The Processing of Affixation and Compounding in Chinese

National Chung Cheng University
Graduate Institute of Linguistics
Wang, Wen-Ling & James Myers
Goals

- Test whether suffixed and compound words are processed differently in Chinese
- Test whether stimulus context plays a role in morphological processing
Why look at Chinese?

- Problems with Chinese (Packard, 2000)

  *Distinction between Affixes & Bound Roots*

  e.g. 員 yuan2 “person”

  vs.

  者 zhe3 “one who does/is X”
Disputes over categorization

- 子 -zi  頭 -tou (nominal suffix)
- 性 -xing4  度 -du4
- 家 -jia1  化 -hua4
- 學 -xue2  者 -zhe3

affixes  quasi-affixes  roots
Compound decomposition

- **Morpheme frequency effects**
  - English: Taft & Forster (1976)
  - Andrews (1986)

- **Component repetition priming effects**
  - Li (1995)
  - Zhou, Marslen-Wilson, Taft, & Shu (1999)
Suffixed word decomposition?

- Inconsistent morpheme frequency effects
  Taft (1979)
  Andrews (1986)

- Weaker component repetition priming
  Stanners, Neiser, Hernon, & Hall (1979)
  Fowler, Napps, & Feldman (1985)

- Prefix stripping vs. suffix stripping (Taft, 1985)
A diagnostic for affixation

- A possible context effect:
  - Compounds are obligatorily decomposed, but suffixed words are not?

  e.g. Andrews (1986)
  
  Suffix words: no morpheme frequency effect
  Compound words: significant morpheme frequency effect
  Mixed: both had morpheme frequency effect
Our experiments

- Exp 1a-c: Replications of Andrews (1986)
- Exp 2a-c: Visual component priming
- Overall design
  - Suffixed and compound stimuli matched for first morpheme frequency, surface frequency, and character complexity
  - Exps a-b: Suffixed and compound stimuli presented alone; Exp c: Suffixed and compound stimuli presented together
Experiment 1a: Morpheme frequency effect for suffixed words?

- **Materials**

  - Most “suffix-like” suffixes chosen based on semantic pretests
  - 76 suffixed words with matched surface frequency but varied morpheme frequency:
    - 38 with high morpheme frequency (HMF) &
    - 38 with low morpheme frequency words (LMF)
  - Occurrences of suffix types were evenly distributed
  - The same design for nonword items (formed of real characters)
Examples of experimental items

HMF: 網子 wang3zi “net”
LMF: 瓶子 ping2zi “vase”

Examples of nonword items

HMF: 鮮子 xian1zi
LMF: 匡子 hui4zi

Participants

25 Mandarin-speaking university students in southern Taiwan
Experiment 1a: Results

- Mean RT

- By participant, $p > 0.05$
- By item, $p > 0.1$
- RT for HMF was *not* significantly shorter than for LMF
Experiment 1a: Discussion

- Lack of morpheme frequency effect for suffixed words (consistent with Andrews, 1986, and other previous work on English)

- A trend in the direction of a morpheme frequency effect, however.
Experiment 1b: Morpheme frequency effect for compound words?

Materials

- 76 transparent compound words with matched surface frequency but varied morpheme frequency:
  - 38 with high morpheme frequency (HMF) &
  - 38 with low morpheme frequency words (LMF)

- The same design for nonword items
Examples of experimental items

HMF: 舊書 jiu4shu1 “old book”
LMF: 蜂窩 feng1wo1 “beehive”

Examples of nonword items

HMF: 忍明 ren3ming2
LMF: 紗捏 sha1nie1

Participants

25 Mandarin-speaking university students in southern Taiwan (different from previous ones)
Experiment 1b: Results

- **Mean RT**

  - By participant, \( p < 0.05 \)
  - By item, \( p > 0.1 \)
  - RT for HMF was *shorter* than for LMF
Experiment 1b: Discussion

- First morpheme frequency effect found for compounds (replicates Andrews, 1986, and other previous work on English)

- Although the RT differences is now significant, it is not significantly larger than for Exp. 1a (no Exp x MorphFreq interaction: $p > 0.5$ by participant and by item)
Experiment 1c: Morpheme frequency effect for both types when mixed?

- **Materials**
  - Stimuli from Experiments 1a-b combined together

- **Participants**
  25 Mandarin-speaking university students in southern Taiwan (different from previous ones)
**Experiment 1c: Results**

- **Mean RT**
  - No effect of morphological type
    - By participant & by item, $p > 0.5$
  - Significant effect of morpheme frequency
    - By participant, $p < 0.0001$; by item, $p < 0.05$
The context effect replicates Andrews (1986)

Positive morpheme frequency effect for both suffixed and compound words

Suffixed words seem to be processed differently when alone vs. when in mixed context, though Exp x MorphFreq interaction is still not significant (p > 0.5 by participant & by item)
Experiment 2a: Component priming of suffixed words

Materials

- Targets: 24 Chinese single-character words
  24 noncharacters

- Priming conditions: Identical (IDEN)
  Suffixed (SUF)
  Unrelated (UNREL)

<table>
<thead>
<tr>
<th>Target</th>
<th>IDEN</th>
<th>SUF</th>
<th>UNREL</th>
</tr>
</thead>
<tbody>
<tr>
<td>磚 zhuàn1</td>
<td>‘brick’</td>
<td>磯 zhuàn1</td>
<td>‘brick’</td>
</tr>
<tr>
<td>磻 zhuàn1</td>
<td>‘brick’</td>
<td>磻頭 zhuàn1tou</td>
<td>‘brick’</td>
</tr>
<tr>
<td>翼 yi4</td>
<td>‘wing’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Target (Noncharacter)

<table>
<thead>
<tr>
<th></th>
<th>Prime</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IDEN</td>
<td>SUF</td>
</tr>
<tr>
<td>斧头</td>
<td>斧</td>
<td>斧頭</td>
</tr>
<tr>
<td>fu3</td>
<td>fu3tou</td>
<td>‘hatchet’</td>
</tr>
</tbody>
</table>


- **Participants**

  21 Mandarin-speaking university students in southern Taiwan (different from previous ones)
Experiment 2a: Results

- **Mean RT**
  - Main effect of prime types in RT analyses
  - By participant, \( p < 0.001 \); by item, \( p < 0.01 \)
  - Mean RT: IDEN & SUF < UNREL (Tukey HSD)
Experiment 2a: Discussion

- Suffixxed words primed their bases
- Inconsistent with Experiment 1a
- This is due to slow UNREL RT of 2 participants:

<table>
<thead>
<tr>
<th></th>
<th>UNREL</th>
<th>SUF</th>
<th>Priming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subj. 18</td>
<td>726</td>
<td>619</td>
<td>106</td>
</tr>
<tr>
<td>Subj. 19</td>
<td>820</td>
<td>654</td>
<td>166</td>
</tr>
</tbody>
</table>

SUF RT for others: 393-669 msec
UNREL RT for others: 397-635 msec
Experiment 2b: Component priming of compound words

- **Materials**
  - Targets: Same targets as Exp. 2a
  - Priming conditions: Identical (IDEN)
    - Compound (COMP)
    - Unrelated (UNREL)

<table>
<thead>
<tr>
<th>Target (Character)</th>
<th>Prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>磚 zhuan1</td>
<td>IDEN</td>
</tr>
<tr>
<td>‘brick’</td>
<td></td>
</tr>
<tr>
<td>磚 zhuan1</td>
<td>COMP</td>
</tr>
<tr>
<td>‘brick’</td>
<td></td>
</tr>
<tr>
<td>磚牆 zhuan1qiang2</td>
<td>UNREL</td>
</tr>
<tr>
<td>‘brick wall’</td>
<td></td>
</tr>
<tr>
<td>翼 yi4</td>
<td></td>
</tr>
<tr>
<td>‘wing’</td>
<td></td>
</tr>
<tr>
<td>Target (Noncharacter)</td>
<td>Prime</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>盟</td>
<td>IDEN</td>
</tr>
<tr>
<td>盟邦</td>
<td>SUF</td>
</tr>
<tr>
<td>斧</td>
<td>UNREL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>汉字</th>
<th>Pinyin</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>盟</td>
<td>meng2</td>
<td>‘covenant’</td>
</tr>
<tr>
<td>盟邦</td>
<td>meng2bang1</td>
<td>‘ally’</td>
</tr>
<tr>
<td>斧</td>
<td>fu3</td>
<td>‘hatchet’</td>
</tr>
</tbody>
</table>

- **Participants**

21 Mandarin-speaking university students in southern Taiwan (different from previous ones)
### Experiment 2b: Results

#### Mean RT

<table>
<thead>
<tr>
<th>RT (msec)</th>
<th>IDEN</th>
<th>COMP</th>
<th>UNREL</th>
</tr>
</thead>
<tbody>
<tr>
<td>540</td>
<td>549</td>
<td>574</td>
<td>605</td>
</tr>
<tr>
<td>560</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>580</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Main effect of prime types in RT analyses
- By participant, $p < 0.0001$; by item, $p < 0.05$
- Mean RT: IDEN $<$ COMP $<$ UNREL (Tukey HSD)
Experiment 2b: Discussion

- Compound words primed their first position morphemes

- Consistent with Exp. 1b
Experiment 2c: Effect of mixing both types on component priming

- **Materials**

Stimuli from Exps. 2a-b

<table>
<thead>
<tr>
<th>Target (Character)</th>
<th>Prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>zhuan1 ‘brick’</td>
<td>zhuan1 ‘brick’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>IDEN</th>
<th>SUF</th>
<th>COMP</th>
<th>UNREL</th>
</tr>
</thead>
<tbody>
<tr>
<td>zhuan1 ‘brick’</td>
<td>zhuan1 ‘brick’</td>
<td>zhuan1tou ‘brick’</td>
<td>zhuan1qiang2 ‘brick wall’</td>
<td>yi4 ‘wing’</td>
</tr>
<tr>
<td><strong>Target</strong> (Character)</td>
<td><strong>Prime</strong></td>
<td><strong>Target</strong> (Character)</td>
<td><strong>Prime</strong></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
<td>------------------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>劈</td>
<td>斧</td>
<td>斧头</td>
<td>盟邦</td>
<td>盟</td>
</tr>
<tr>
<td>‘hatchet’</td>
<td>‘hatchet’</td>
<td>‘ally’</td>
<td>‘covenant’</td>
<td></td>
</tr>
</tbody>
</table>

- **Participants**

20 Mandarin-speaking university students in southern Taiwan (different from previous studies)
Experiment 2c: Results

- **Mean RT**

  Main effect of prime types in RT analyses
  - By participant, $p < 0.0001$; by item, $p > 0.05$
  - Mean RT: IDEN, SUF, COMP $<$ UNREL (Tukey HSD)
Experiment 2c: Discussion

- Both suffixed & compound words primed their constituent morphemes

- Suffixed priming effect when alone vs. when mixed with compound words: consistent with Exp 1c?

- Decomposition of Chinese suffixed words as a strategy induced by stimulus context?
General discussion

- Suffixed and compound words in Chinese seem to be distinguishable in processing, though the evidence so far is weak.
- Stimulus context may affect lexical processing.