Cross-Linguistic Sound Symbolism

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Sound Symbolism: Challenging the Arbitrariness of Language
Emory University
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Arbitrariness assumption

Sounds of language bear a necessarily *arbitrary* relationship to their referents

within language

*mosquito, whale*

across languages

*dog, chien, perro, cane, kelb*
Arbitrary sound-meaning relationships…

- Universal
- Conventional
- Species specific?

“The term "arbitrary" should not imply that the choice of the signifier is left entirely to the speaker ...; I mean that it is unmotivated, i.e. arbitrary in that it actually has no natural connection with the signified.” (pp. 68-69, de Saussure, 1966)

(de Saussure, 1966; Hockett, 1977)
Arbitrary sound-meaning relationships…

- Cognitive advantages
  - flexibility
  - generative
  - referential specificity

(Gasser, 2004; Hockett, 1977; Monaghan & Christiansen, 2006)
Non-arbitrary sound to meaning correspondences

- onomatopoeia – sound to sound – *boing, buzz, moo*

- phonological cues to form class
  (Farmer et al, 2006; Shi, Werker, & Morgan, 1999)

- iconicity in syntactic constructions
  (Haiman, 1985; Slobin, 1985)
Sound Symbolism

Japanese mimetics (Hamano, 1998)
- gosogoso – searching or rummaging
- kyorokkyoro – look around, spin

Phonesthemes (Bergen, 2004; Hutchins, 1998)
- glitter, glisten, glow, gleam, glare, glint

Sound to shape mappings (Maurer et al, 2006)
- kiki, bouba

Sound to category mappings (Berlin, 1994)
- Bird and fish names in Huambisa
Sound Symbolism

Is sound symbolism a pervasive, consistent quality of spoken language?

Why and how would these correspondences be maintained given the apparent advantages of an arbitrary system?

Does sound symbolism have psychological or functional significance?
Outline

• Sensitivity to cross-linguistic sound to meaning mappings

• Prevalence of non-arbitrary mappings across languages

• Properties of sound structure of speech that correspond to meaning domains

• Functional consequences of sound symbolism for word learning and processing
Cross-linguistic sound symbolism

Kunihira (1977)

• Native English speakers were presented Japanese antonym pairs
  
  » *akarui* - *kurai*  
  » *amai* - *suppai*  
  » *arai- nameraka*  

• Participants identified the English equivalents significantly above chance
Cross-linguistic sound symbolism

• Is this effect restricted to Japanese, or can it be demonstrated in other languages as well?

• Does each language use its own set of sound symbolic conventions or do these relationships reflect a general mechanism?
Method

Listeners

Native speakers of American English, screened for knowledge of the test languages

Stimuli

- 23 antonym pairs taken form Kunihira (1977)
  - Translated by native speakers of each language into Russian, Danish, and Shona

- Words were recorded by native speakers of each language
Method

Design and Procedure

• Language was manipulated between participants

• On each trial, listeners heard a word and then were asked to choose which antonym corresponded with the word

  amai

  sweet     sour
Cross-language antonym classification

Namy, Nygaard, Clepper, & Rasmussen, in prep

* $p < .05$
Cross-linguistic sound-meaning relationships

- Listeners were reliably able to choose the English equivalent for for Japanese, Russian, Danish, and Shona antonyms

- Relationships between sound structure and meaning may not be due exclusively to language-specific conventions
Sound symbolism across languages

Prevalence of sound symbolism across languages

• **Mult-language database** of foreign language synonyms for nine dimensional adjective pairs

  - Native speakers of 10 foreign languages

  Albanian, Dutch, Gujarati, Romanian, Indonesian, Korean, Mandarin, Tamil, Turkish, Yoruba
Sound symbolism across languages

- Native speakers nominated and then recorded synonyms for nine dimensional adjective pairs in their native language

  - round/pointy  up/down
  - big/small    near/far
  - bright/dark  loud/quiet
  - slow/fast   good/bad
  - still/moving

- 1220 items across languages and meanings
Sound symbolism across languages

Behavioral ratings

• foreign words were presented to native English speakers who were unfamiliar with the 10 languages used

• mixed language presentation, grouped by dimension

Participants were asked to guess each word’s meaning:

\[ \text{dhembezuar} \Rightarrow \text{round or pointy?} \]
By language

Proportion correct

* p < .05

Nygaard, Clepper, & Namy, in prep
By dimension

* * p < .05

Nygaard, Clepper, & Namy, in prep
Variation in sound symbolic properties

Distribution of Big-Small items

Distribution of Albanian items
Summary

• Robustness of sound symbolism across multiple languages and meanings

• Sensitivity to sound to meaning mappings despite changes across trials in language

• Extensive variability in sound symbolic properties within language and within meaning
Sound to meaning mappings

• Less systematic attention has been paid to the actual cues that underlie the sensitivity to sound-to-meaning mappings

• What features of the sound structure of spoken language relate to particular semantic domains?

  • Jakobson’s colored vowels

Joan Miró, *Song of the Vowels*
Analysis of sound to meaning correspondences

- Foreign words selected from five dimensions of the multi-language database

  Motion-related - fast/slow, still/moving
  Object form-related - round/pointy, big/small
  Valence-related – good/bad
Analysis of sound to meaning correspondences

• Frequency counts
  Total consonants, vowels, phonemes, syllables

• Broad phonetic transcriptions (IPA)

• Feature Coding
  Counts of particular phonological features
Feature coding

Consonants
  voicing – voiced, unvoiced
  manner of articulation – obstruent, sonorant
  place of articulation – labial, coronal, dorsal, glottal

Vowels
  height – close, mid, open
  backness – front, central, back
  roundedness – rounded, unrounded
Questions

• Are there correlations between prevalence of particular phonological features and listeners’ judgments of word meaning?

• Do particular sets of correlated features reliably predict particular word meanings?
Correlations between judgments of Meaning and Word length

<table>
<thead>
<tr>
<th>Proportion responses</th>
<th>Consonants</th>
<th>Vowels</th>
<th>Syllables</th>
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<tbody>
<tr>
<td>Big</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round</td>
<td>-0.41</td>
<td>-0.49</td>
<td>-0.46</td>
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<tr>
<td>Fast</td>
<td>0.29</td>
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<tr>
<td>Moving</td>
<td>0.47</td>
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<td>0.64</td>
</tr>
<tr>
<td>Good</td>
<td></td>
<td>0.15</td>
<td>0.18</td>
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</tbody>
</table>

$p < .05$

Mathur, Clepper, Nygaard, & Namy, in prep
Correlations between judgments of Meaning and Phonological features

<table>
<thead>
<tr>
<th>Proportion responses</th>
<th>Voiced</th>
<th>Sonorant</th>
<th>Labial</th>
<th>Glottal</th>
<th>Close</th>
<th>Mid</th>
<th>Open</th>
<th>Front</th>
<th>Back</th>
<th>Rounded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big</td>
<td>0.25</td>
<td></td>
<td></td>
<td>-0.27</td>
<td></td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round</td>
<td>0.23</td>
<td>0.19</td>
<td></td>
<td>0.23</td>
<td>-0.29</td>
<td></td>
<td>0.34</td>
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<td>0.41</td>
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<tr>
<td>Fast</td>
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<td>-0.27</td>
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<td>Moving</td>
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<td>0.16</td>
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<td>0.21</td>
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<tr>
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$p < .05$

Mathur, Clepper, Nygaard, & Namy, in prep
<table>
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<th>Examples</th>
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</tr>
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<tbody>
<tr>
<td>big/small</td>
<td></td>
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<tr>
<td>round/pointy</td>
<td></td>
</tr>
<tr>
<td>fast/slow</td>
<td></td>
</tr>
<tr>
<td>moving/still</td>
<td></td>
</tr>
<tr>
<td>good/bad</td>
<td></td>
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</tbody>
</table>
Conclusions

• Sets of phonological features reliably predicted judgments of meanings
  \( \text{across ten unrelated languages} \)

• Feature to meaning relationships specific/unique for each meaning dimension

• Cross-modal nature of this mapping
  acoustic, articulatory, linguistic?
Functional significance of sound symbolism

Sound symbolism in word learning

• Language learners may be able to exploit non-arbitrary associations between sound structure and meaning

  both first and second language learners

• Examined the contribution of sound symbolism to a novel word learning task
Vocabulary learning task

Listeners

Native English speakers with no familiarity with the Japanese language

Stimuli

• 21 Japanese antonym pairs (Kunihira, 1977)
• All 42 words were recorded by a female native Japanese speaker
Vocabulary learning task

**Match** condition - Japanese words were paired with actual English equivalent

\[\text{hayai} \rightarrow \text{fast}\]

**Opposite** condition - Japanese words were paired with the English equivalent of their antonym pair

\[\text{hayai} \rightarrow \text{slow}\]

**Random** condition - Japanese words were randomly paired with the unrelated meaning of another antonym

\[\text{hayai} \rightarrow \text{blunt}\]
Vocabulary learning task

Learning and test cycles repeated over three blocks

*Learning* - Listeners heard a Japanese word over headphones while being presented with its English equivalent on the computer screen

*Test* - Listeners heard a Japanese word and were presented with two possible English “translations” -- the correct target word and the distractor word

*hayai*

fast walk
Strategy

Are learners incorporating sound-meaning relations into their on-line word retrieval processes?

Examined situation where performance was highly accurate
- time to respond is dependent measure

Listeners were given two possible English word choices
- asked to choose the correct match
Vocabulary learning - Forced choice accuracy

Nygaard, Cook, & Namy, *Cognition*, 2009
Vocabulary learning - Response time

Nygaard, Cook, & Namy, Cognition, 2009
Results

- Pairings with non-arbitrary sound to meaning mappings were processed more accurately and quickly than arbitrary pairings.

- Word pairings within the same semantic domain, albeit antonyms, appeared to result in some benefit in the word learning task.
Summary

• Listeners were sensitive to sound-meaning correspondences and these connections influenced vocabulary learning

• Learners appeared to store and retrieve sound-meaning relationships during the word learning task

• Sound symbolism has processing consequences for spoken language
  – Categorization (Kovic, Plunkett, & Westermann, 2010)
Potential mechanisms

• General cross-modal sensory-perceptual and/or perceptual-motor connections
  (Marks, 1978; Ramachandron & Hubbard, 2001; Spector & Maurer, 2009)

• Probabilistic nature of sound symbolism – weak constraint

• Semantic dimensions and valence

• Generalization of sound symbolism across domains
Conclusions

• Challenges assumptions that words bear an exclusively arbitrary relationship to their referents

• No strict dichotomy between linguistic form and referential meaning

• Sound to meaning correspondences may arise from general perceptual cross-modal relationships
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