Letter Spacing and Target Uncertainty Effects on Word Identification Capacity

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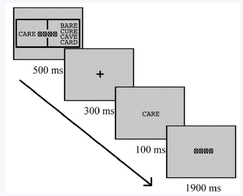
Introduction

Houpt, Townsend and Donkin (2014) demonstrated that the capacity coefficient is a powerful tool in assessing word processing efficiency.
The capacity coefficient measures the change in efficiency of letter identification as a function of whether they are in a word context or alone.



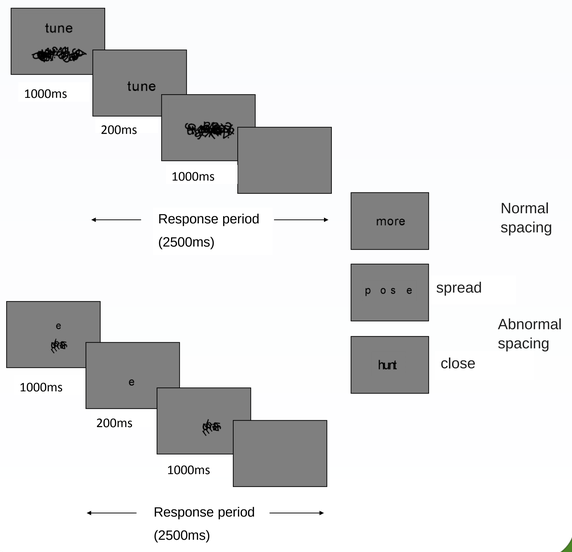
$$C(t) = \frac{[\sum_{i=1}^{4} K_{ci}]}{K_s}$$

> 1 super capacity
= 1 unlimited capacity
< 1 limited capacity

K_{ci} : *the cumulative reverse hazard for the letter character response times*
K_S : *the culmutive reverse harzard function for the string condition response times*

We replicated Houpt, Townsend and Donkin's finding of a word superiority effect using variable target words across trials instead of a fixed target word in the first experiment. In the second experiment, we measured the effect of abnormal interletter spacing on word processing efficiency with variable target words.

Experiment Design



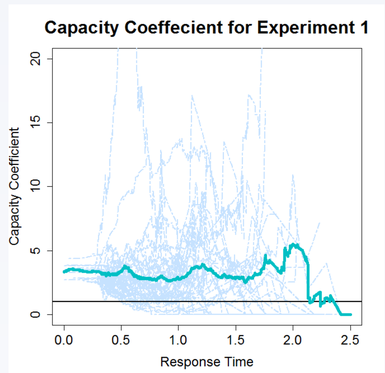
Experiment 1 – Variable Target Word

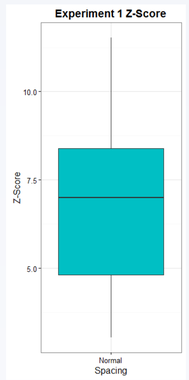
Methods

- 50 subjects participated for course credits
- 700 trials (350 word trials, 350 letter trials) per subject
- All subjects reported no difficulty reading English

Results

- 6 subjects were excluded for having lower than 80% accuracy
- All remaining subjects (44) indicated **super capacity coefficient** with Z score from 3.04 to 11.53 and average of 6.72.





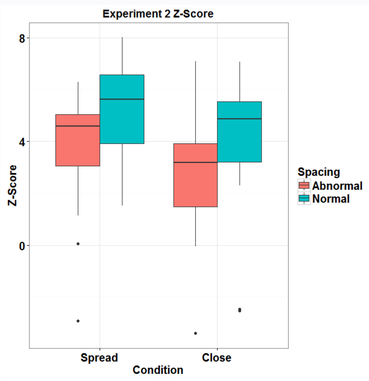
Experiment 2 – Variable Target Word with Abnormal Interletter Spacing

Methods

- Within subjects comparison
- 350 normal spacing trials (175 word trials, 175 letter trials) and 350 abnormal spacing (175 word trials and 175 letter trials) per subject, abnormal and normal spacing sections were interleaved between subjects
- 20 subjects participated in spread condition
- 16 subjects participated in close condition
- All subjects reported no difficulty reading English

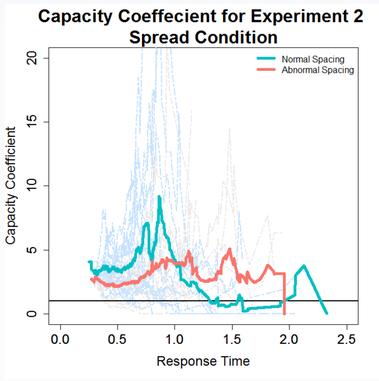
Results

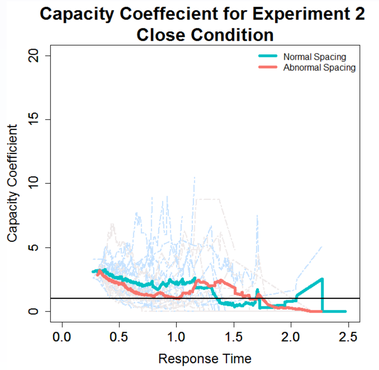
Spread		
	Normal Spacing	Abnormal Spacing
Super Capacity	14	12
Unlimited Capacity	1	3
Limited Capacity	0	1
NA	5	4
Total	20	20
Close		
Super Capacity	14	8
Unlimited Capacity	0	3
Limited Capacity	2	1
NA	0	4
Total	16	16



ANOVA table for Capacity Coefficient Z-score in Experiment 2

		df	F	Sig.	η^2
Spread	Ordering	1	3.81	0.07	0.10
	Spacing	1	2.31	0.15	0.11
	Ordering x Spacing	1	0.75	0.40	0.04
Close	Ordering	1	0.95	0.35	0.08
	Spacing	1	2.43	0.15	0.03
	Ordering x Spacing	1	0.19	0.67	0.00





Discussion

- Similar to Houpt, Townsend and Donkin, we found high levels of super capacity for words despite variable targets in Experiment 1.
- Though some subjects indicated unlimited or limited capacity for abnormal spacing section in experiment 2, there was a consistency of super capacity at overall group level. The result is different from previous research (cf., Purcell & Stanovich, 1982 ; Marchetti & Mewhort, 1986) stating context advantage depends on relative spacing.

Future Research

- In the future study, we plan to measure the capacity coefficient with uneven spacing boundary we used the experiment 2. The spacing will either be fixed within a block of trials or vary across trials.

References

Houpt, J. W., Townsend, J. T., & Donkin, C. (2014). A new perspective on visual word processing efficiency. *Acta psychologica*, *145*, 118-127.

Marchetti, F. M., & Mewhort, D. J. (1986). On the word-superiority effect. *Psychological research*, *48*, 23-35.

Purcell, D. G., & Stanovich, K. E. (1982). Some boundary conditions for a word superiority effect. *The Quarterly Journal of Experimental Psychology*, *34*, 117-134

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