Familiarity, but not visual complexity, affects letter encoding in visual working memory

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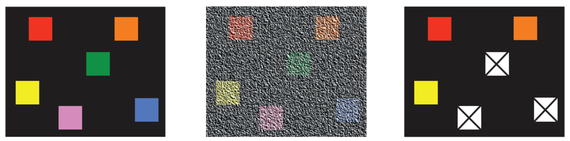
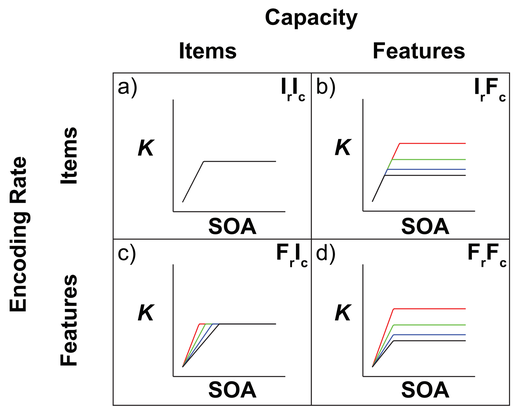
Models of storage in VWM



Encoding rate and capacity of VWM

Encoding rate and capacity of VWM might be limited by number of items or number of features.

How does encoding rate & VWM capacity vary with stimulus complexity?



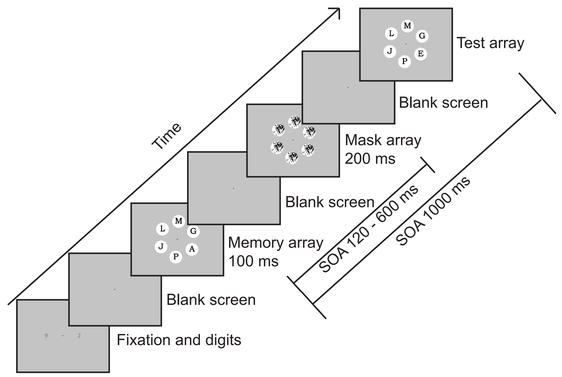
Perimetric complexity (κ)

Perimetric complexity provides a quantitative estimate of the number of features in a visual object. It is defined as the square of the combined inside and outside perimeters of a letter (***P*total**), divided by its area (*A*), all divided by 4π.

1 6.81 27.06

Perimetric complexity predicts letter-recognition efficiency (Pelli et al., 2006).

Change-detection paradigm



Stimulus onset asynchrony was 120, 130, 160, 200, 270, 390, or 600ms.

Stimuli

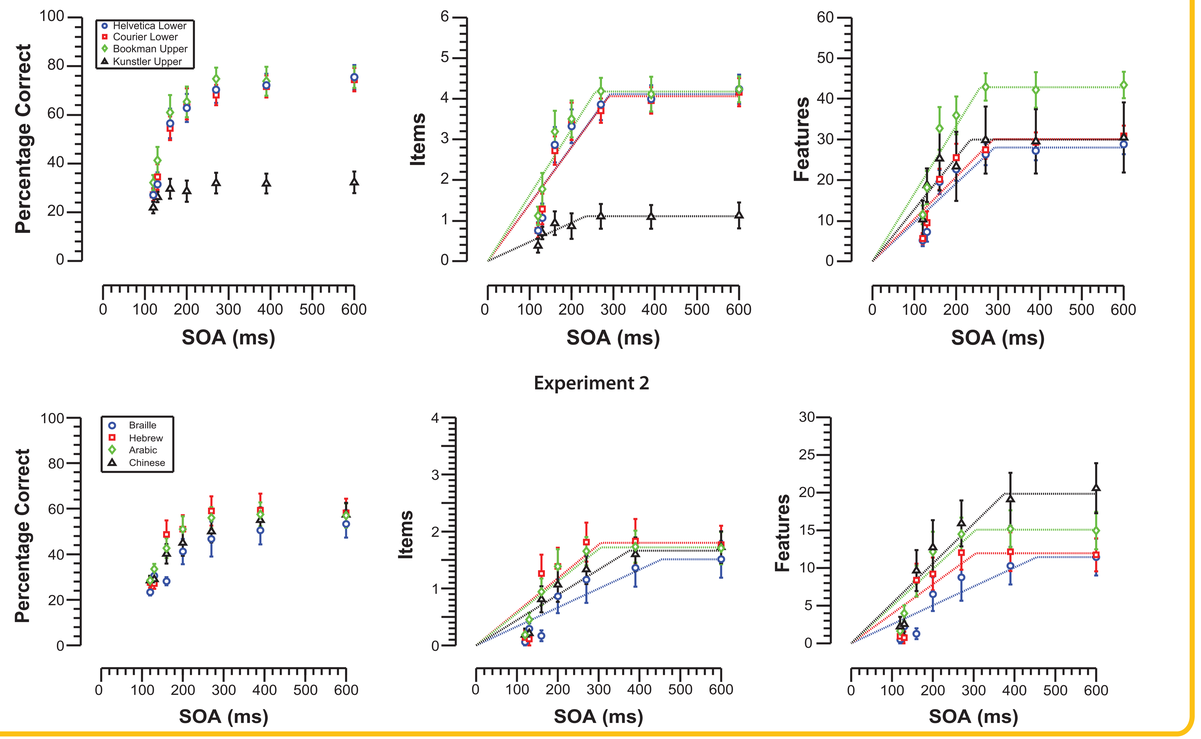
Experiment 1

Helvetica	a	b	d	e	g	h	j	k	l	m	κ = 6.81
Courier	a	b	d	e	g	h	j	k	l	m	κ = 7.42
Bookman	A	B	D	E	G	H	J	K	L	M	κ = 10.26
Künstler	𝒜	ℬ	𝒟	ℰ	𝒢	ℋ	ℐ	𝒦	ℒ	ℳ	κ = 27.06

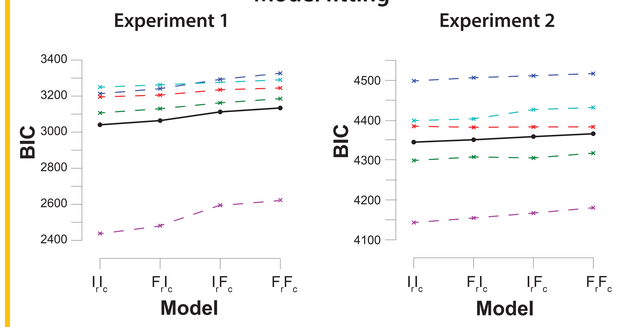
Experiment 2

Braille	⠒	⠂	⠢	⠐	⠔	⠱	⠰	⠣	⠄	⠵	κ = 1.00
Hebrew	א	ב	ג	ד	ה	ל	ז	מ	י	ך	κ = 2.06
Arabic	ا	ل	ث	ف	خ	ر	س	غ	ض	ط	κ = 6.73
Chinese	太	先	谢	再	見	國	會	請	說	問	κ = 12.03

Encoding curves

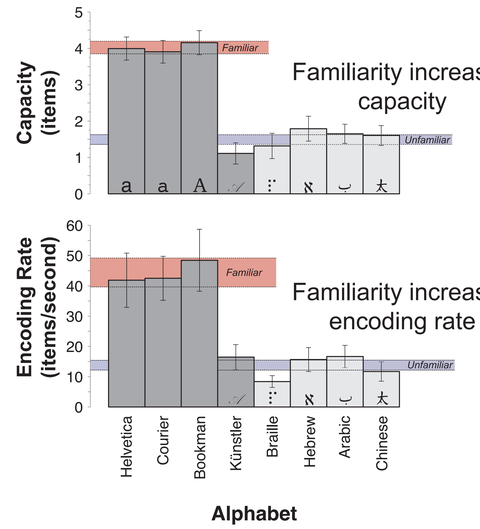


Model fitting



The best fitting model in both experiments estimates encoding rate and capacity in terms of items.

Familiar vs unfamiliar



Capacity and encoding rate of VWM

Capacity and encoding rate of VWM were not predicted by the perimetric complexity. Model-fitting indicated the capacity was best measured by the number of items and the encoding process is not limited by the number of features.

Data are more consistent with the slots model than models that assume more resources are used with increasing stimulus complexity.

Encoding rate and capacity of VWM were higher for familiar alphabets than for unfamiliar alphabets.

References

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