

Asymmetry in interference arising from naming practice: shape beats color

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Stroop interference is strongly asymmetric: It is difficult to respond with “red” to green (interference from reading to color naming); But it is no problem to respond “green” – there is no interference from colors to words.

Most theories attribute this asymmetry to practice: reading is extensively practiced but color naming is not. However, the asymmetry cannot be reversed with color naming practice.

Theories positing inherent structural asymmetries attribute the difference to the uniquely linguistic nature of the relation between orthographic and phonological word forms, hypothesizing privileged access.

Here we question both the linguistic specificity and the dependence on practice, claiming instead that interference asymmetries arise from inherent differences in visual processing of forms (shapes) versus colors.

Rationale

- (a) If asymmetry depends on practice, there should be no asymmetry in interference between equally practiced dimensions.
- (b) If asymmetry depends on visual word form, there should be no asymmetry when naming non-linguistic novel shapes.

We created interdimensional conflict using a visual-verbal paired associate learning task in which the same responses were associated with different aspects of the stimuli (form and color) that could be congruent or incongruent.

Method

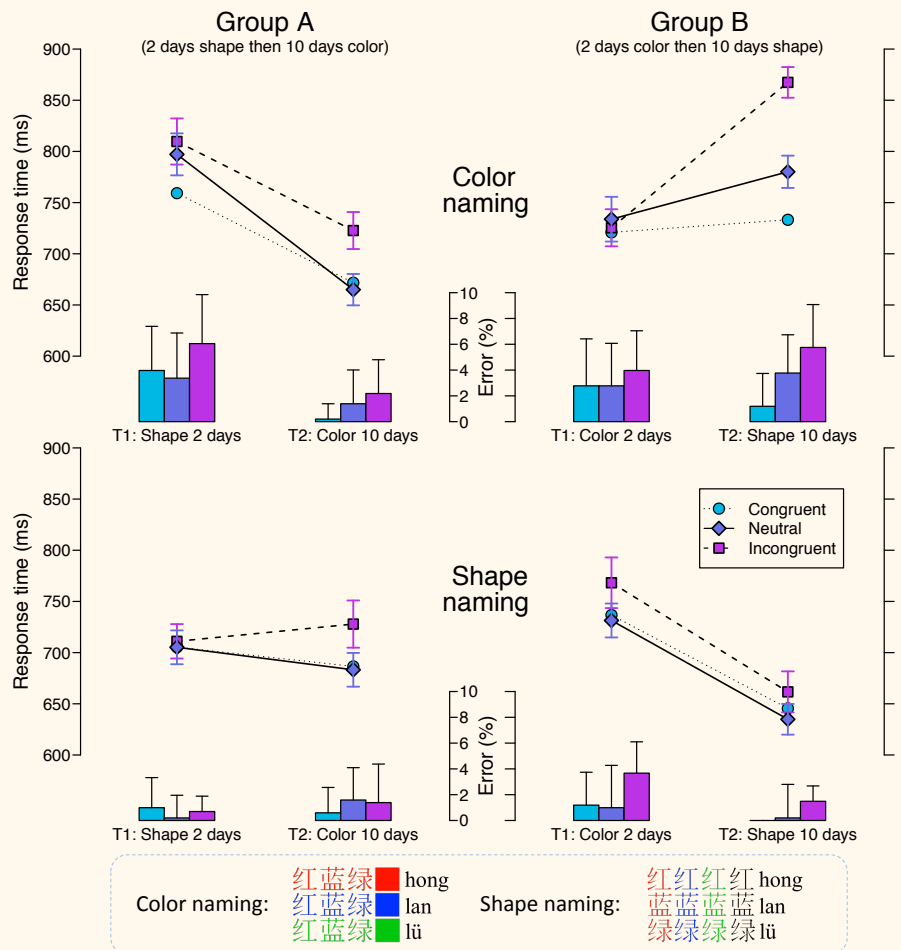
28 adults practiced naming 3 color patches and 3 novel shapes using the same 3 nonsense syllables. Group A practiced shape naming for 2 days (600 trials total), then color naming for 10 days (3000 trials); Group B practiced the opposite order and amount. Both groups were tested in both color and shape naming after each practice block. In the neutral condition, shapes were white-on-black and colors were patches, as practiced. In the congruent condition, shapes were presented in the colors corresponding to the same response. In the incongruent condition, shapes were presented in colors corresponding to different responses.

Analysis

Interference change (in log-RT and binomial accuracy) was tested as an interaction between time and condition in R mixed-effects models.

Results

- (a) Practice was about equally effective for both dimensions, reducing response times and error rates in the *trained* dimension after 10 days’ training.
- (b) There was an asymmetry in the effects of practice on the *untrained* dimension: shape naming improved with either training whereas color naming deteriorated after extensive shape naming.
- (c) Interference was successfully produced in both dimensions after training.
- (d) There was a strong asymmetry in interference: extensive practice in either dimension produced interference in color naming, whereas interference in shape naming was only produced by color training and was not as large.
- (e) Facilitation only occurred for color naming, after shape naming practice.



Conclusion

Interference asymmetries emerged despite balanced practice and nonword responses. Therefore the source of the asymmetry is inherent but not specific to language or practice. Perhaps shapes are meant to be named, but colors are not.

These findings are not inconsistent with any specific theoretical accounts of interference but do point out the need to consider the *source* of the asymmetry.

To the extent that reading can be conceptualized as a form of visual-verbal association between orthographic and phonological forms akin to learned paired associates, these results may point towards an explanation of the observed correlation of reading with rapid naming and with paired associate learning.