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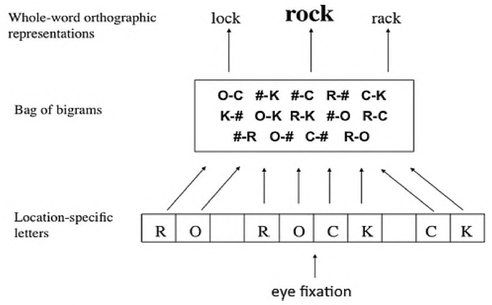
Reading Between the Bigrams

Gina M. Cascone, Deion L. Colbert, & Albert F. Smith

Introduction

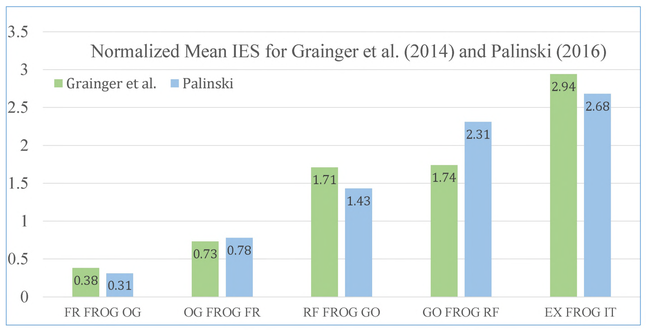
- Many researchers have proposed that information is processed in a hierarchal system. Grainger and Van Heaven (2003) included a level in which activation of letter pairs contributes to activation of word representations in the mental lexicon. This includes both adjacent and nonadjacent bigrams. (See Fig. 1)

Figure 1



- In 2014 Grainger, Mathôt, & Vitu conducted a lexical decision experiment in which letter strings were presented with flanking bigrams that contained pairs of adjacent letters from the target string or letters not in the target string.
- In 2016 Palinski replicated this experiment and found the same pattern found by Grainger et al. (See Fig. 2)

Figure 2



- In these two experiments the effects of adjacent, different letter bigrams and the way they can be presented has been tested extensively. However, it has not yet been determined whether they facilitate a better IES or create an interference in lexical decision making.

Objectives

- Because these experiments conducted by Grainger et al. and Palinski have assumed the nature of how flanking bigrams impact lexical decision making over the summer, we designed an experiment to determine the true influence they have on performance.
- The experiment we plan to conduct will closely resemble the experiment done by Palinski, containing two adjacent letter bigram conditions—bigrams ordered the same as in target (FR_OG) and bigrams presented in switched order (OG_FR)—as well a condition containing different letter flanking bigrams, and two control conditions.

Methods

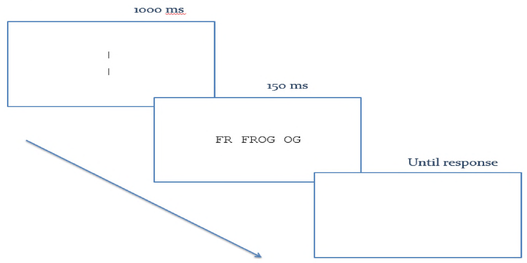
- Below is a figure that displays all of the conditions that will be in our experiment. (See Fig. 3)

Figure 3

Conditions (Flanker Types)	Example
#1 - Same Order Bigrams	FR FROG OG
#2 - Switched Order Bigrams	OG FROG FR
#3 - None	FROG
#4 - Special Character	#% FROG *&
#5 - Different Letter Bigrams	EX FROG IT

- In the control conditions: (1) target words will be flanked by bigrams made up of four non-letter characters (&, *, %, #); and (2) target words will have no flanking characters. The first control condition is to determine if bigrams have a positive or negative impact on word processing, and the second is to examine the effect of any kind of visual clutter flanking the target: For example, it is possible that performance will be more efficient with no flanking material than with flanking bigrams that contain letters that are in word targets.
- We plan to test 25 participants with an experiment created with SuperLab. There well be four blocks of trials, with 50 trials in each block. Stimulus presentation will be on a computer screen and participants will respond using two buttons on a five-button response pad.
- As in previous experiments, on each trial, the participant will see a focus consisting of two vertical lines for 1000 ms; and then the stimulus display will appear for 150 ms. the screen will remain blank until a response is given. Participants will press one button if the string that flashed on the screen is a word and another if the string is a pseudo-word (a letter-string that resembles a real word - FROP). (See Fig. 4)

Figure 4

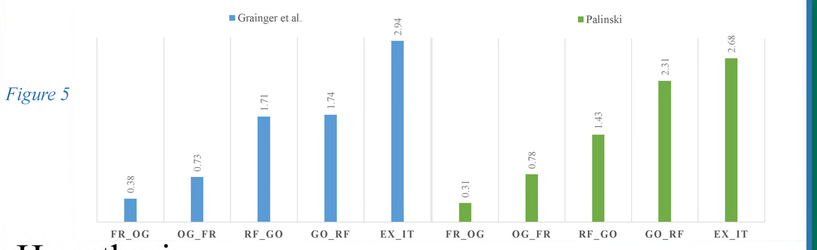


- Before participants begin the experiment, they will complete a practice block containing 40 trials that measure the accuracy of their responses. If the participant does not answer correctly at least 80% of the trials they will be given the practice block again, and if they still fail to answer correctly 80% of the time, their data for the actual experiment will not be included.
- Unlike in previous experiments, these practice trials will include audio feedback for incorrect responses—a 1000Hz tone that will play for 300 ms.

Previous Results/ Data

- We have not begun collecting data, however we have some predictions based on evidence found in the results of Grainger's original experiment and Palinski's replication.
- In both of these experiments a significant difference in performance for same letter bigrams and different letter bigrams was observed. (FR FROG OG has a more efficient performance than EX FROG IT).
- We also observed that when flanking bigram were order the same as they appear in target performance was more efficient than when the flanker bigrams were switched (FR_OG is performed more efficiently than OG_FR).
- And while this difference is not significantly different it is a consistent pattern found in both experiments. (See Fig. 5)

Figure 5



Hypothesis

- If the results we compared previously is accurate, we predict:
  - The 1st condition, adjacent letter bigrams ordered the same in target, will have better performances than the 2nd condition-adjacent letter bigrams ordered different than target.
  - The 3rd condition without any flanking bigrams will have the best average performance of all conditions
  - The 5th condition containing different letter bigram flankers will still have the highest IES.
- For the 4th condition we do not have any predictions, but if its mean IES is between our same letter conditions and our different letter condition this could prove that bigrams can both facilitate and interfere with lexical decision making.

Acknowledgments

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