Cross-Linguistic Sound Symbolism

Lynne C. Nygaard

Department of Psychology
Emory University

Sound Symbolism: Challenging the Arbitrariness of Language
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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
- *kyorokyoro* – 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* bright - dark
  - » *amai - suppai* sweet - sour
  - » *arai- nameraka* rough - smooth
- 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

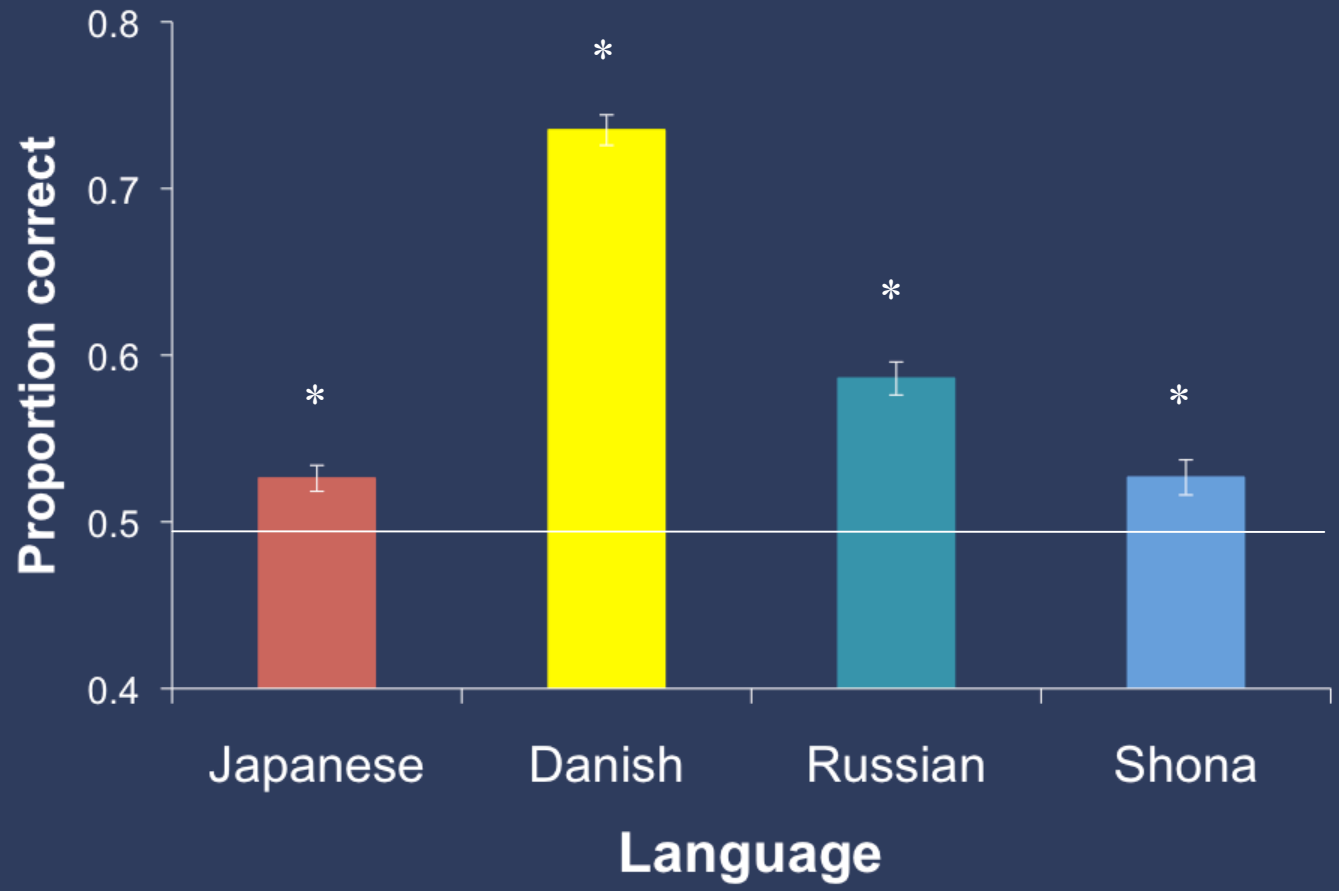
Design and Procedure

- 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



* $p < .05$

Namy, Nygaard, Clepper, & Rasmussen, in prep

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

- 1220 items across languages and meanings

Sound symbolism across languages

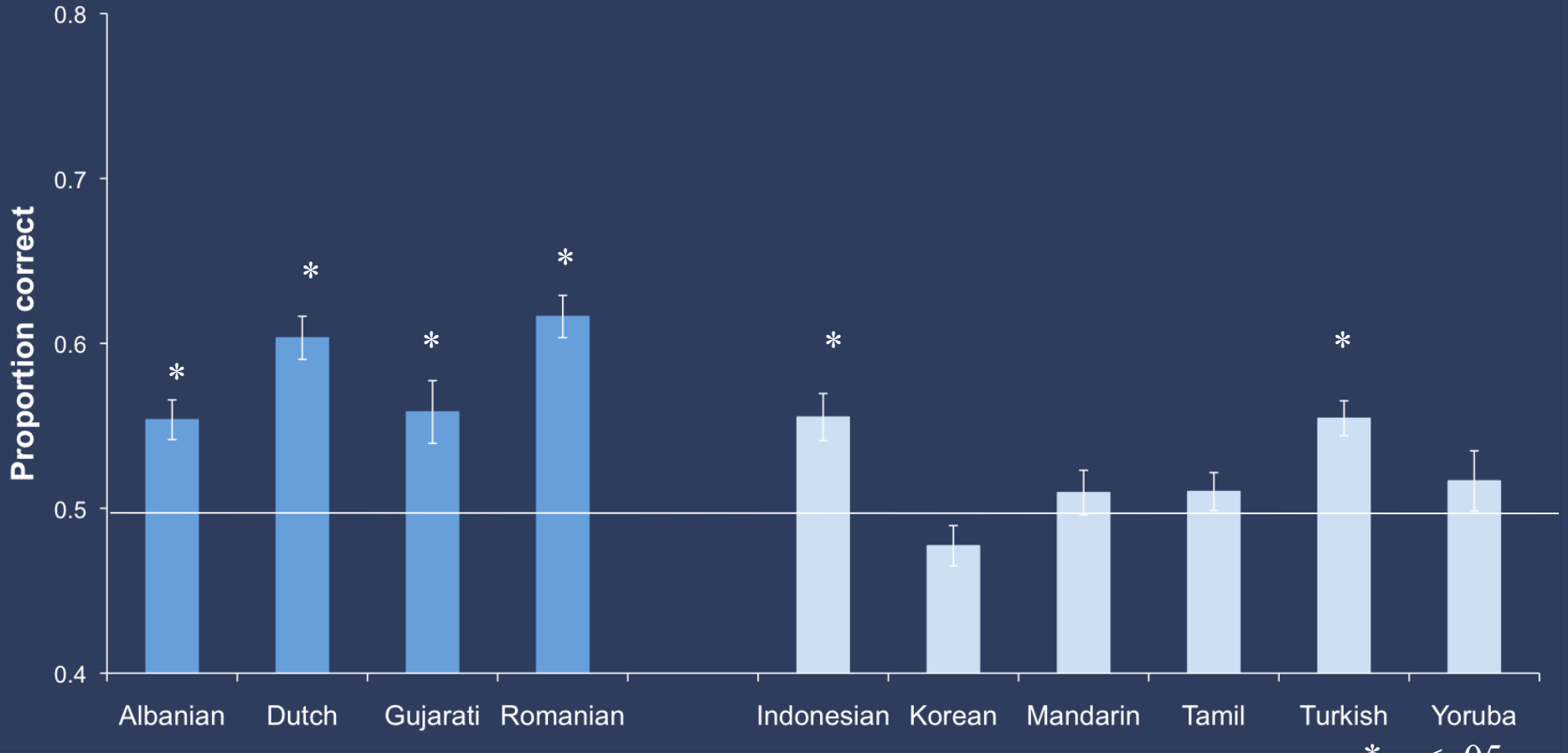
Behavioral ratings

- 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:

dhembezuar => round or pointy?

By language



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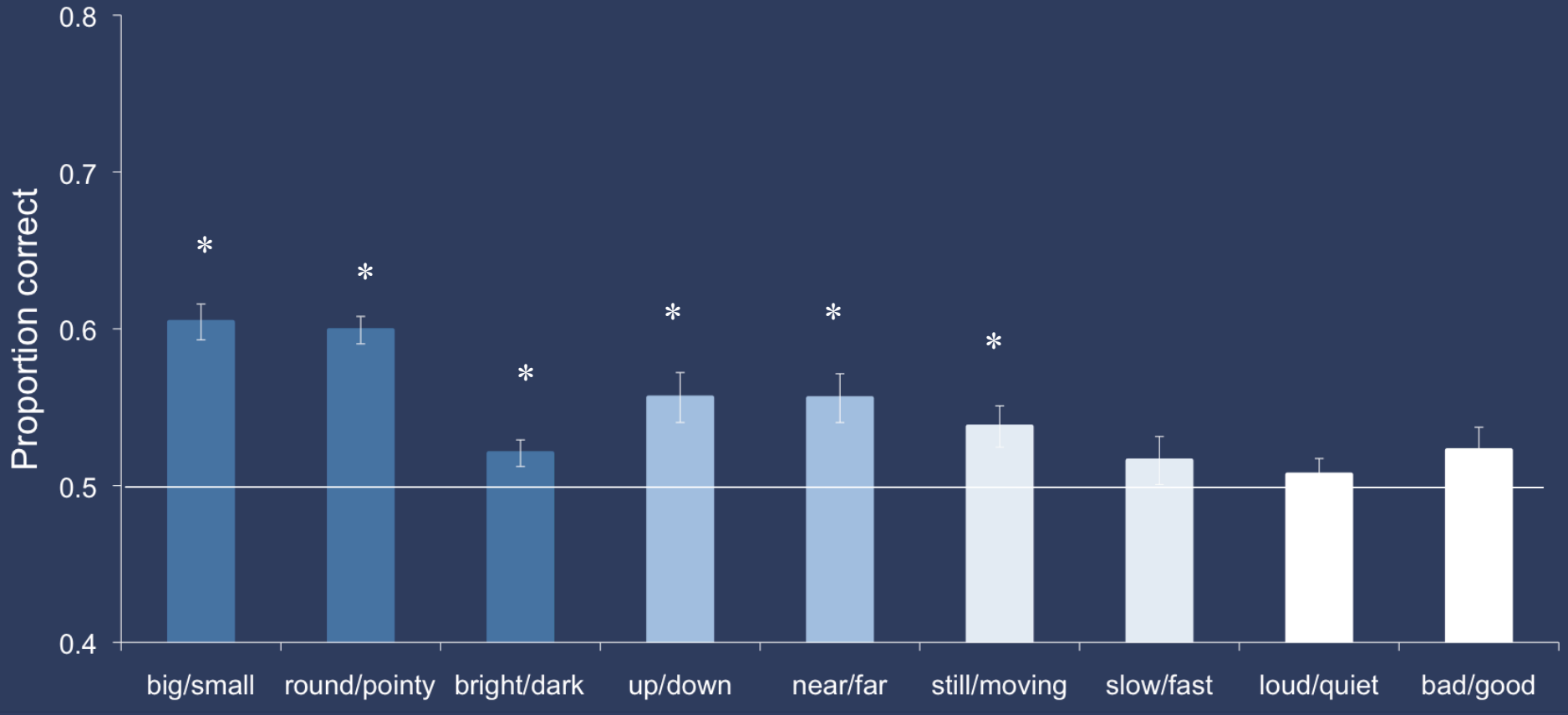
Nygaard, Clepper, & Namy, in prep

By dimension



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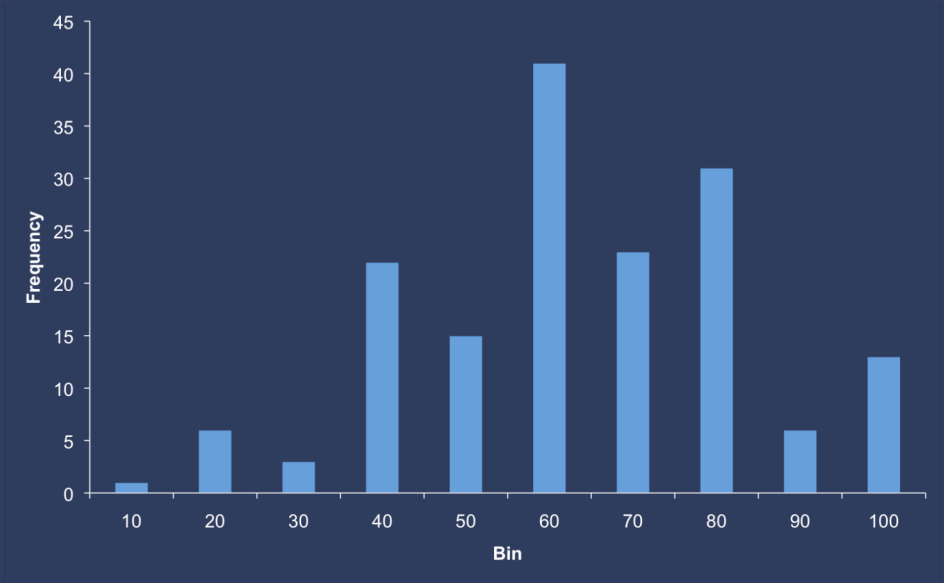
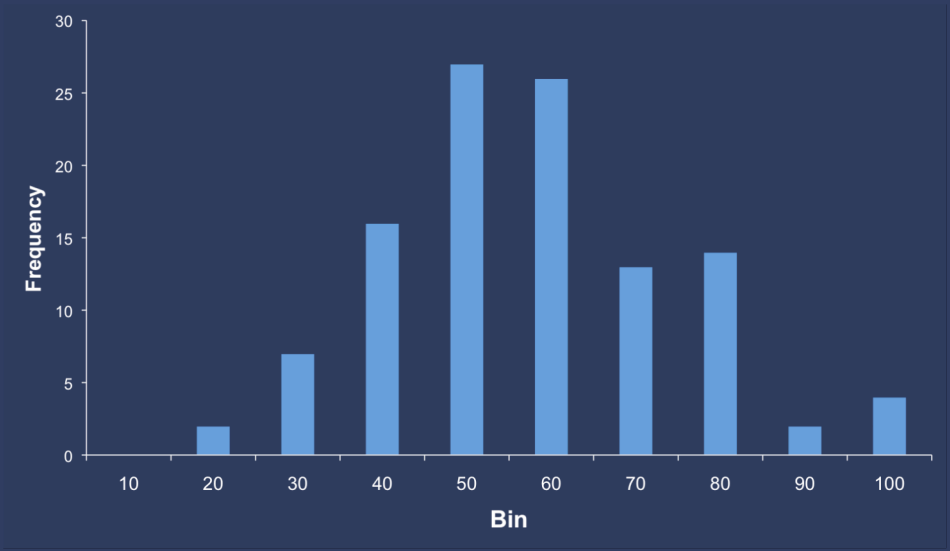
Nygaard, Clepper, & Namy, in prep

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

Proportion responses	Consonants	Vowels	Syllables
Big			
Round	-0.41	-0.49	-0.46
Fast	0.29	0.31	0.33
Moving	0.47	0.64	0.64
Good		0.15	0.18

$p < .05$

Mathur, Clepper, Nygaard, & Namy, in prep

Correlations between judgments of Meaning and Phonological features

Proportion responses	Voiced	Sonorant	Labial	Glottal	Close	Mid	Open	Front	Back	Rounded
Big	0.25				-0.27		0.17			
Round	0.23		0.19			0.23		-0.29	0.34	0.41
Fast		-0.27								-0.17
Moving	0.18			0.16	-0.27		0.21			
Good	0.17									

$p < .05$

Mathur, Clepper, Nygaard, & Namy, in prep

Examples

big/small 

round/pointy 

fast/slow 

moving/still 

good/bad 

Conclusions

- Sets of phonological features reliably predicted judgments of meanings

  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

hayai -> fast

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

hayai -> slow

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

hayai -> 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

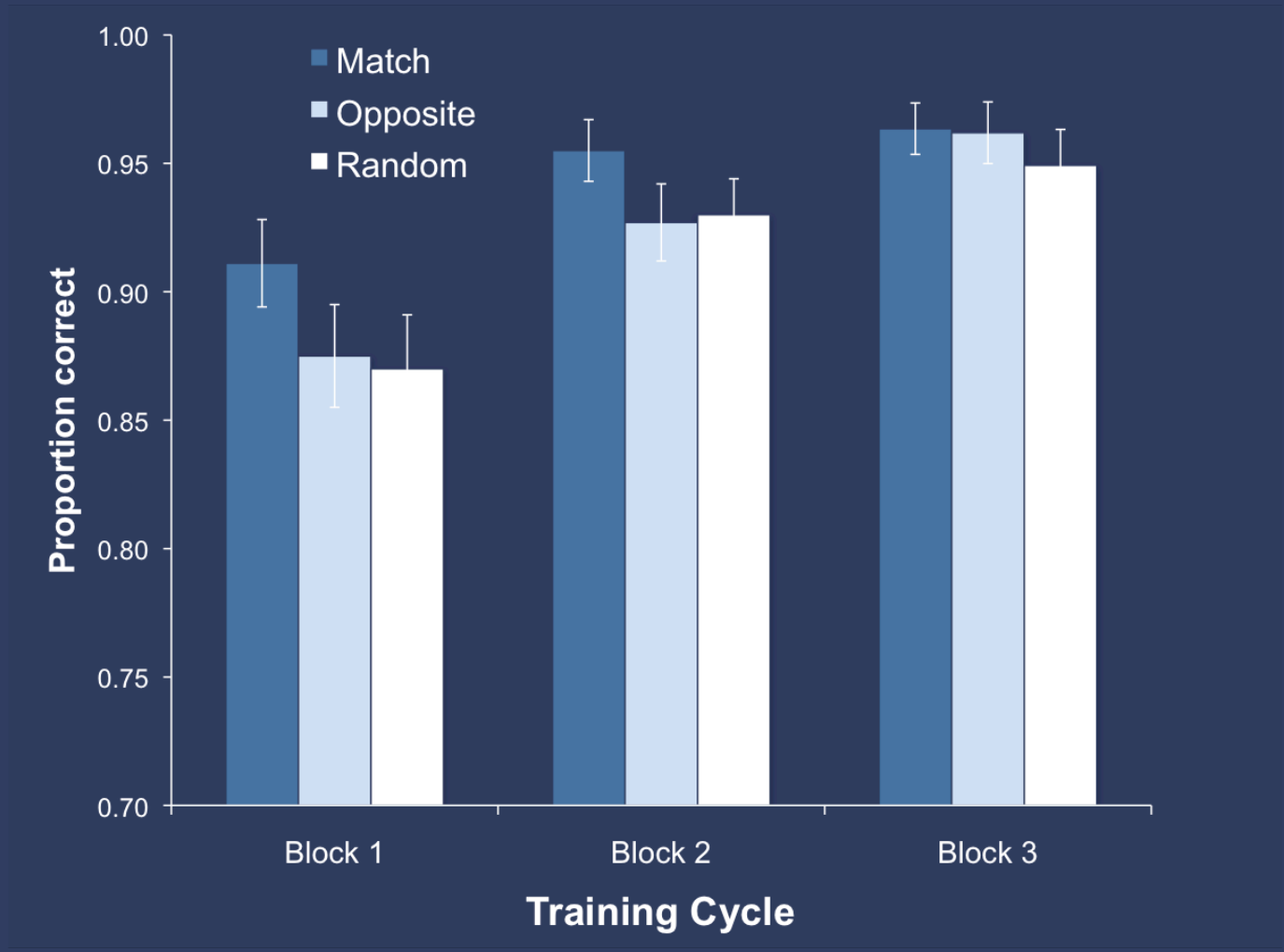
Strategy

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

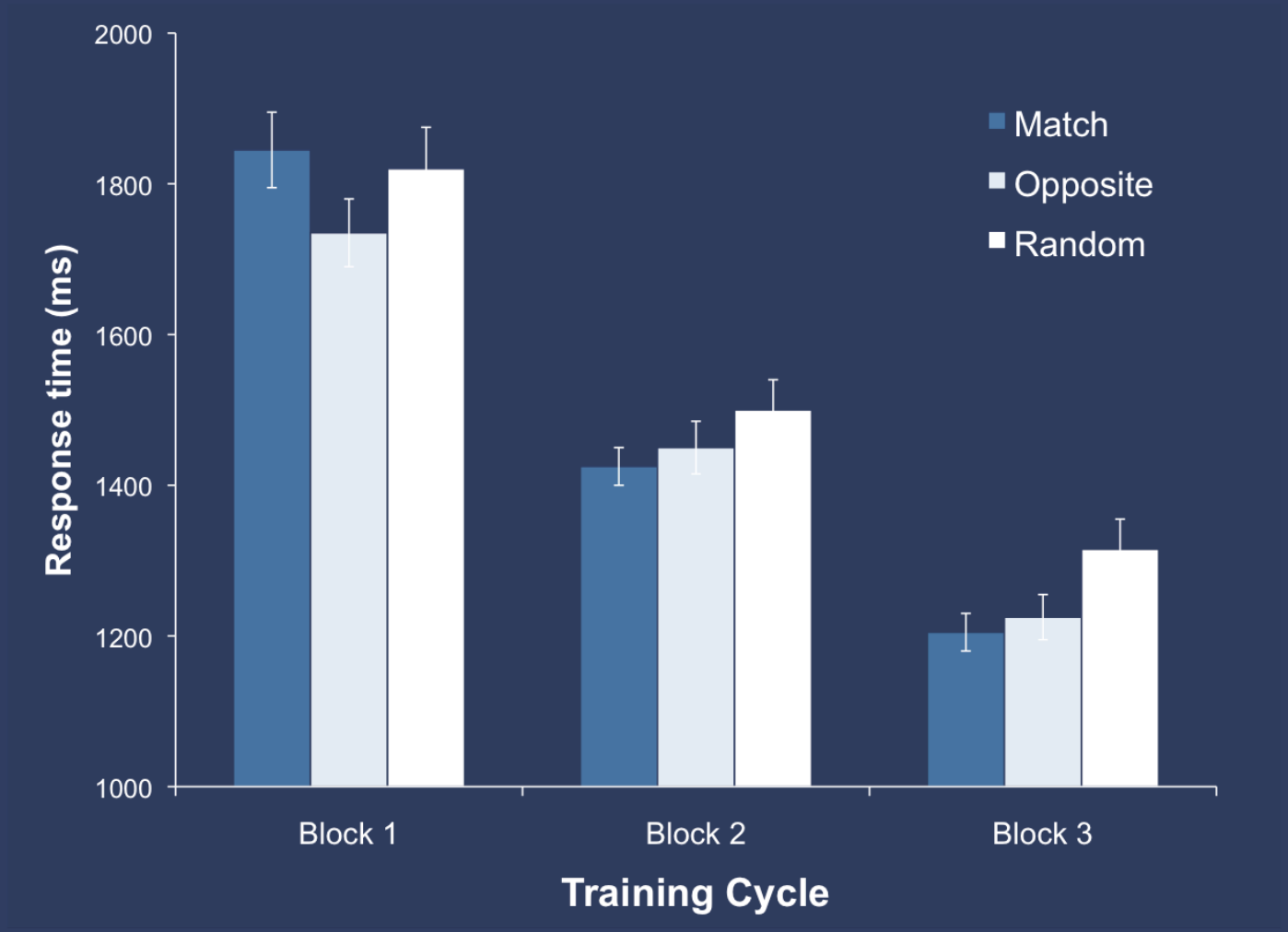
Listeners were given two possible English word choices
- asked to choose the correct match

Vocabulary learning - Forced choice accuracy



Nygaard, Cook, & Namy, *Cognition,* 2009

Vocabulary learning - Response time



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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
  - Word learning in children (Imai, Kita, Nagumo, & Okada, 2008)
  - 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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