DIACHRONIC LANGUAGE CHANGE AND ITS INFLUENCE ON LEXICO-SEMANTIC REPRESENTATIONS ACROSS THE LIFESPAN

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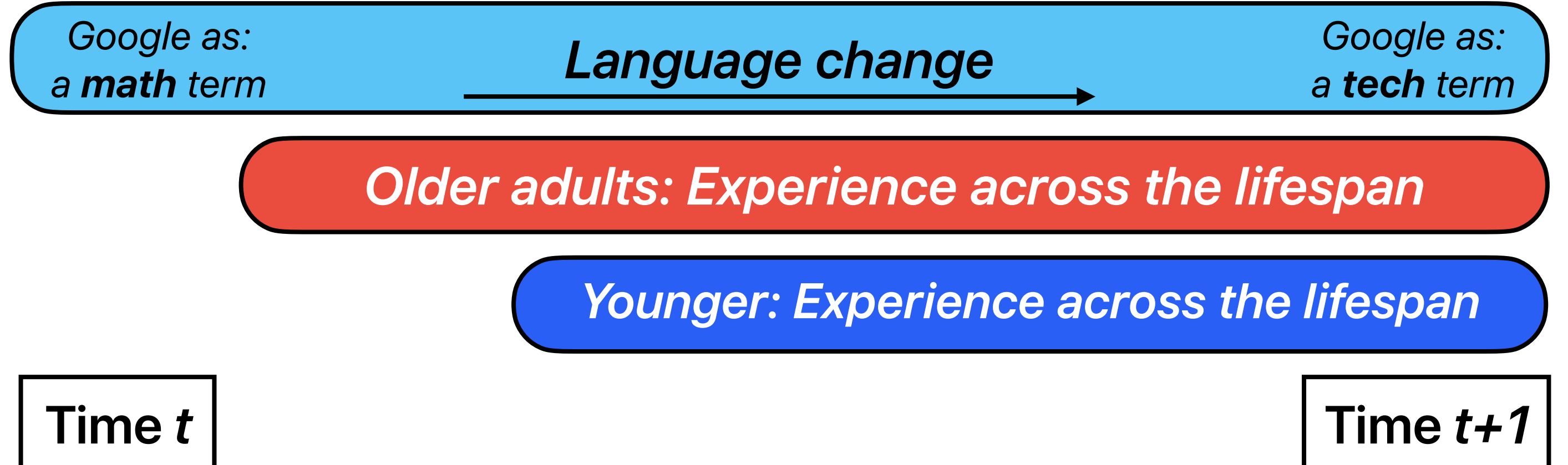
Full paper

BACKGROUND

- Language as a **complex adaptive system** (Beckner et al., 2009)
- Collective patterns of language use **change over time** (Bybee, 2015; Bynon, 1977; Michel et al., 2011)
- **Age-related differences** in language processing and organization (Dubossarsky et al., 2017; Federmeier et al., 2010)

Example of two cohorts with different learning experiences

Google as: a **math** term → Language change → Google as: a **tech** term

Older adults: Experience across the lifespan

Younger: Experience across the lifespan

Time *t*   Time *t+1*

RESEARCH QUESTION

How does diachronic language change relate to lexico-semantic representations of individuals across the lifespan?

DATA SETS

- **HistWords**: diachronic word embeddings (Hamilton et al., 2018)
- **SWOW**: Small World of Words (De Deyne et al., 2019)
- Relatedness judgments (Current paper)

CORPUS ANALYSIS

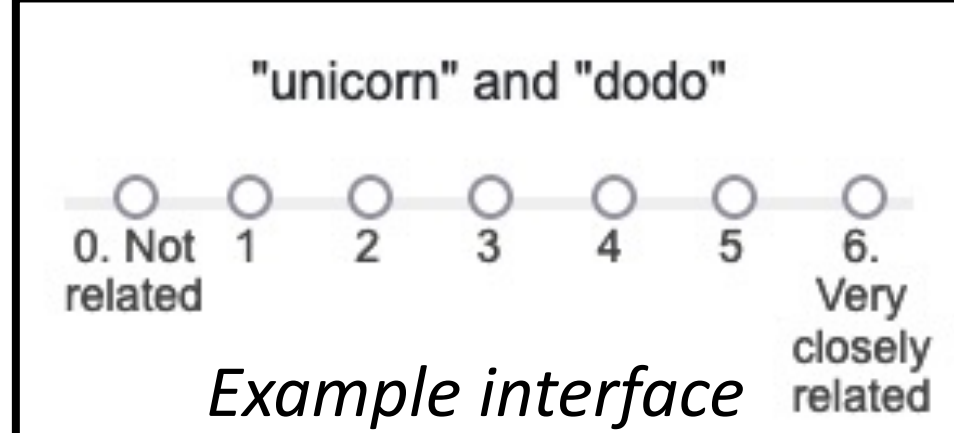- **Representational similarity analysis** (Kriegeskorte, 2008) was used to compare corpus-based (HistWords) to association-based (SWOW) lexico-semantic representations
- Each data source is represented using a **representational similarity matrix**, where a cell corresponds to the similarity between two words

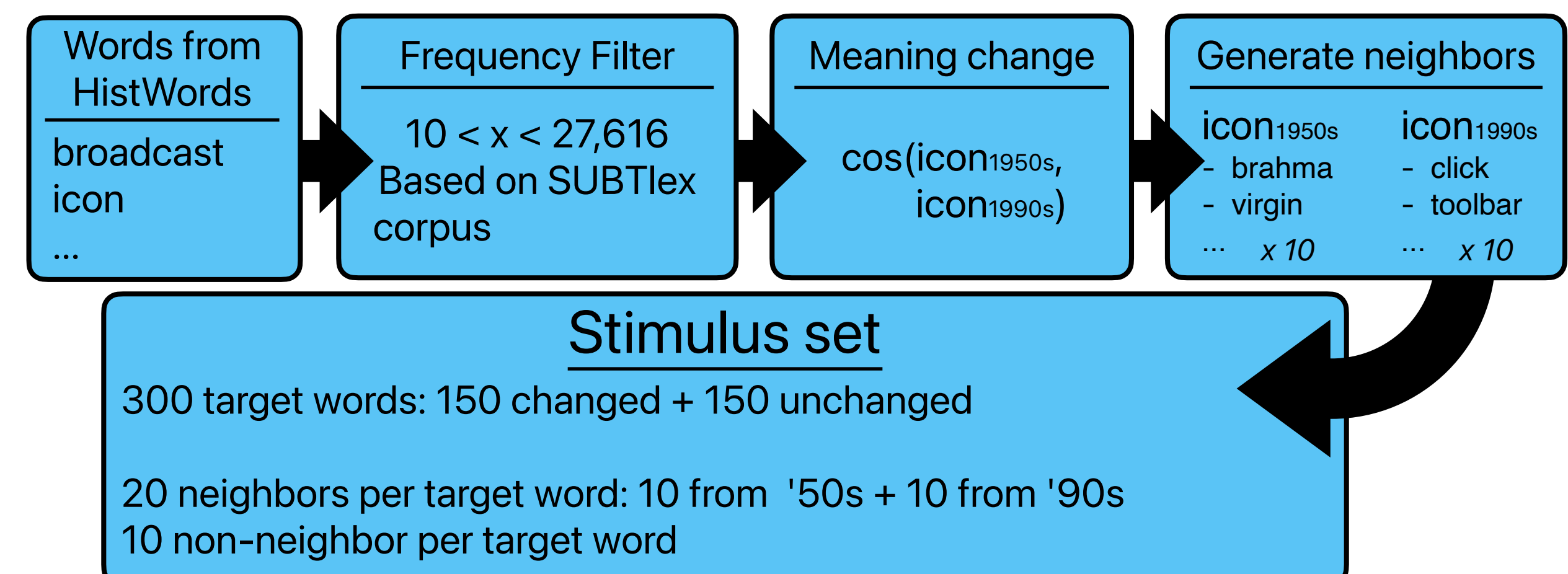### 1A. RSA between decade-level corpus-based representations
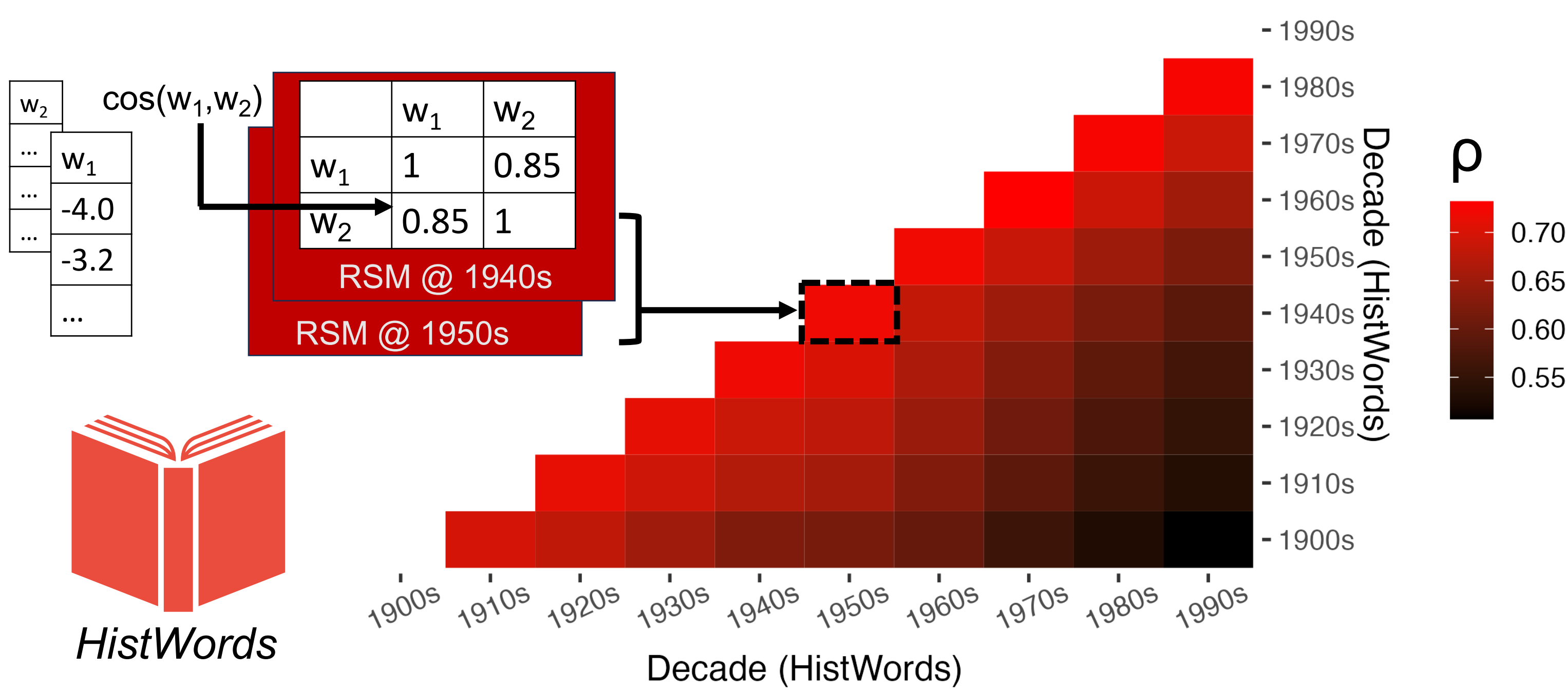
1B. RSA between association-based representations

Diagonal (reliability) adjusted using Spearman-brown prophecy formula

1C. Comparison between corpus-based (1A) and association-based (1B) representations

1A. Meaning changes **gradually** over time
1B. No linear pattern in similarity across age cohorts
1C. Individuals' representations match **more recent decades**, across all age cohorts (similar pattern with linear model ablation analysis)

RELATEDNESS JUDGMENTS

- Recruited from Mturk and Prolific
- Participant information:

"unicorn" and "dodo"
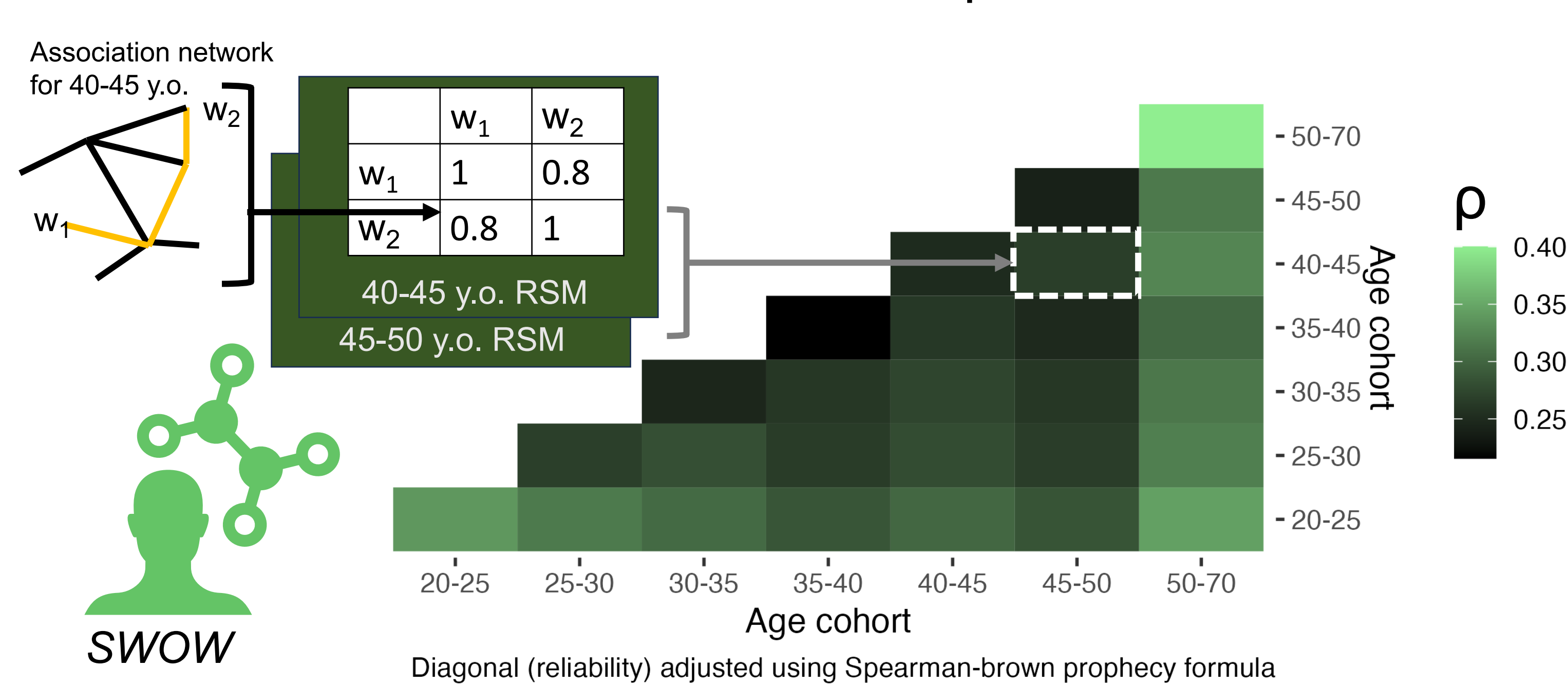
0. Not related 1 2 3 4 5 6. Very closely related

Example interface

Age group	Count	Mean age (SD)	Range
Younger adults (YA)	500	27.74 (4.04)	18-33
Older adults (OA)	500	68.04 (4.33)	63-86

- Stimuli:

Words from HistWords: broadcast, icon ... → Frequency Filter: 10 < x < 27,616 Based on SUBTlex corpus → Meaning change: $cos(icon_{1950s}, icon_{1990s})$ → Generate neighbors: $icon_{1950s}$ (brahma, virgin ... x 10), $icon_{1990s}$ (click, toolbar ... x 10)

Stimulus set

300 target words: 150 changed + 150 unchanged

20 neighbors per target word: 10 from '50s + 10 from '90s
10 non-neighbor per target word

2A. Relatedness ratings by pair type
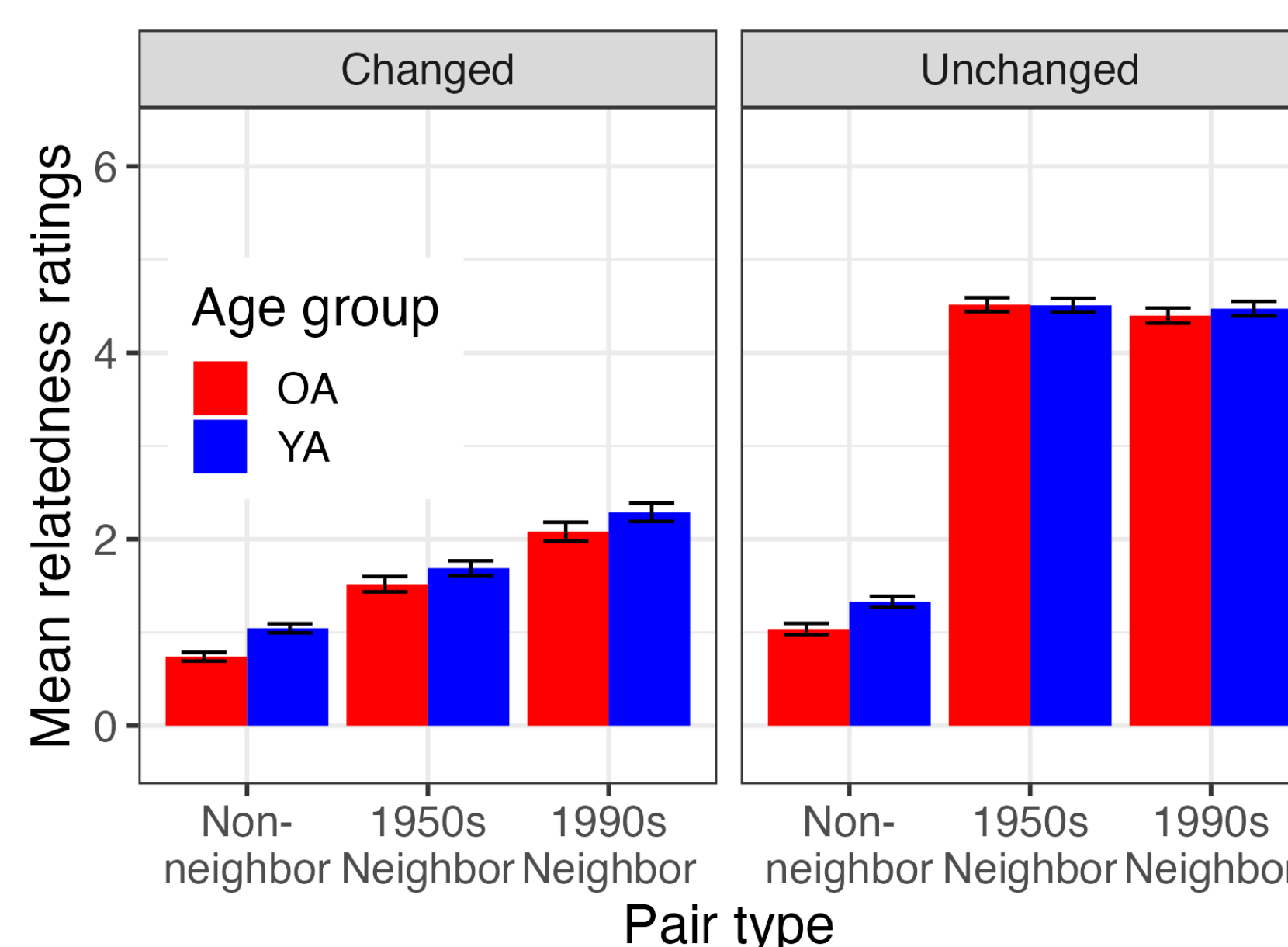
2B. Rating consistency across random halves (100 iterations)

Age group	YA	OA
Pairwise IAA	0.71	0.76
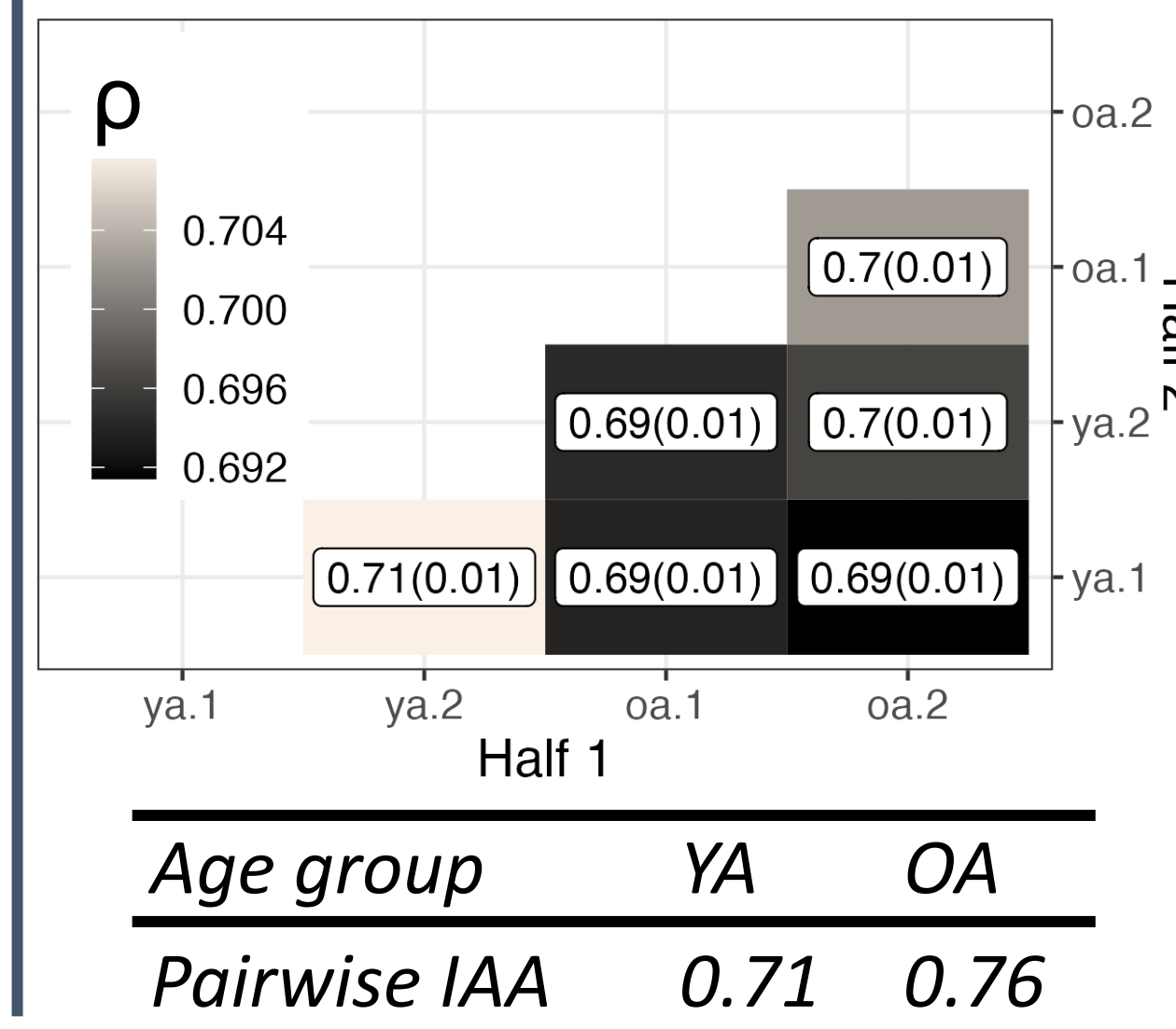
2C. Comparison between ratings (2A) and corpus-based (1A) representations
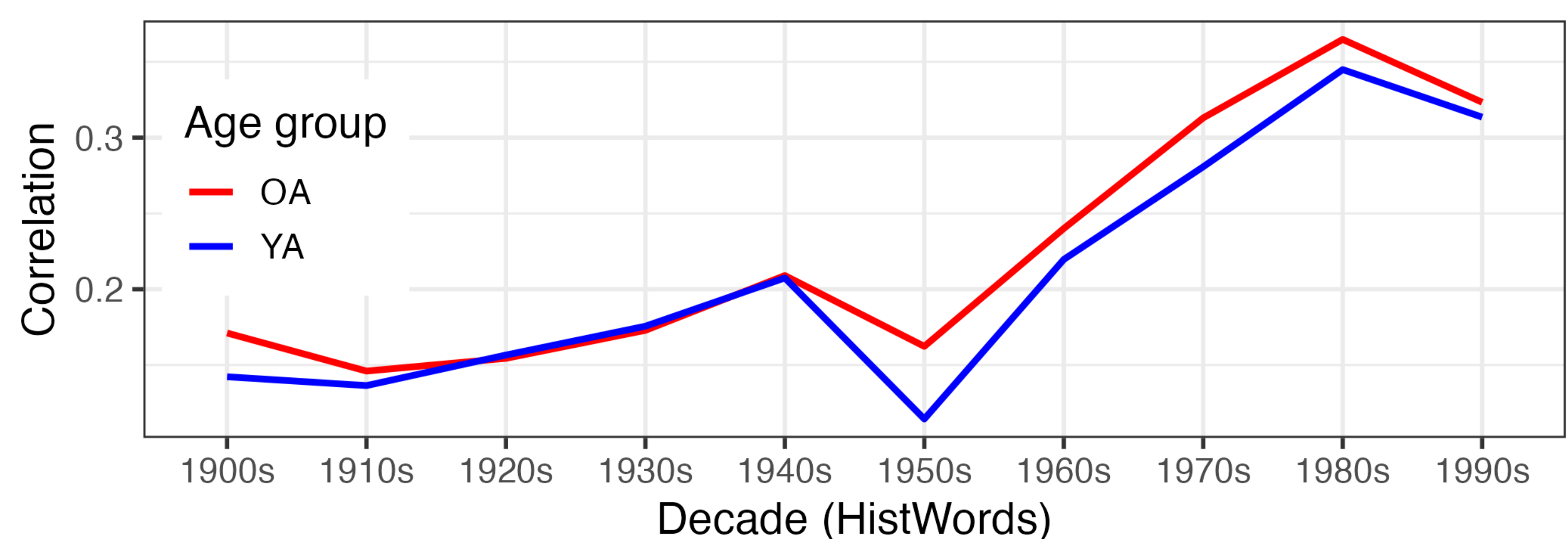
2A. Similar pattern across the two age cohorts' ratings, with a **recency trend** in relatedness for changed words
2B. High internal reliability and IAA across both age groups
2C. Ratings match **more recent decades across both age cohorts**

Overall, we found similar representations across age groups, **despite** different language experiences
- *Align more closely with more recent meanings (as derived from recent corpora)*
- Suggests that we quickly adapt to changes in word meaning
  - *Similar to lexical entrainment within dialogues (Brennan, 1996)*
- May see age-related differences in other domains that change at a different rate (i.e., syntax)