Lexical Categorization Variables for English and Mandarin Quantify Ambiguity in Object Naming

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Introduction

Words and Concepts

→ **Words and their meanings** are distinct from underlying conceptual knowledge *(Malt, 2019)*

→ **Words provide cues** to a nuanced combination of perceptual and linguistic information, from which concepts may be arise *(Lupyan & Lewis, 2019)*

Cross-linguistic Research

→ *Translations of **nouns aren't equivalent between languages**, even for names of common objects (Graham & Belnap, 1986; Malt et al., 1999, 2003; Ameel et al., 2005; Zinszer et al., 2015)*

→ Distributional semantic models show that **translations of nouns widely vary in their associations** with other words in each language *(Zinszer et al., 2016; Thompson et al., 2020)*

Stimuli Often Conflate Word & Concept

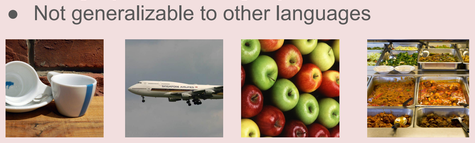
Classic, widely-used normed stimulus sets have long prioritized canonical, high name agreement images (Snodgrass & Vanderwart, 1980)

MultiPIC (Dunabeitia et al., 2018) multilingual database of 750 pictures

- Normed in 6 European languages
- Represent highly distinctive pictorial characteristics
- Hand drawn by one artist minimize heterogeneity

THINGS (Hebart et al., 2019) image database with dozens of photos per category label (e.g., "couch")

- *but images selected for fit to* **dominant names**
- Provides inaccurate representation of real world ambiguity when naming objects
- Not generalizable to other languages



The Present Study

Comparing picture naming and rating responses from monolingual speakers of **English & Mandarin**

- Large populations of bilinguals and monolinguals
- For monolingual speakers, relatively low cross-cultural contact in object naming norms *(Zinszer et al., 2015)*

Using photographs of objects corresponding to concrete nouns from several **difficult-to-translate** object categories

- Assess stability of ratings about **within language** after 8 years & drawn from a wider sample
- Compare degree of language-dependence for **three measures of category fitness**: % name agreement, name entropy, and name typicality

Method

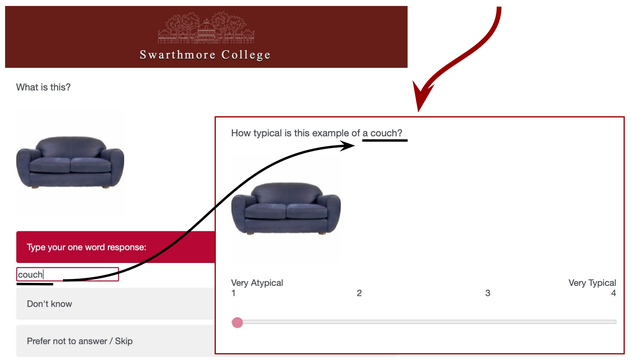
Image Set

- Object images from a **2013** study of translation ambiguity (407 images): vehicles, clothing, dishes, tools, furniture
- 150 images in **2021** study selected for:
  - **differing norms** between languages (2013)
  - a wide range of name agreement levels across images, within language

2013 Participants (College Students)		
20 English monolinguals @ Penn State	2 M / 18 F	19.4 y
24 Mandarin monolinguals @ South China Normal	6 M / 18 F	21.0 y
2021 Participants (American MTurkers)		
27 English monolinguals	18 M / 9 F	35 y (28-51)

Survey

1. Language History Questionnaire
2. 150 images:
   - "What is this?"
   - "How typical is this example of a ___?"



Results

91% of images had **same dominant English names** in 2021 & 2013

Wide range in name agreement (40-100%) and typicality ratings (1.5-4)

NA = Name Agreement
H = Name Entropy
T = Average Typicality

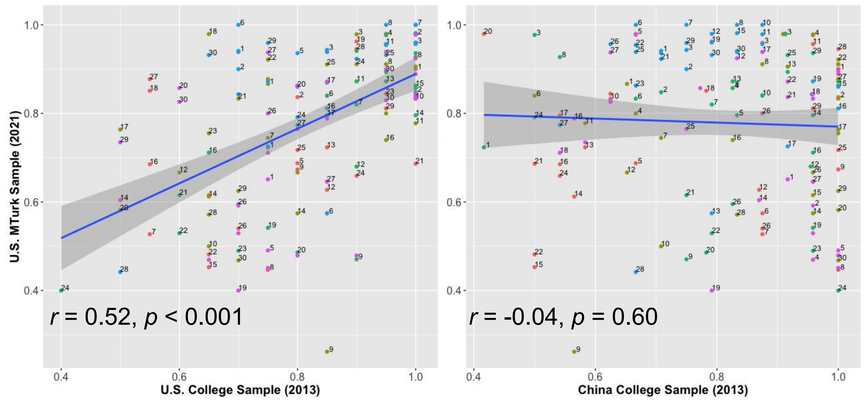
Correlation between languages in 2013 college samples

	r	*p*
NA	-0.01	0.92
H	0.03	0.74
T	0.56	<0.001

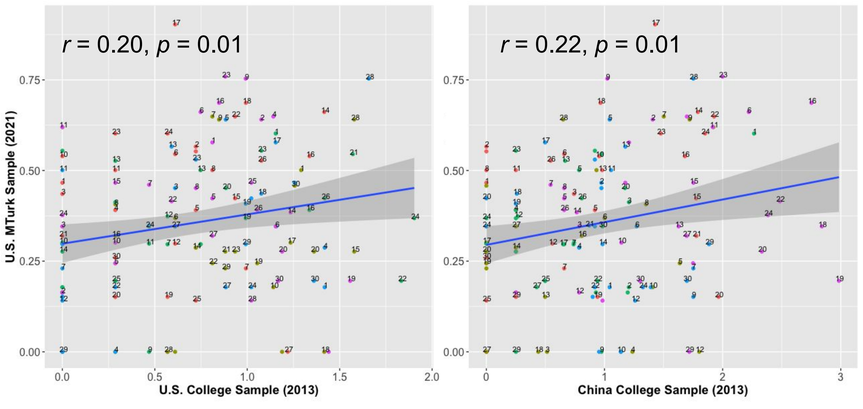
Correlation between variables in 2021 English sample

	NA	H	T
NA	1.00	-	-
H	-0.39	1.00	-
T	0.18	-0.15	1.00

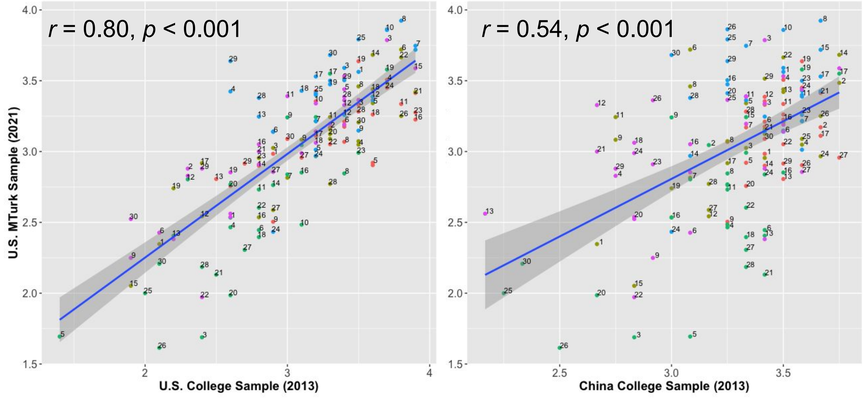
Name Agreement for 2021 vs. 2013 Monolingual Samples



Name Entropy (H) for 2021 vs. 2013 Monolingual Samples



Typicality Ratings for 2021 vs. 2013 Monolingual Samples



Discussion

Reliability of ratings within language

- **Dominant names** and **name agreement** for the images are consistent over 8 years and different English-monolingual samples
- Lower correlation for **name entropy** suggests that non-dominant names might differ over time or between groups
- **Typicality** ratings are highly preserved. *Raters' intuitions about category fitness seem to change even less than the labels themselves.*

Cross-language categories & concepts

- Images selected from 2013 sample to minimize cross-language name agreement
- Nonetheless, **typicality ratings** were still **closely matched** between 2013 samples
- New sample of English monolinguals show the same relationship to Mandarin ratings:
  - No correlation in name agreement
  - Low correlation in name entropy
  - Strong correlation in typicality ratings
- Consistent with literature that **naming varies more between languages than concepts do** *(Malt et al., 1999; Malt, 2019)*

Interpreting categorization variables

- **Name entropy** is less consistent between same-language samples, preserves lexical category ambiguity
- While explicitly word-level variables (name, name agreement) have low cross-langauge correlation, **typicality** might draw on non-linguistic conceptual information.

Future directions

- Studying **Mandarin-English bilinguals** can explain how first language category knowledge changes over time and influences naming objects in new language

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