Grapheme size is processed like stress

Experimental evidence from Chinese script

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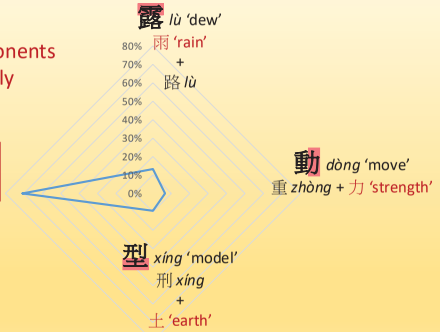
SLE 2020: 53rd Annual Meeting of the Societas Linguistica Europaea
26 August - 1 September 2020, Cyberspace

Thanks to Taiwan's Ministry of Science and Technology (MOST 103-2410-H-194-119-MY3), my lab assistants, and anonymous reviewers. All errors are my own fault. I'm so sorry.

Chinese character structure

Semantic components (radicals) strongly favor the left

張 *zhāng* 'spread'
弓 'bow' + 長 *cháng*



"Grapheme" is used in the title for convenience; "component" or "radical" more common terms.
These are traditional characters, but simplified characters work the same way.
Characters without this semantic-phonetic structure are relatively rare (<20%).

Position and size regularities

- Semantic radicals are usually small in any position

張 動 露 型

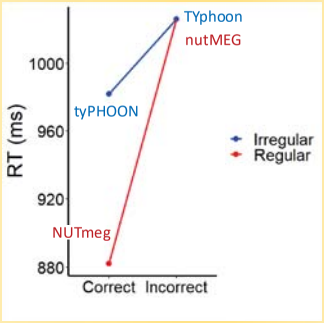
- But only at left is small size a regular pattern

比 林 竝

- Myers (2019) claims it's analogous to regular stress
  - Other related analogies: Reduplication, clash, weight, ...
  - Evidence from corpus analyses and experiments
  - Orthographic "prosody" (see Evertz, 2018 for alphabets)
- This study: More experimental evidence?

Regular stress effects in English

- Regular English stress
  Strong-weak: *nútmeg*
  (vs. irregular *typhóon*)
- **Cutler & Clifton (1984)**
  Exp 3: Lexical decisions for regular vs. irregular words (without vowel reduction), with correct vs. incorrect stress
- **Regularity x Correctness**
  Incorrect stress mattered less for irregular words, as if mentally regularized



Testing regular size effects

- **Lexical decisions**
  - 40 traditional readers
  - 50 semantic-phonetic characters
    - 25 each with L/R radicals
  - 50 fakes with same components
  - Matched in number of strokes, character token frequency, component type frequency
  - Counterbalanced
- **Acceptability judgments**
  - 42 traditional readers
  - Only fake characters

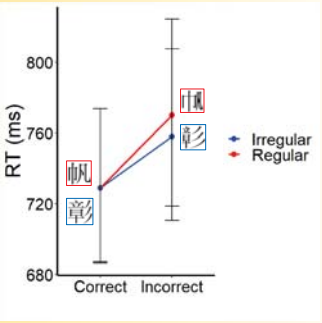
Real	Correct	Incorrect
Regular	帆	巾帆
Irregular	彰	彰

Fake	Correct	Incorrect
Regular	崢	巾崢
Irregular	區	區

Stimuli were created using Wenlin's Character Description Language (https://wenlin.com/)

Lexical decisions

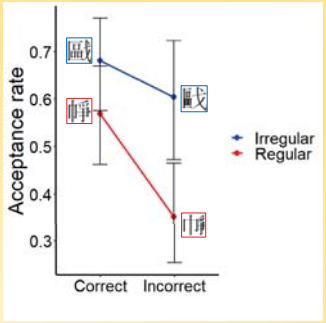
- **Only correctness matters**
  Responses to real characters slower with incorrect size structure, regardless of radical position regularity
- Cf. Cutler & Clifton (1984)
  Not the same pattern here
- Lexical frequency
  Matters more to incorrectly sized items, but no interaction with radical position regularity



Plot shows modeled effects with 95% confidence intervals.
Best fitting mixed-effects linear regression has random slopes for participants and characters (correctness within character); Satterthwaite test significant ($p < .01$) only for correctness.

Acceptability

- Regularity matters
  Judgments are more tolerant of novel irregular characters
- Correctness matters
  Radicals are expected to have their usual small size
- **Regularity x Correctness**
  Radical size matters less for irregular characters
- Cf. Cutler & Clifton (1984)
  Similar interaction as here



Plot shows modeled effects with 95% confidence intervals.
Best fitting mixed-effects logistic regression has random slopes for participants but not for characters; correctness ($p < .0001$), regularity ($p < .01$), interaction ($p < .05$) all significant.

Conclusions

- Effects of regularity and size correctness
  - Left/right-radical characters are equally easy to access
  - But readers still favor smaller left component
  - Effect is analogous to regularity bias with English stress
    - Though more lexically constrained: only seen in acceptability
- Two types of explanation
  - Amodal phonology
    - Any complex symbol system engages innate language faculties
  - General cognition
    - Learning of coarse-grained perceptual regularities (stress, size)

References

Cutler & Clifton Jr. (1984). The use of prosodic information in word recognition. In Bouma & Bouwhuis (Eds.) *Attention and Performance X: Control of Language Processes*. Erlbaum.

Evertz (2018). *Visual prosody: The graphematic foot in English and German*. Walter de Gruyter.

Myers (2019). *The grammar of Chinese characters: Productive knowledge of formal patterns in an orthographic system*. Routledge.

See abstract for more references and bibliographic information.