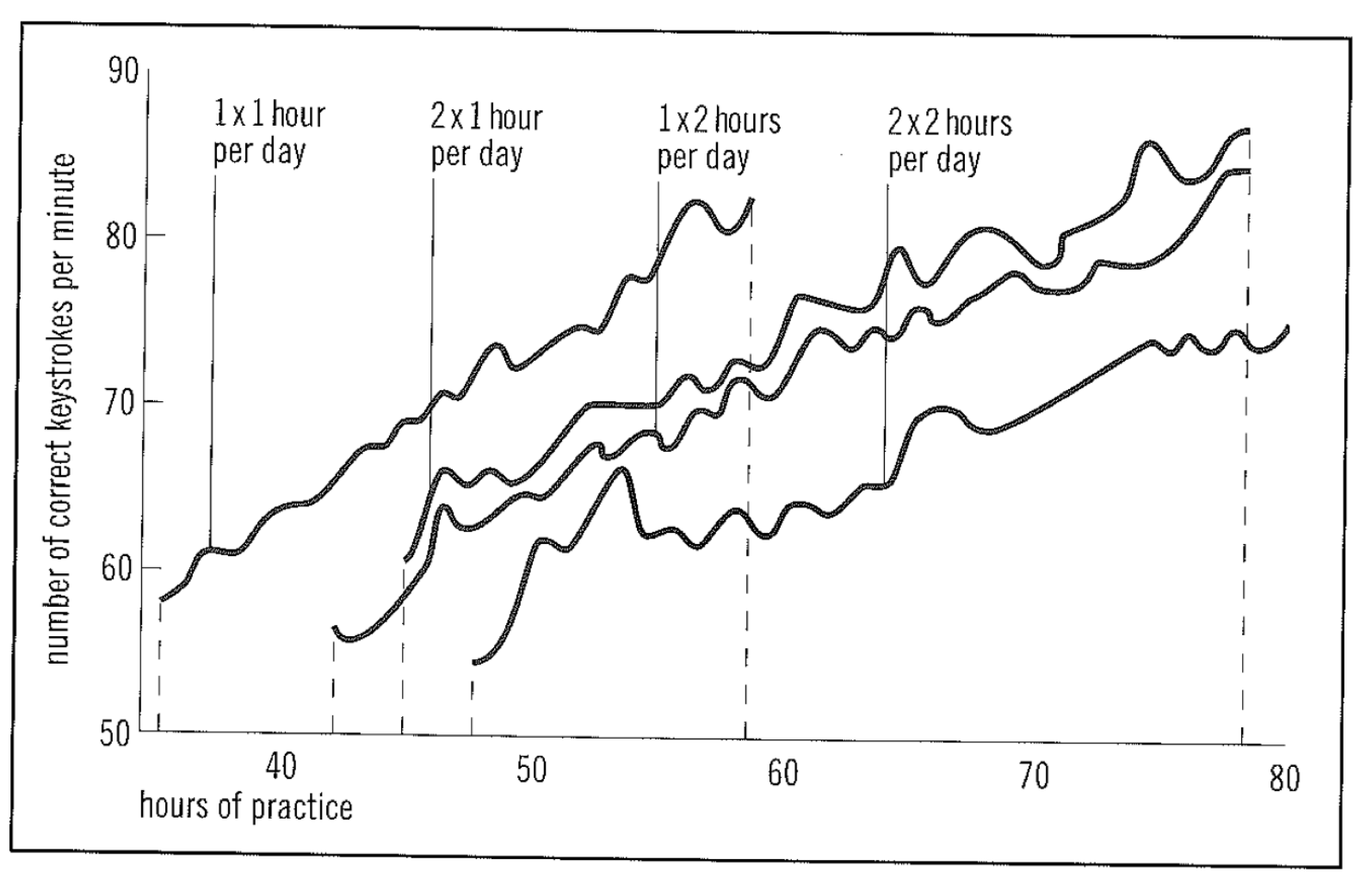
More Practice Time = More Learning

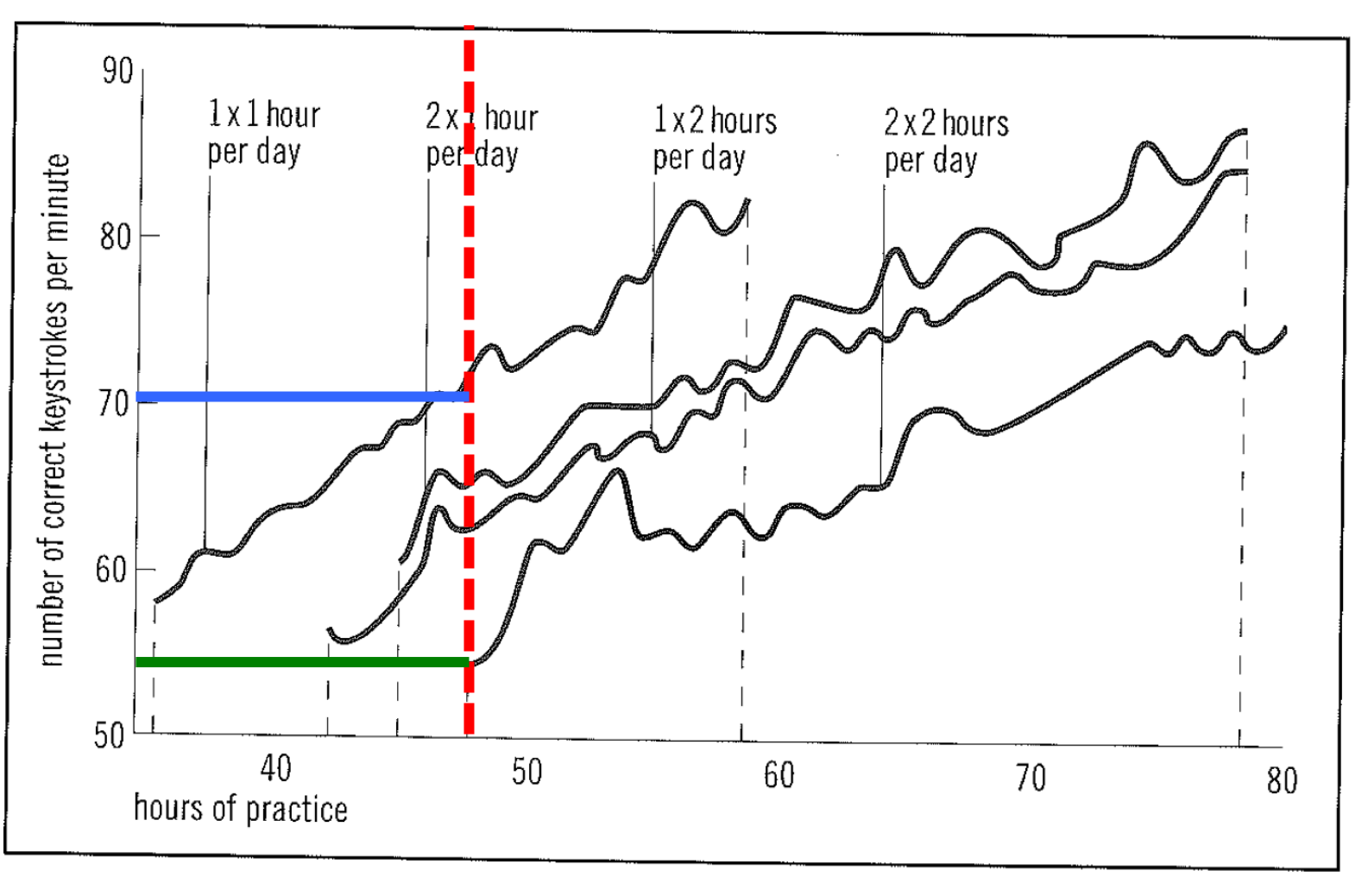
The Total Time Hypothesis



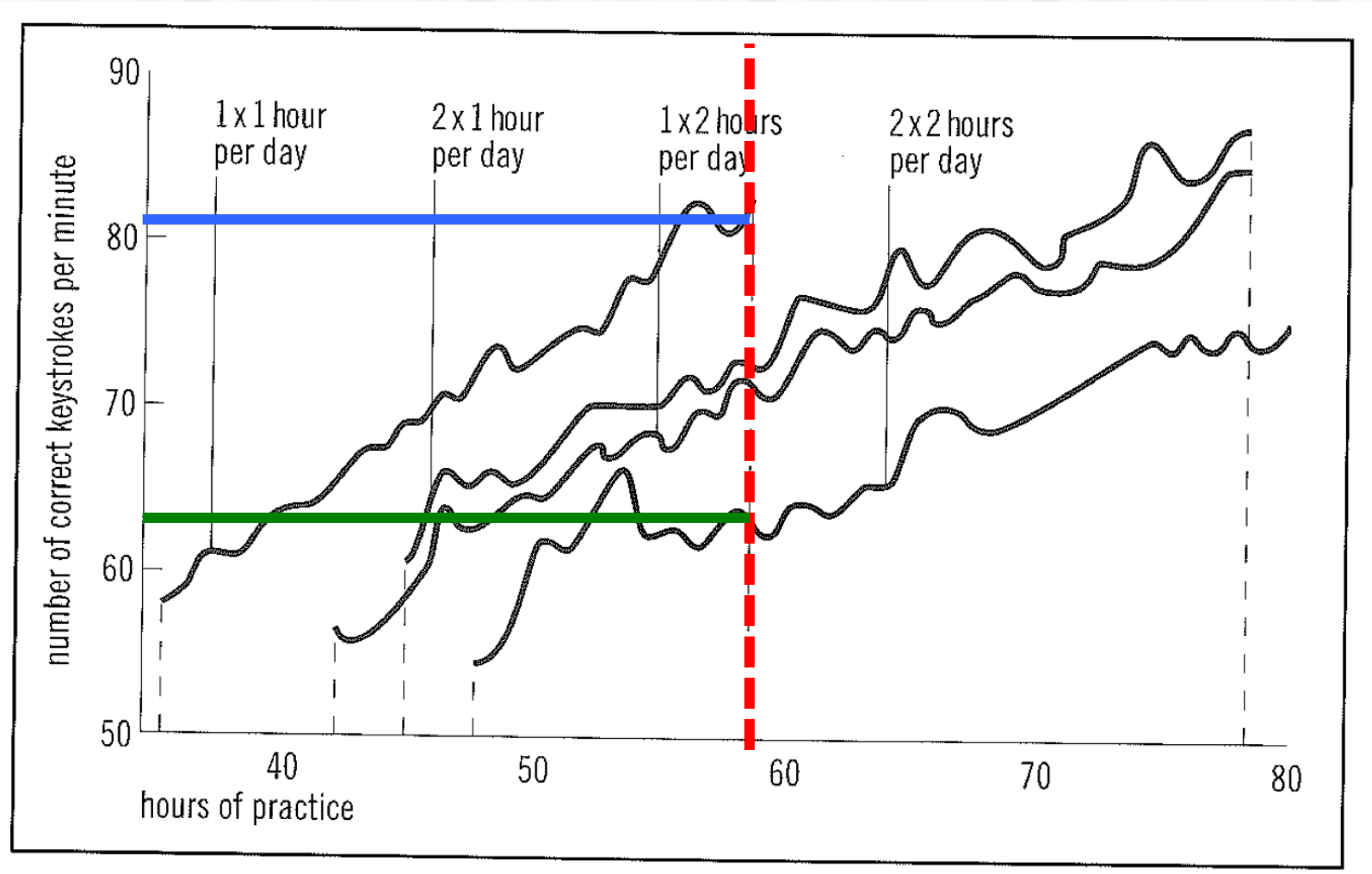
Distributed > Massed Practice



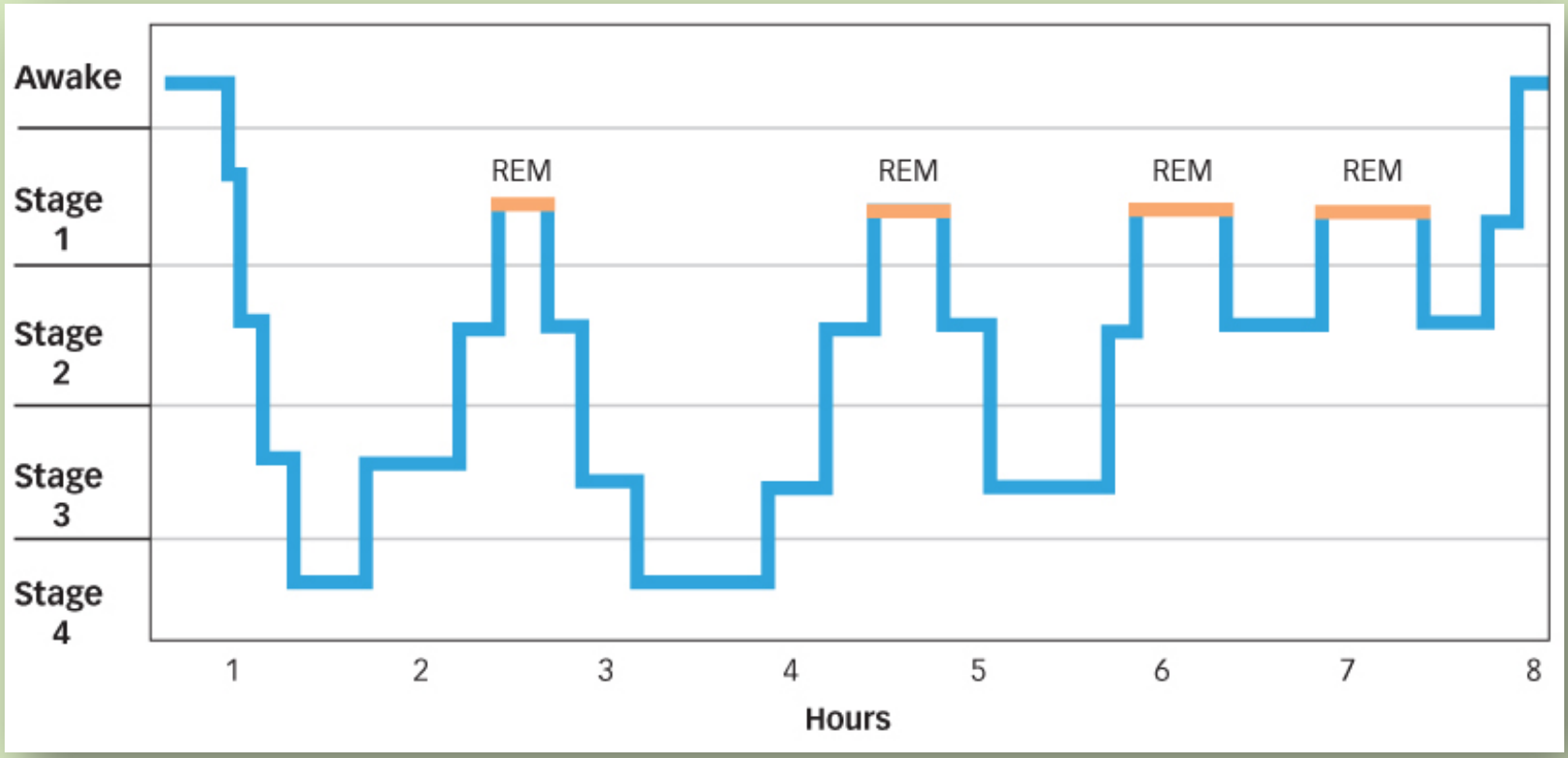
Distributed > Massed Practice



Distributed > Massed Practice



Sleep


Awake
Stage 1
Stage 2
Stage 3
Stage 4
REM
REM
REM
REM
1
2
3
4
5
6
7
8
Hours

Task Difficulty

Learning typically proceeds best when the task is difficult (and thus errors are made), but not impossible (otherwise errors might be uninformative)

- Implicit in all training that uses adaptive difficulty algorithms (e.g., staircases)

Explicit Feedback

- Learning typically proceeds best when feedback is immediate and informative
  - Implicit here is that the learning task is an active one – an action/decision is made and a consequence observed (as opposed to passive observation)

Best Practices…

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- In doing experiments to show generalization of learning

Effects of Context

	Study Location #1	Study Location #2	Recall Location
Group #1:	Basement Room	Basement Room	Class Room
Group #2:	Basement Room	Courtyard Room	Class Room

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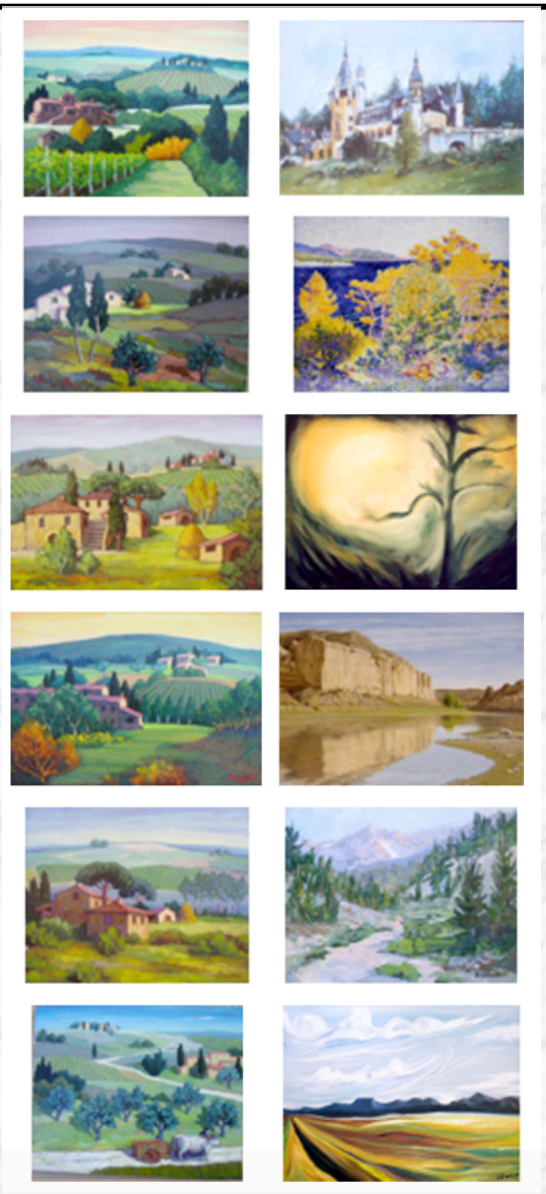
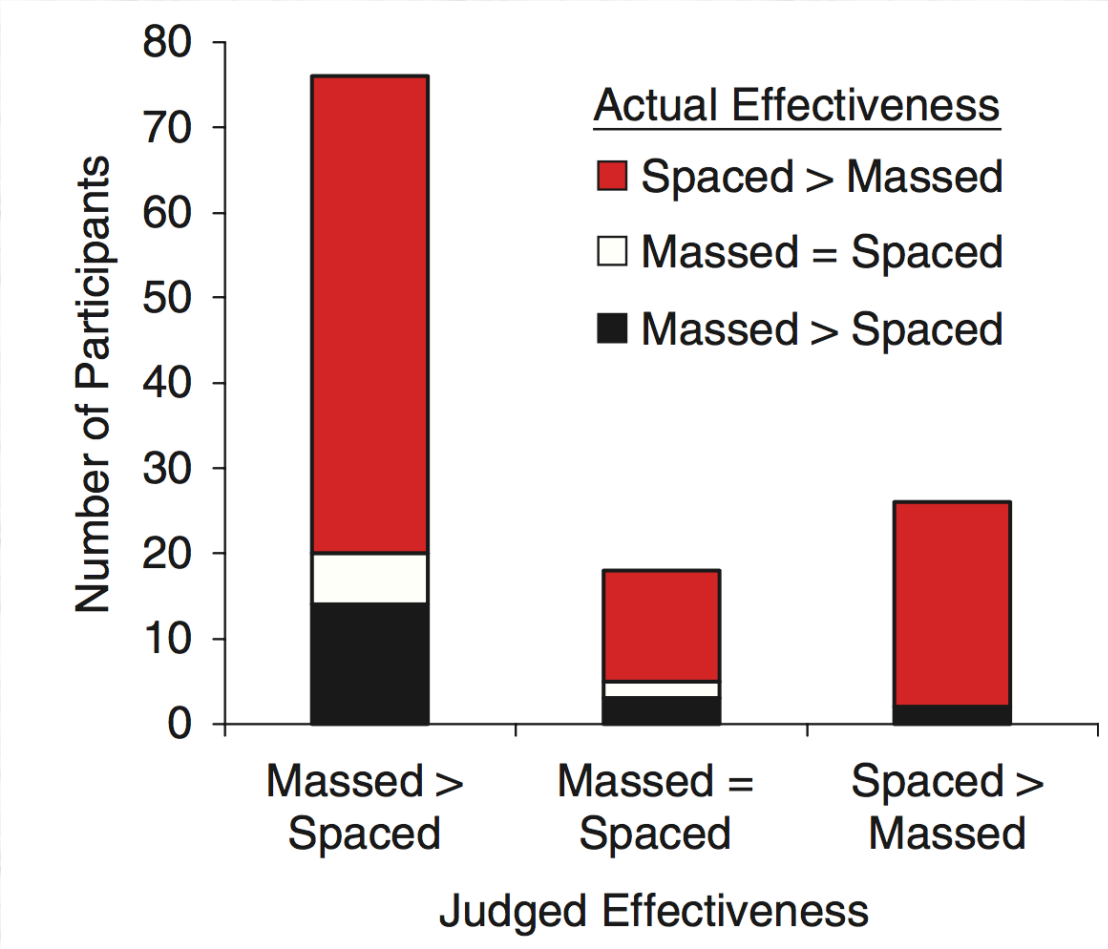
	Study Location #1	Study Location #2	Recall Location
Group #1:	Basement Room	Basement Room	Class Room
Group #2:	Basement Room	Courtyard Room	Class Room

Group #1: Recalled on average 16 words

Group #2: Recalled on average 24 words

Effects of Interleaving Material





Best Practices…

- In producing learning
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- **In doing experiments to show generalization of learning**

Functional Form of Learning

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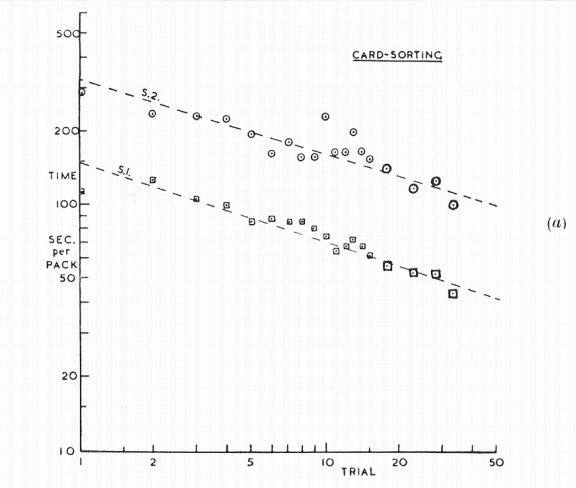
- Power Law of Practice

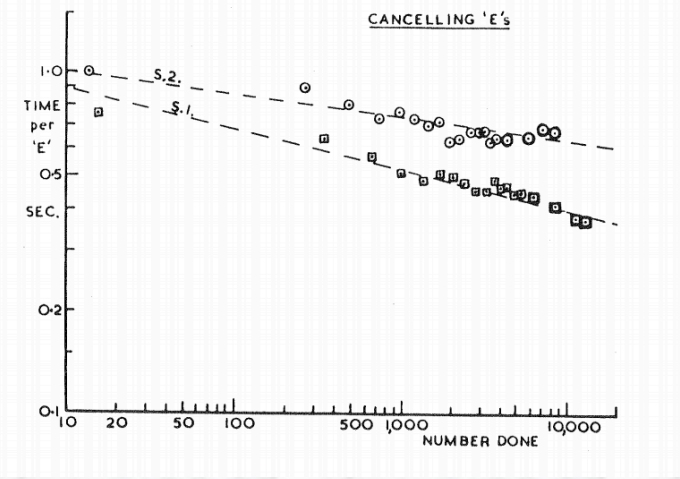
Power function:

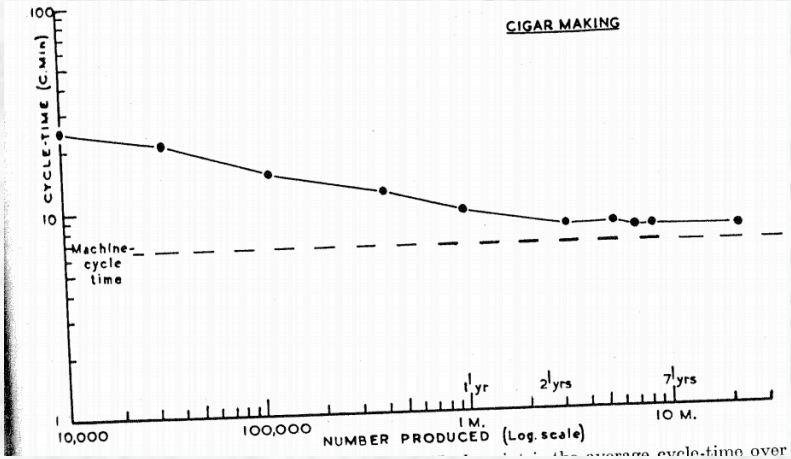
$$RT = aP^{-b} + c$$

Functional Form of Learning

- Power Law of Practice

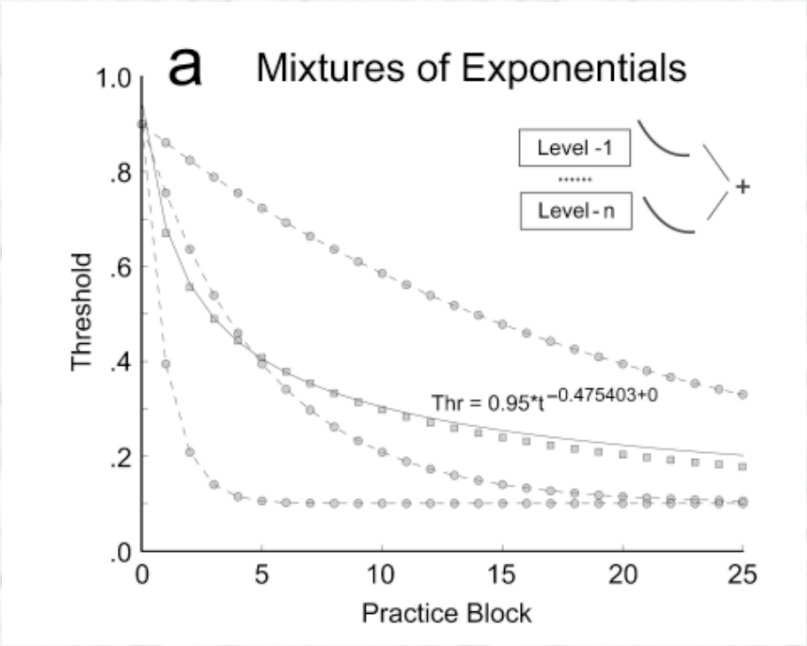






Functional Form of Learning

- Research always aggregated across individuals



Functional Form of Learning

- Newer work suggests better fits to individual-level data are achieved via exponential function

Exponential function:

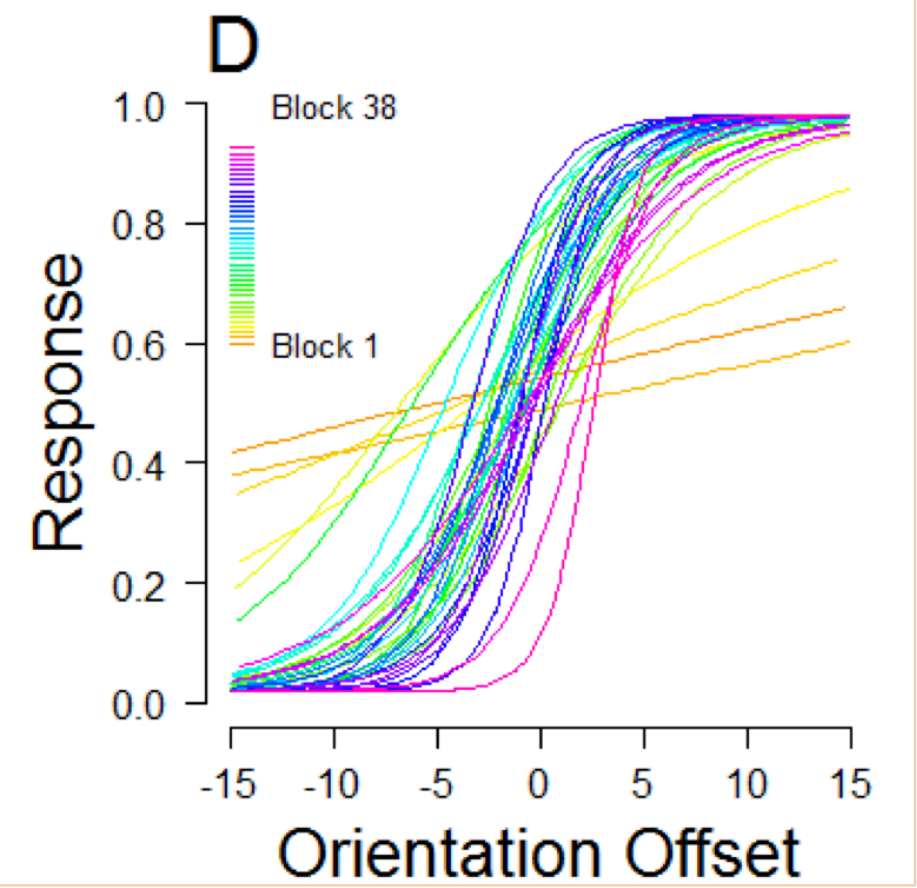
$$RT = ae^{-b(P-1)} + c$$

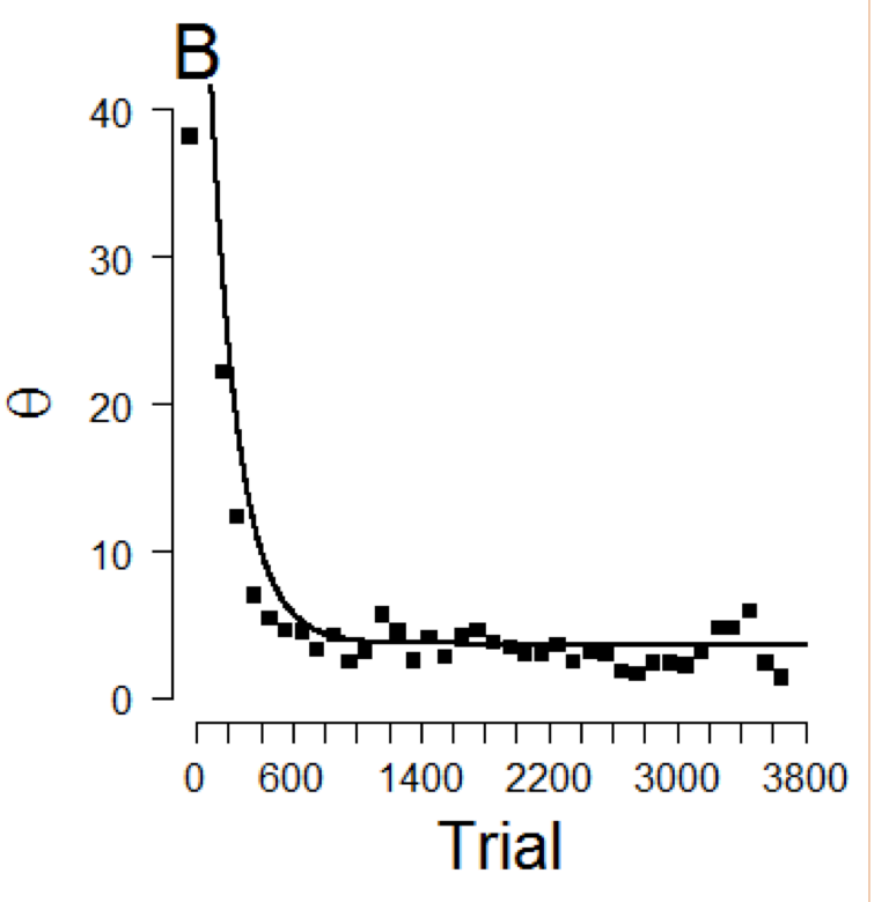
Functional Form of Learning

What aspects of learning can we potentially change via task design?

- Initial Ability
- Rate
- Final Ability

Assessment of Learning





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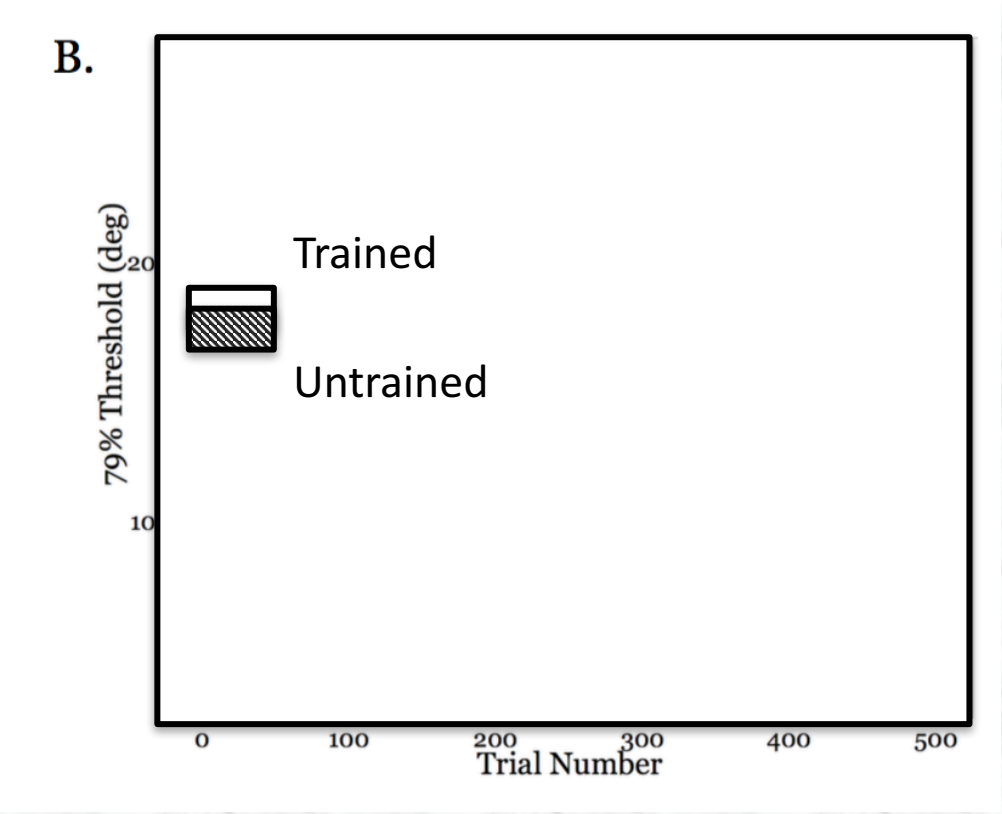
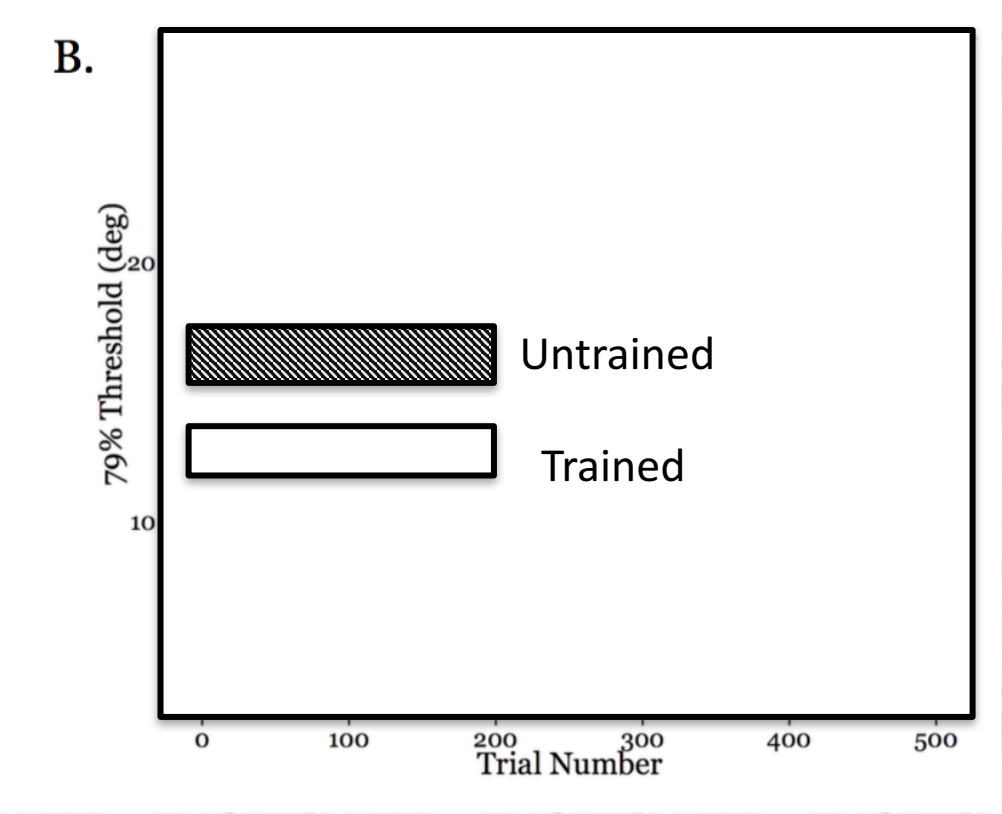


Assessment of Learning



Assessment of Learning

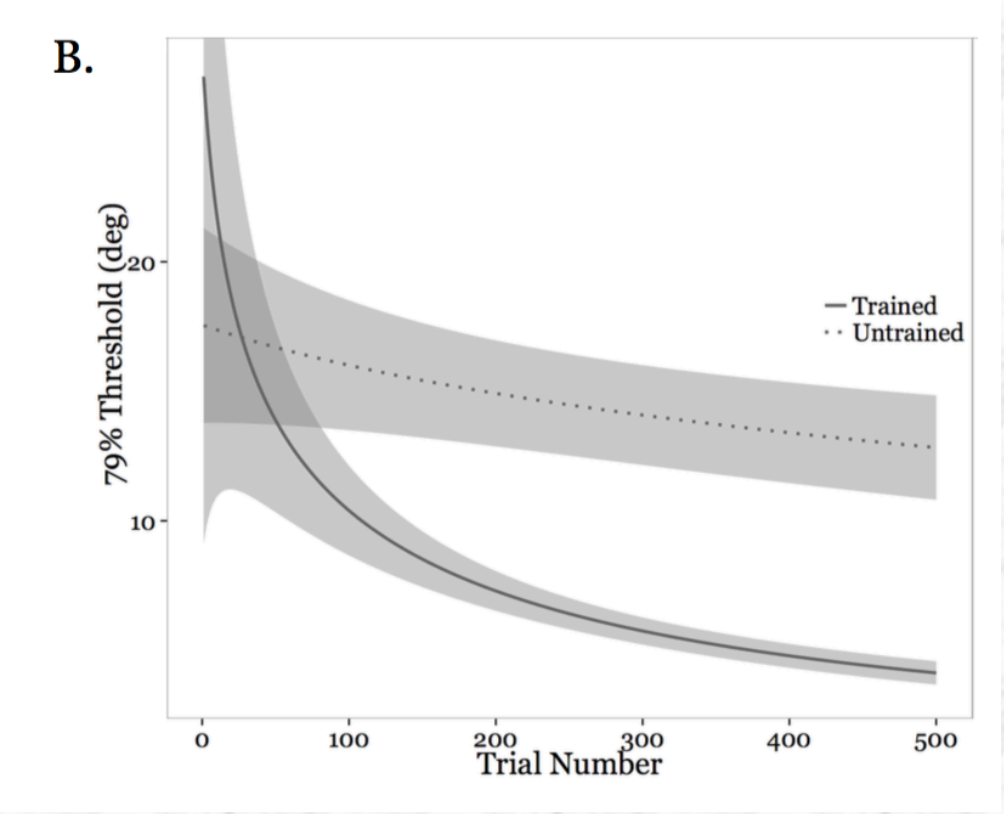
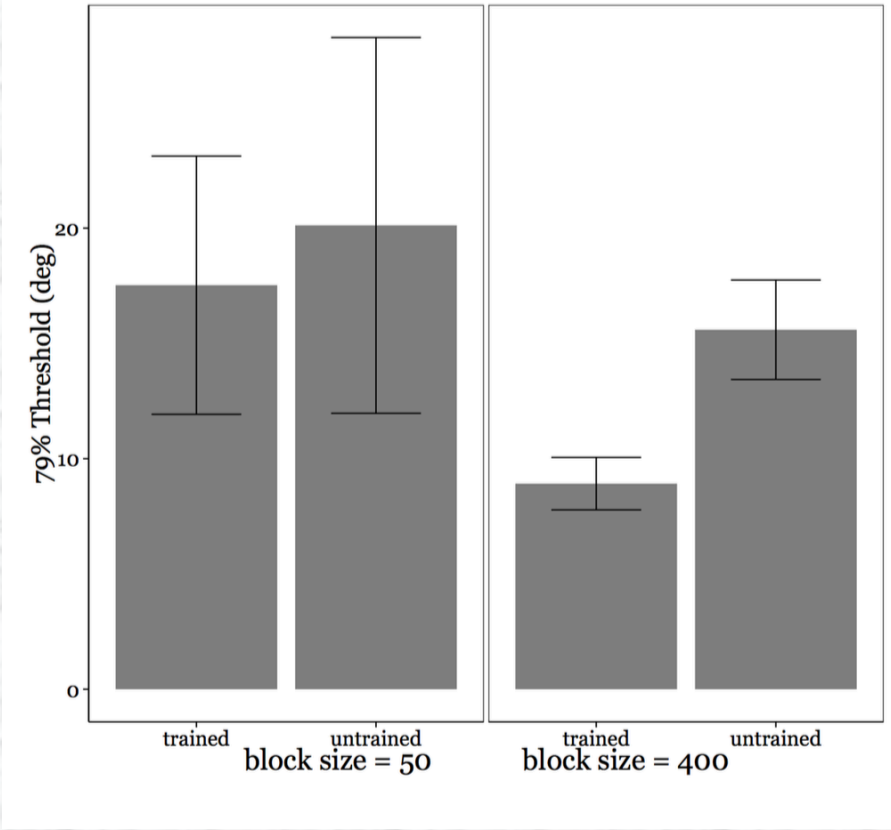
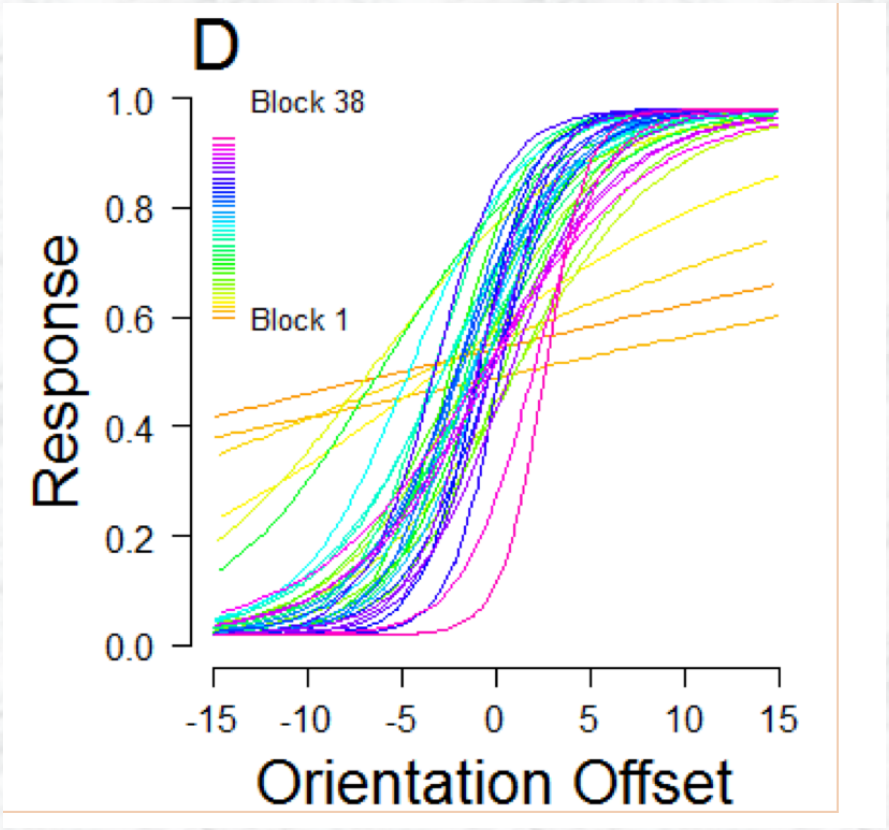
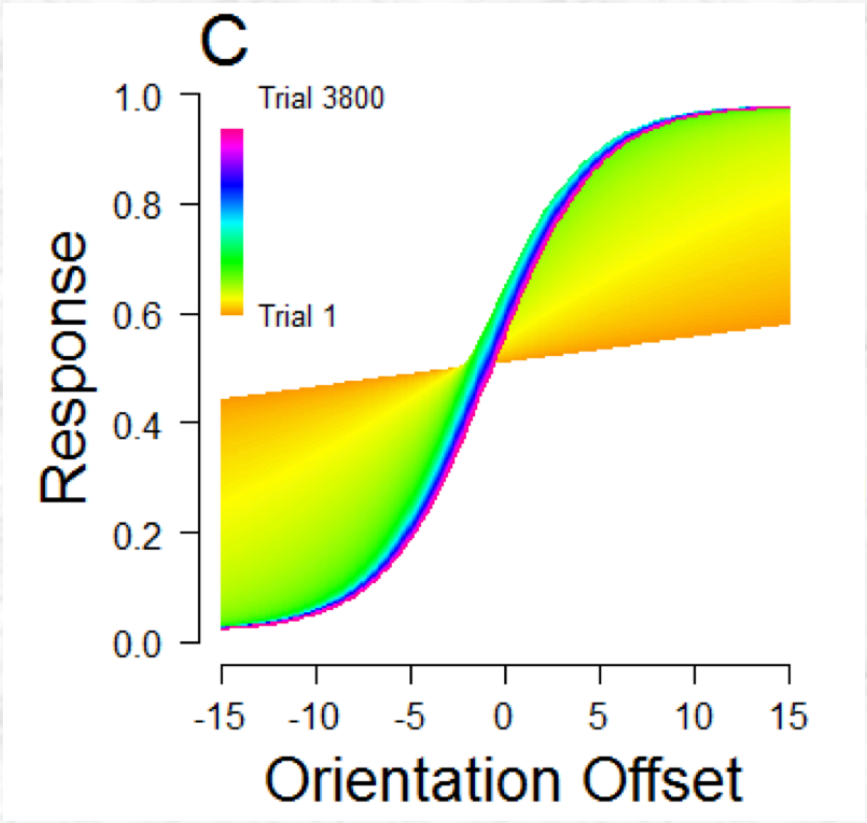


Figure 3

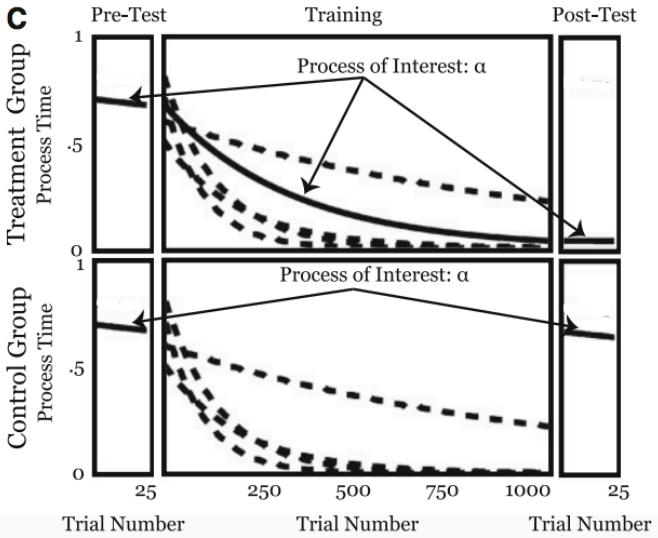


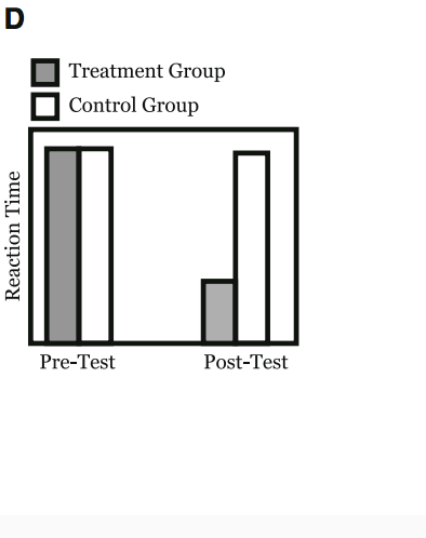
Assessment of Learning





Minimize Test Re-Test Effects





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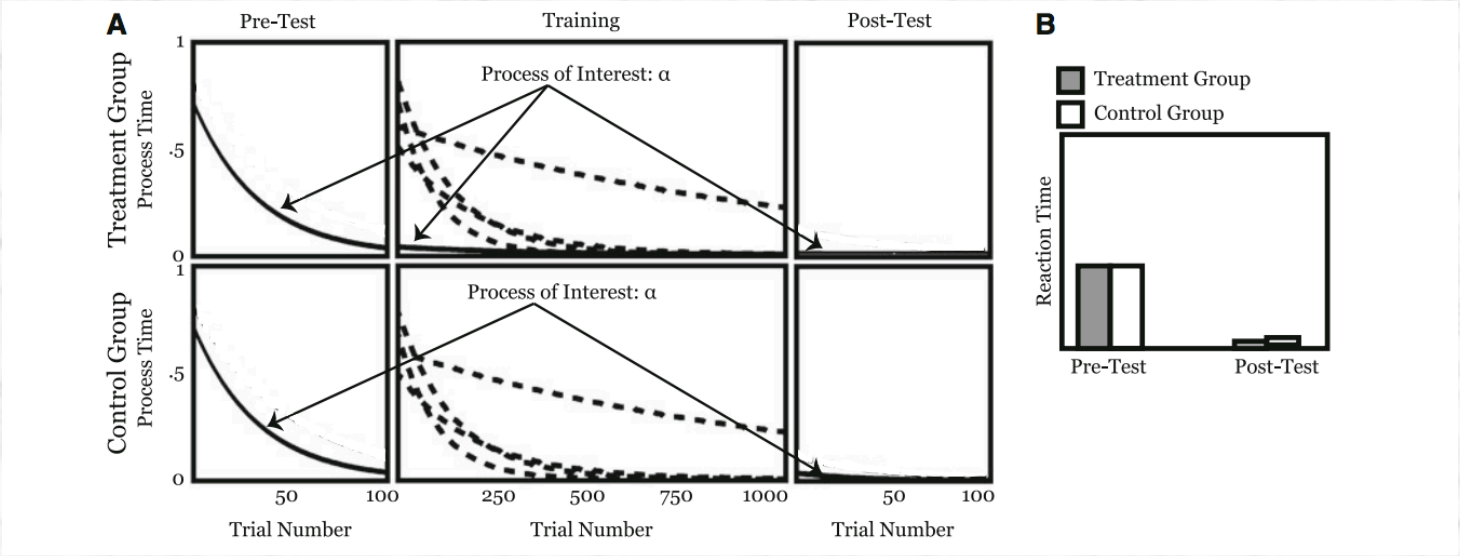

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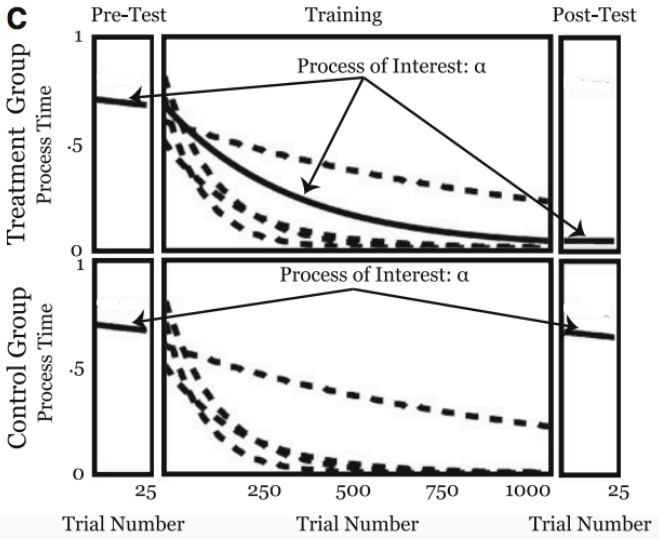

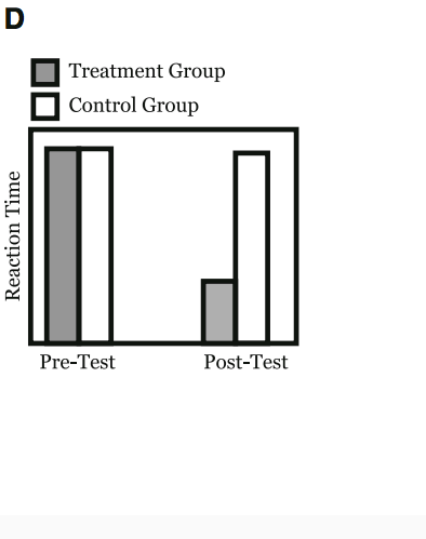

Minimize Pre-Test Differences