Revisiting lexical processing: evidence from Greek-speaking adults

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Word recognition: the process of going from a printed letter string to the selection of a single item stored in mental lexicon
Introduction

- Factors affecting word recognition:

  - AoA (age-of-acquisition)
    (Morrison & Ellis, 1995)
  - Word frequency
    (Becker, 1976; Monsell et al., 1989)
  - Length
    (Gough, 1972; Whaley, 1978)
  - Morphological complexity
    (Dell, 1987)
  - Phonological complexity
    (Frost, 1998)
  - Neighborhood size
    (Andrews, 1989)
  - Orthographic processing skills
    (Bräten et al., 1999)
  - Phonological processing skills
    (Unsworth & Pexman, 2003)
  - Print exposure
    (Stanovich & West, 1989)
Research Questions

Assumptions

• Which factors influence Greek native speakers/readers?
  • Frequency
  • Word length
  • Gender

• Does educational background affects lexical decision?

(cf. previous findings wrt ART/MRT (print exposure) affecting Lexical Decision: Fotiadou, Fleva, Katsiperi, Tsimpli, 2014)
Lexical Decision Task (on-line)

**Design**

- 60 real words (inanimate nouns)
- 60 pseudo-words
  - based on existing words beginning with a consonant cluster
  - substitution of the first or the second consonant by another one
    
    while respecting the phonotactic rules of the language

    ex. κρίνος [krinos] - κλίνος [klinos]

- 20 illegal words
  - based on existing words beginning with a consonant cluster
  - substitution of the first or the second consonant by another one
    
    violating the phonotactic rules of the language

    ex. ζβέρκος [zverkos] - ζρέρκος [zzerkos]
Variables

• **Frequency of real words** (lemmas)

GreekLex corpus (Ktori, M., van Heuven, W.J.B., & Pitchford, N.J., 2008)

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Mid</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>δρόμος</td>
<td>‘road’</td>
<td>φόβος</td>
<td>ψόγος</td>
</tr>
<tr>
<td>δύναμη</td>
<td>‘strength’</td>
<td>οθόνη</td>
<td>ανέμη</td>
</tr>
</tbody>
</table>

• **Frequency of pseudo-words**

- Frequency of **initial consonant cluster**

Institute for Language & Speech Processing (ILSP): PsychoLinguistic Resource

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Mid</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>θράχος</td>
<td>instead of ‘βράχος’</td>
<td>φλάδος</td>
<td>συνύλος</td>
</tr>
<tr>
<td>σχαφίδα</td>
<td>instead of ‘σταφίδα’</td>
<td>ϕλέγατα</td>
<td>γλακέτα</td>
</tr>
<tr>
<td></td>
<td></td>
<td>instead of ‘κλάδος’</td>
<td>instead of στύλος</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ϕλέγατα</td>
<td>γλακέτα</td>
</tr>
<tr>
<td></td>
<td></td>
<td>instead of ‘φρεγάτα’</td>
<td>instead of πλακέτα</td>
</tr>
</tbody>
</table>
Variables

- **Word Length** (syllables)
  - 70 two-syllable items
  - 70 three-syllable items

- **Gender**
  - 70 masculine items (-ας, -ος)
  - 70 feminine items (-η, -α)

  choice of suffixes based on their predictability values
  (Mastopavlou & Tsimpi, 2011)
Design

(pseudo) words
(n=60)

High Frequency
(n=20)

2 syllables
(n=10)

Feminine
(n=5)

Masculine
(n=5)

Mid Frequency
(n= 20)

3 syllables
(n= 10)

Low Frequency
(n=20)

illegal words
(n=20)

2 syllables
(n=10)

Feminine
(n=5)

Masculine
(n=5)

3 syllables
(n= 10)
Participants

- 60 young monolingual adults (Mean: 23.01 yrs., SD.: 3.5)
- 30 University students (Humanities & Science Departments)
- 30 College students (Speech Therapy & Physiotherapy Departments)

Measurements

- Accuracy
- Response Times (in msecs)
Results
Results

• **Accuracy**

**Word status**

<table>
<thead>
<tr>
<th></th>
<th>Real</th>
<th>Pseudo</th>
<th>Illegal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc</td>
<td>86.7</td>
<td>95.2</td>
<td>99</td>
</tr>
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</table>

**Frequency by Word Status**

<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Mid</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real</td>
<td>99</td>
<td>99.3</td>
<td>61.8</td>
</tr>
<tr>
<td>Pseudo</td>
<td>94</td>
<td>96.7</td>
<td>95</td>
</tr>
</tbody>
</table>

• Ceiling performance in recognising pseudo and illegal words

• Greater difficulty with real words -> **low frequency**

• **Frequency Effect** for both real words \((F(2, 177)= 278.6; p<.001)\) and pseudo words \((F(2, 177)= 3.3; p=.03)\)

• Word Status* Frequency \((F(2, 354)= 202.8; p<.001)\)
Results

Word Status (Response Times)

- **Word Status Effect** \( (F(2, 179) = 20.8; p < .001) \)
- Real words were identified faster than both pseudo- \( (p < .001) \) and illegal words \( (p < .029) \)
Results

Frequency by Word Status

- Word status Effect ($F(1, 354) = 30.2; p<.001$)
- Frequency Effect ($F(2, 354) = 2.9; p=0.05$)
- **Word Status * Frequency** ($F(2, 354) = 10.8; p<.001$)
Results

Length by Word Status

- Word Status Effect \((F(2, 354)=35,1; \ p<.001)\)
- Length Effect \((F(1, 354)=12,3; \ p=.001)\)
Results

Gender by Word Status

- Gender Effect among real words:
  \[ F(1, 118) = 4.2, \ p = .04 \]

- Word Status * Gender:
  \[ F(1, 826) = 10.6; \ p = .001 \]
Let’s split the group...
Results

Word Status (Accuracy)

- Word status Effect, $F(2, 174)= 15.1; p<.001$
- Education Type Effect, $F(1, 174)= 14.3; p=001$
- Word Status*Education Type, $F(2, 174)=10.7; p=.001$
Results

**Word Status by Frequency (Accuracy)**

- **Education Type * Frequency** among real words $F(2, 174)= 11.4; p<.001$
Results

Word Status (Response Times)

- Word Status Effect, $F(2, 174) = 22; p < .001$
- No Education Type Effect
Results

Word Status by Frequency

• Word Status Effect, $F(1, 348)= 31.8 ; p<.001$
• Frequency Effect, $F(2, 348)= 6.9 ; p=.04$
• **Education Type Effect**, $F(1, 348)= 3.0 ; p=.009$
Summary of results

• **Word status** - faster RTs (but not more accurate responses) gained by real words

• **Frequency** - effect on *real* and *pseudo* words in both accuracy & response times

• **Length** - more time to recognise 3-syllable words

• **Gender** - masculine suffixes increased lexicality

• **Education Type** - Education type influenced but did not interact

  Groups differ wrt →

  accuracy in low frequency words

  response times on high frequency pseudo-words
Discussion

- **Frequency** the most powerful variable across participants
- Vulnerability depending on education type (both on accuracy and response times)
  - Accuracy among low freq real words
  - RTs among high freq pseudo words
- **Gender** affects speed of response (masculine marking more salient than feminine among real words)
- **Educational background** affects word recognition partially
  - Accuracy among real (low freq) words
  - RTs among pseudo (high freq) words
  (in accordance with previous findings)
Thank you