Language and Thought

A wide range of questions can be asked about the relation between language and thought

- Are some thoughts unthinkable without language?
- Do people who speak different languages think differently?
- Do polyglots think differently when speaking different languages?
- Does learning new languages change the way you think?

**If you answer “YES” to these questions, endorsing the “linguistic relativity hypothesis”.

- Strong version of linguistic relativity is called linguistic determinism.

  – The claim that speakers of different languages are constrained to think in certain ways because of their specific language (e.g., Orwell).
    - e.g., if your language has no term for blue, you can't see blue, if no term for "justice", no corresponding concept. The idea behind "Newspeak"
  – Largely rejected -- It seems doubtful that Newspeak would work.

- Weaker version of language specific effects is called linguistic relativity.
  - The claim that different languages shape or bias (rather than determine) the thoughts of its speakers.
    - e.g., easier to perceive the difference between two colours if your language distinguishes between them.
    - e.g., If your language marks the word bridge as grammatically feminine, then bridge has a feminine connotation.
  - However, on this view, language does not fundamentally restrict our perceptual abilities, or prevent us from entertaining any thoughts. Rather, it biases thoughts (and in some cases improves them, to a limited degree).

- Weakest version is sometimes called thinking-for-speaking.

- The claim here is that different languages shape thoughts (perceptions) of speakers while speaking.

- This contrasts with linguistic relativity research which generally focuses on the impact of language on non-linguistic thinking.
  - E.g., how language might impact on reasoning about space or time in a non-linguistic task.

- Consider the sentence: “The elephant ate the peanuts”:
  - In English, must include tense – that the event happened in the past.
  - In Mandarin and Indonesian, tense is optional, and not marked on the verb.
  - In Russian, the verb includes tense and also whether the peanut-eater was male of female (but only in past tense), and whether the peanut-eater ate all the peanuts.
  - In Turkish, must specify whether the eating of the peanuts was witnessed or if it was hearsay.
- Question: If Russian speaker is describing an ongoing scene of an “elephant eating the peanuts”, does the speaker attend more carefully to the peanuts? (because this information is relevant to the grammatical marking of words in Russian).

Nice definition of linguistic relativity (in all its forms):

"The debate, as we see it, is not whether language shapes thought—it is whether language shapes thoughts in some way other than through the semantic information that it conveys. That is, the interesting debate is over whether *the structure of language*—syntactic, morphological, lexical, phonological, etc.—has an effect on thought".

– Bloom and Keil (2001)

Some example of research questions in the domain of linguistic relativity Time:

- In English, we generally use front/back terms to talk about time.
  - Good times *ahead*, hardships *behind*.
- In Mandarin, vertical metaphors are common
  - Earlier events are “shang” (up), later events are xia (down).
- Question: Do the different ways of talking about time lead to differences in how people think and reason about time?

Boroditsky, L. (2001). Does language shape thought?: Mandarin and English speakers' conceptions of time. *Cognitive psychology*, *43*(1), 1-22.

Space:

Different languages use different spatial references:

- Relative terms specify directions and locations relative to the viewer (English, Dutch, Japanese)
  - E.g., Left/right, front/back
- Intrinsic terms specify locations in term of object-centred coordinates (Arrente, Australia)
  - E.g., "the ball is at the foot of the hill"
- Absolute terms specify locations based on a global reference frame centred on the object (Totonac, Mexico).
  - E.g., "the ball is North of the hill"

Majid, A., Bowerman, M., Kita, S., Haun, D., & Levinson, S. C. (2004). Can language restructure cognition? The case for space. *Trends in cognitive sciences*, *8*(3), 108-114.

Objects

- Many languages include grammatical gender.
  - Spanish, French, Italian mark objects as being masculine or feminine
  - E.g., Toasters are masculine in some languages, feminine in others.
- No grammatical gender in English.
- Question: Does talking about inanimate objects as if they were masculine or feminine actually lead people to think of the objects differently?

Boroditsky, L., Schmidt, L. A., & Phillips, W. (2003). Sex, syntax, and semantics. *Language in mind: Advances in the study of language and cognition*, 61-80.

Today: briefly consider linguistic relativity in the case of sounds and colours

-Why do we see bands of colour? They are not there.

-Why can't Japanese speakers hear the difference between "l" and "r"?

Our perception of colour and sounds highlight the importance of Categorical Perception (CP). CP is revealed when we perceive discrete categories in the world when in fact the world is continuous.

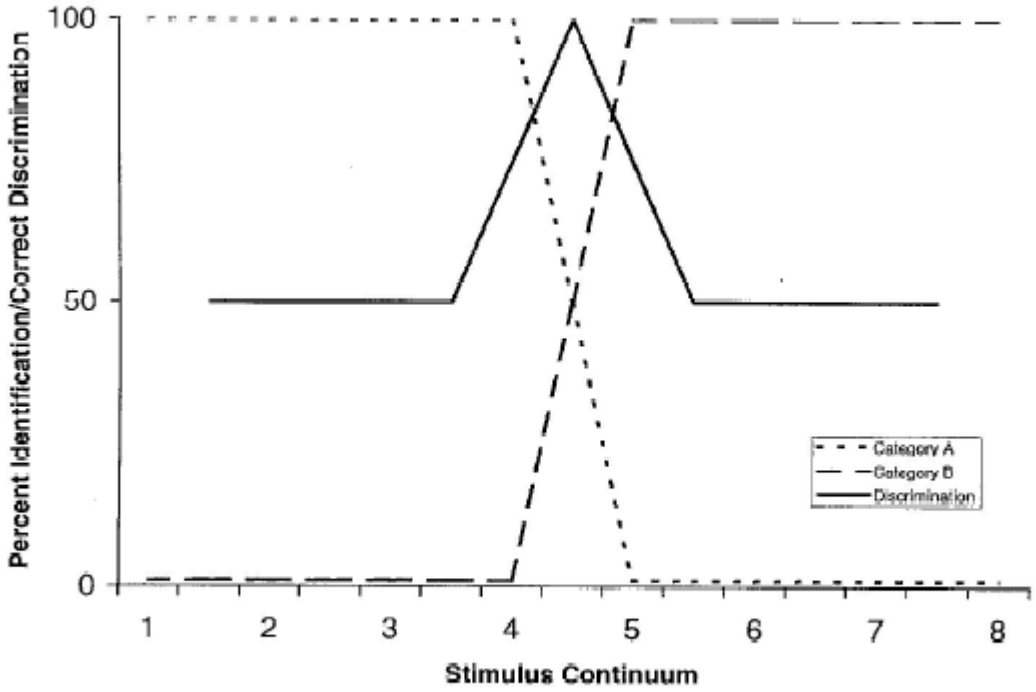


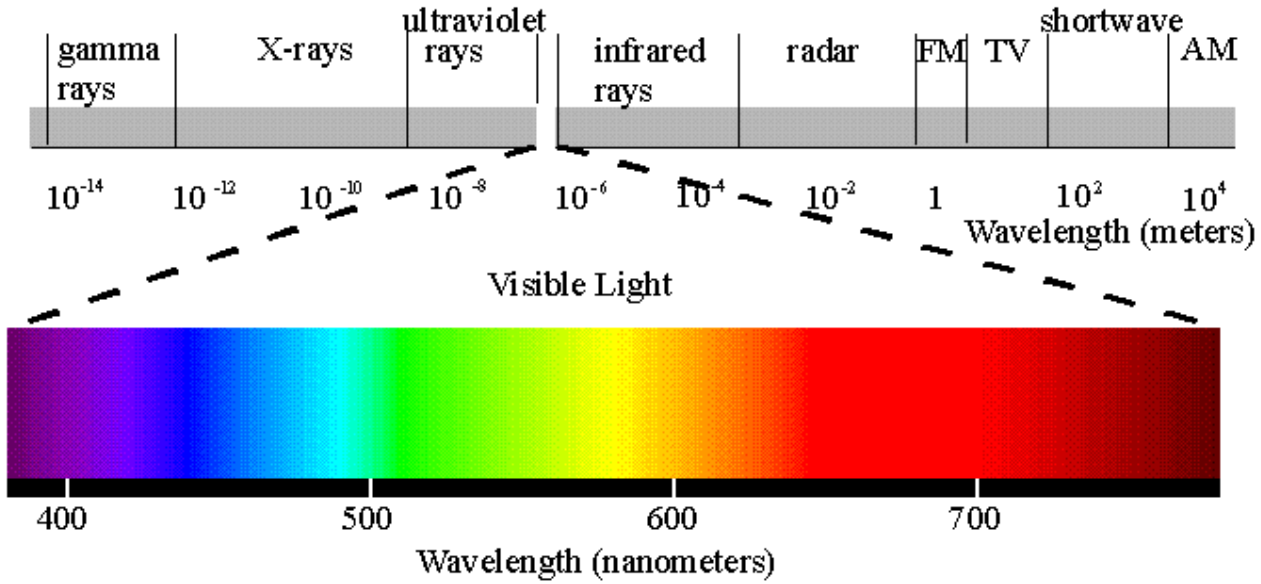
Figure 7 Categorical perception: idealized patterns of identification and discrimination.

A B

Two features of categorical perception:

1) Sharp labelling (identification) function
2) Discontinuous discriminations

Colour and categorical perception

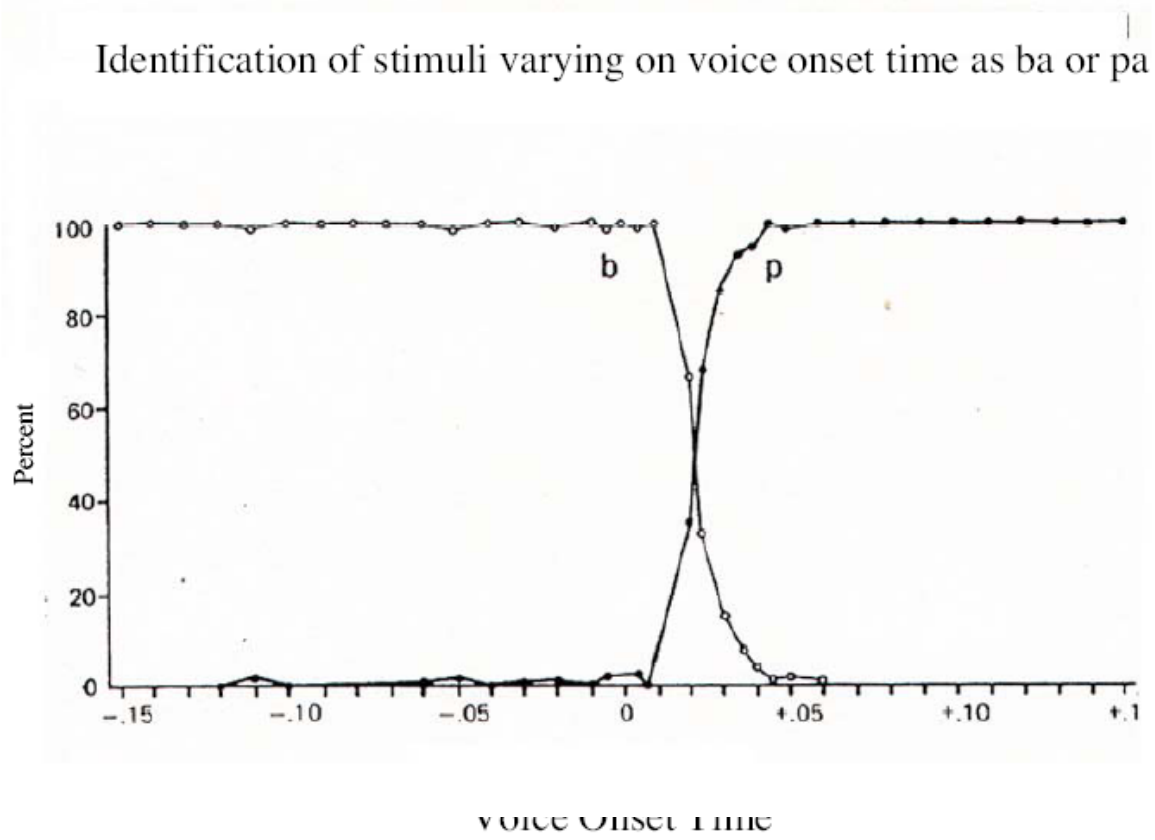


-Colour is a classic case of "categorical perception": When our perceptions categorize stimuli in an arbitrary manner given the nature of the physical world

-Our colour perceptions do not faithfully mirror the physical properties of light. Perceived differences among wavelengths that fall into different categories are exaggerated, and differences among wavelengths that fall within same category are minimized.

--Does language contribute to these seemingly arbitrarily organized categories?

Another classic case of categorical perception: Phoneme perception



Although stimuli that vary on VOT vary in a continuous way, our perceptions are categorical – either “ba” or “pa”.

-Does language contribute to these seemingly arbitrarily organized categories?

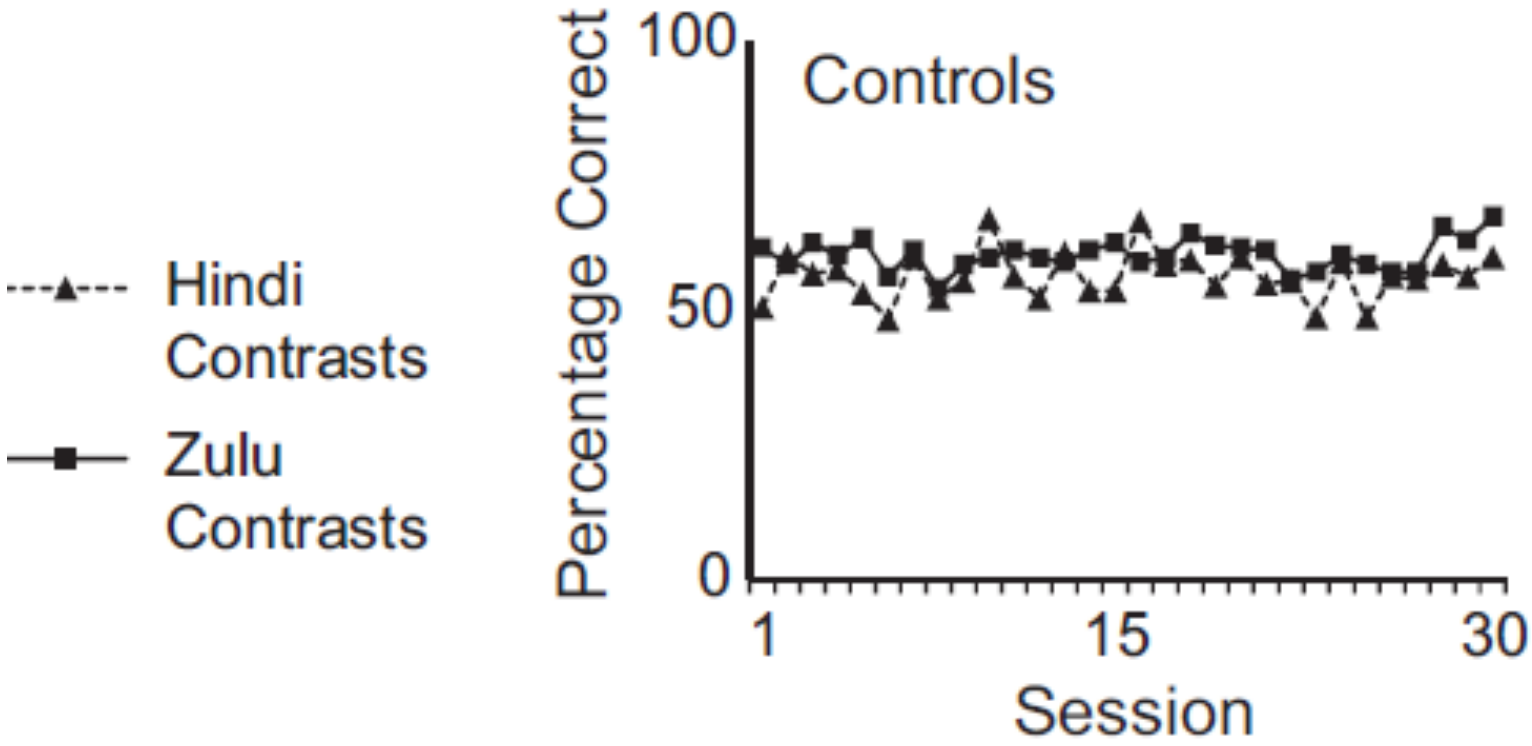
Why do we show categorical perception in the domain of vision and speech?

- One explanation: The language we learn impacts on our perception of colour and speech sounds.
  - E.g., since English distinguishes between blue and green at a given wavelength, we reorganize colour space to make this contrast salient.
  - e.g., if p/b, or l/r contrasts are critical for our language, we reorganize our perception in order to improve perception of these particular sounds.

- Another explanation: The physiology of the visual and auditory systems is such that we would show categorical perception independent of language.
  - The colour terms we use are a by-product of what colours appear the most salient (independent of language).
  - The phonemes selected for language are the by-product of the acoustic contrasts are most salient based on auditory physiology.

We already know that language experience impacts on the perception of sound.

English speakers attempting to distinguish Hindi and Zulu phones:



Babies start off better able to perceive a wide range of phonemes outside their experience, but perception changes with exposure to a language, so that difficult to hear phonemes from other languages.

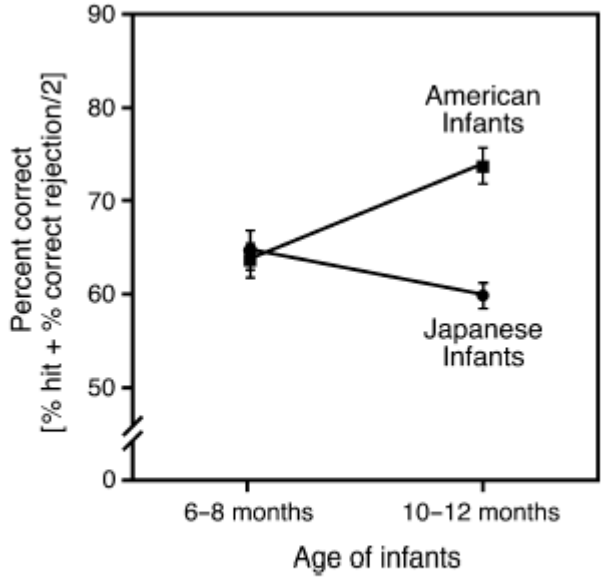


Figure 1 *Effects of age on discrimination of the American English /ra-la/ phonetic contrast by American and Japanese infants at 6–8 and 10–12 months of age. Mean percent correct scores are shown with standard errors indicated.*

Kuhl, P. K., et al. (2006). Infants show facilitation for native language phonetic perception between 6 and 12 months. **Developmental Science**, 9, 13-21.

Classic work on this topic by Patricia Kuhl:

http://ilabs.washington.edu/kuhl/

•In the task above, children hear a sequence of /ra/ trials, and occasionally a /la/ trial occurs (and vice versa), and trained to turn their head on change trials

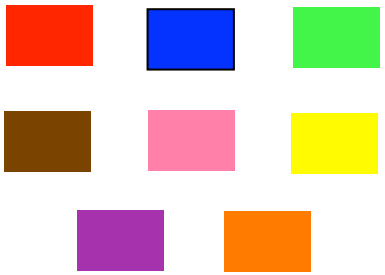
Do these effects show that linguistic relativity is real?

- Depends on definitions: This is an effect of language on the perception of linguistic stimuli (phonemes).
  - Linguistic relativity is often considered an effect of language on non-linguistic perception and thinking.

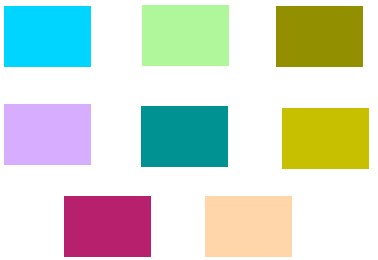
Case of Colour is more relevant:

- Question: Is the perception of colour biased by language?
- Long-history of addressing this question, with mixed conclusions.
- Early study compared memory for focal and non-focal English colours in English speakers
  - » Brown & Lenneberg, 1954

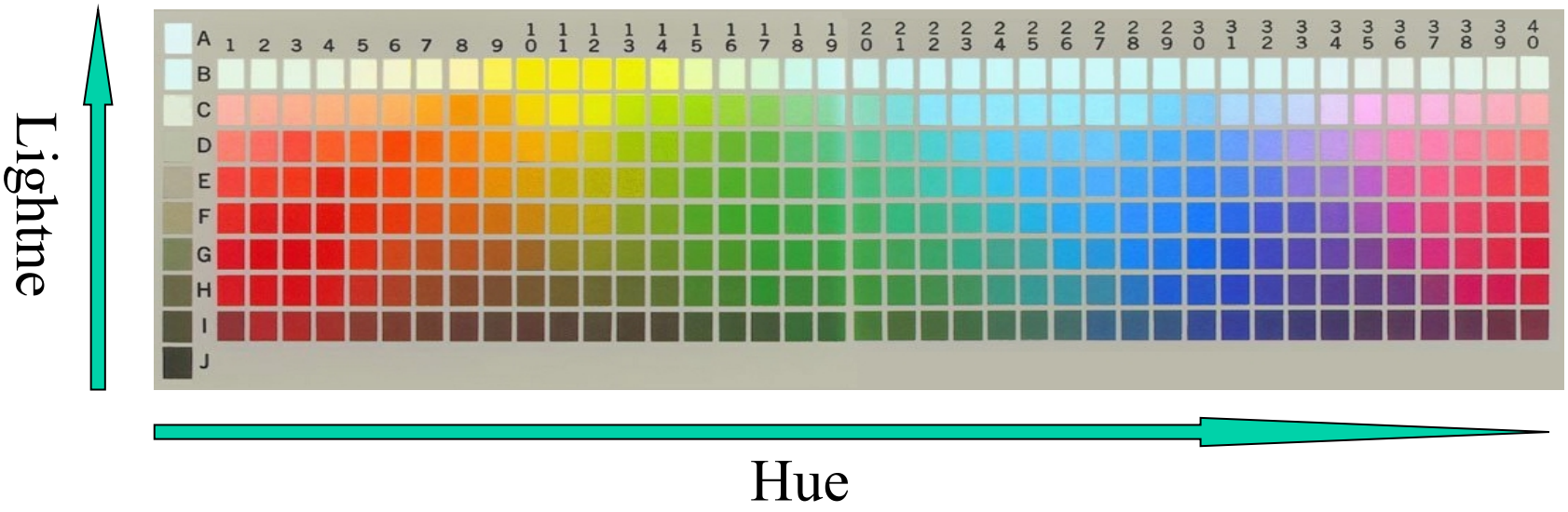
Focal English



Non-Focal English



Participants shown four target chips, that were either high or low codeable. After short delay, asked to select matches from an array of colour chips (240 chips).



- Participants better able to remember a colour that had a high codability colour name.
- This taken to support the claim that language impacts on colour perception and memory.

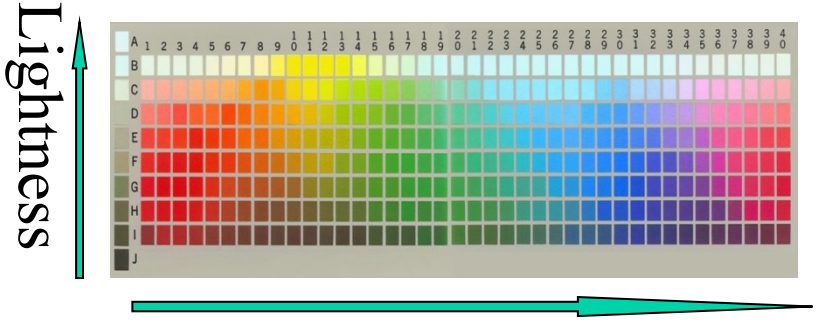
- BUT logic is flawed:
  - Codability effects might be due to the physiology of the colour system. The REASON why we have the colour terms RED, BLUE, etc. is because these colours are more salient (e.g., due to rods and cones in fovea). This in turn makes our memory better for these colours.
- Not possible to decide if language or low-level physiology is responsible for these effects when studying a single language.

Roberson, Davies, & Davidoff (2000), *Journal of Experimental Psychology: General, 129*, 369-398

Berinmo tribe
New Guinea
labels colours
quite differently
than English

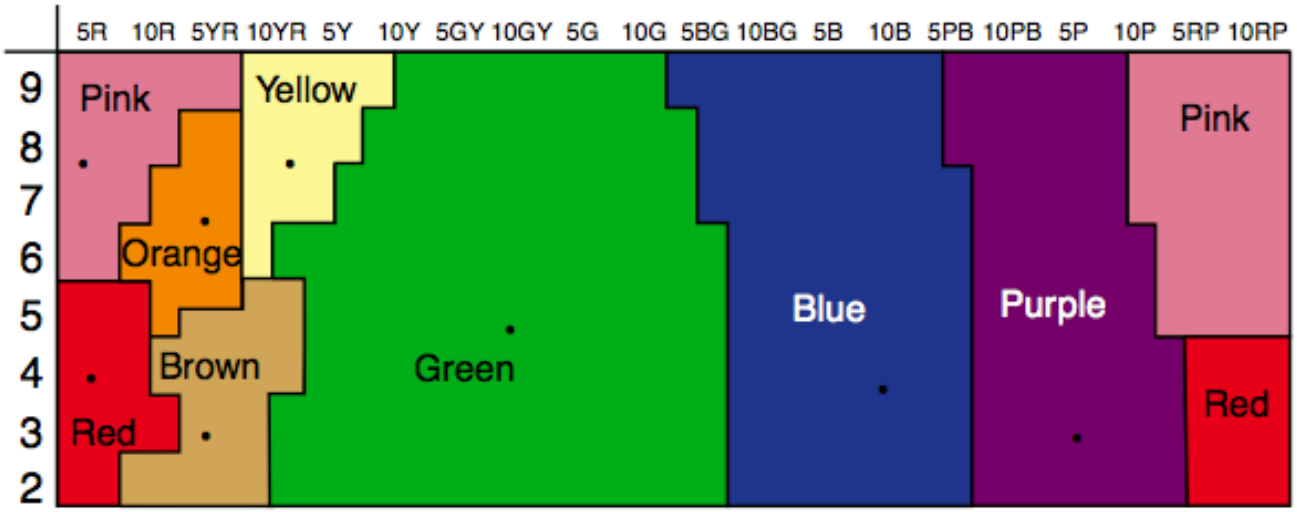
Jules Davidoff
U. of London, UK

Debi Roberson
U. of Essex, UK

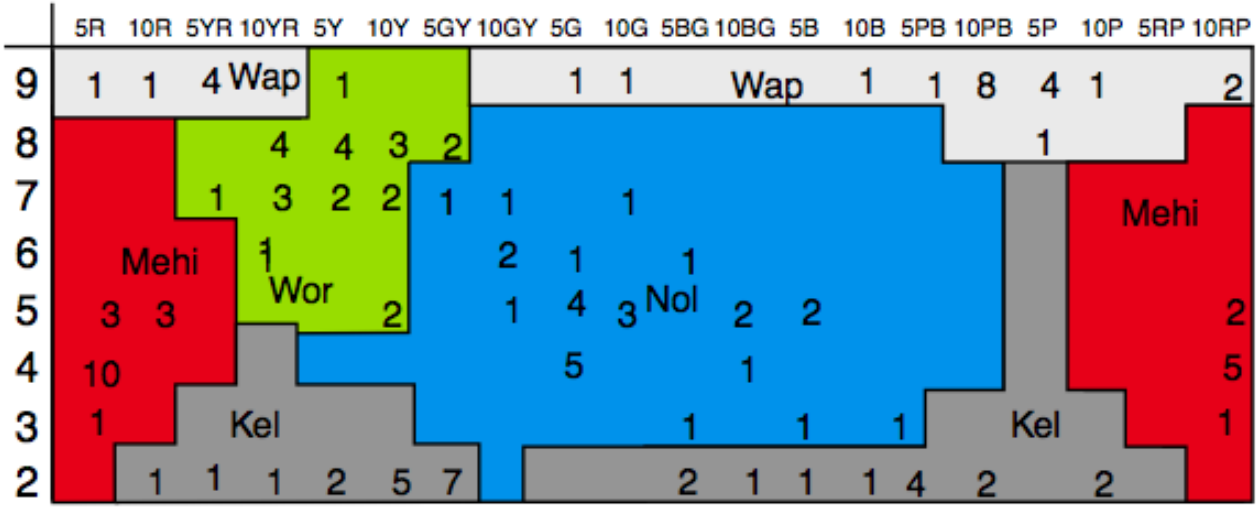


Different languages carve up colour space differently with terms

English



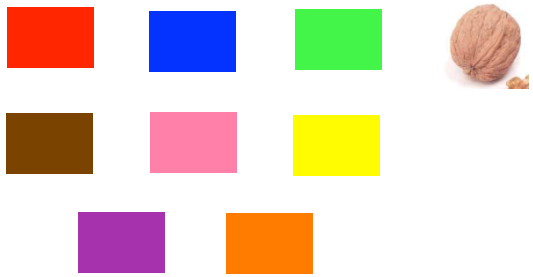
Berinmo

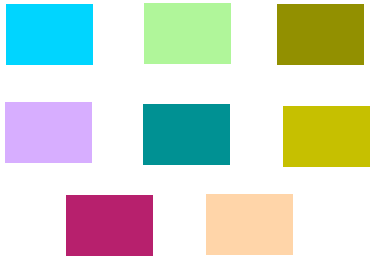


LTM for colour: Paired associate learning task:

-12 monolingual Berimno speakers took part.

- 8 focal and 8 non-focal ENGLISH colours paired with pictures of familiar nuts (each participant only learned 4 of each).





-8 pictures of nuts randomly presented on table, and colour chips placed on top. Then pictures removed, shuffled, and participants asked to place colour chips back on pictures.

-Performed 5x a day for 5 days (or until correct)

Results:

- Berinmo participants did not remember English focal colours better.
- Rather, they remembered Berinmo focal colours better.

Various additional studies carried out by authors.

Go to: http://essex.academia.edu/DebiRoberson/Papers

- Possible criticism: This is a measure of colour memory rather than perception.

Visual search is a relatively low level perceptual/ attention task that is less amenable to these criticisms

-One colour is different from the rest – press left/right button when ID
-Colours 1-step different from one another, either within or across colour boundary
-Target colour is either presented to the left or right visual field

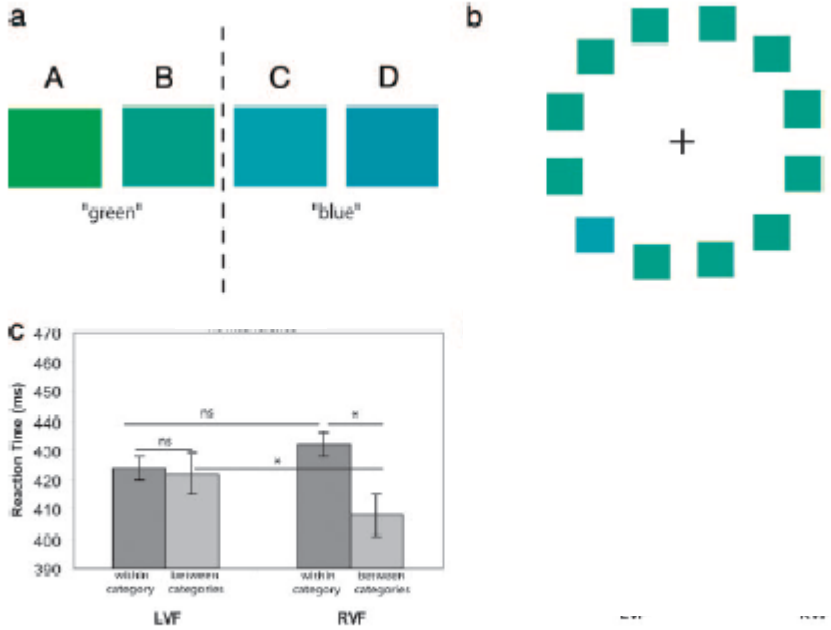


Fig. 1. Lexical categories influence perception in the RVF. (a) Print-rendered versions of the four colors used. (b) Sample display for the visual search task. Participants were required to press one of two response keys, indicating the side containing the target color. (c) In the no-interference condition, RTs were faster for the between-category pair and slower for the within-category pairs when targets appeared in the RVF compared with when they appeared in the LVF.

Visual search task carried out in split brain patient.

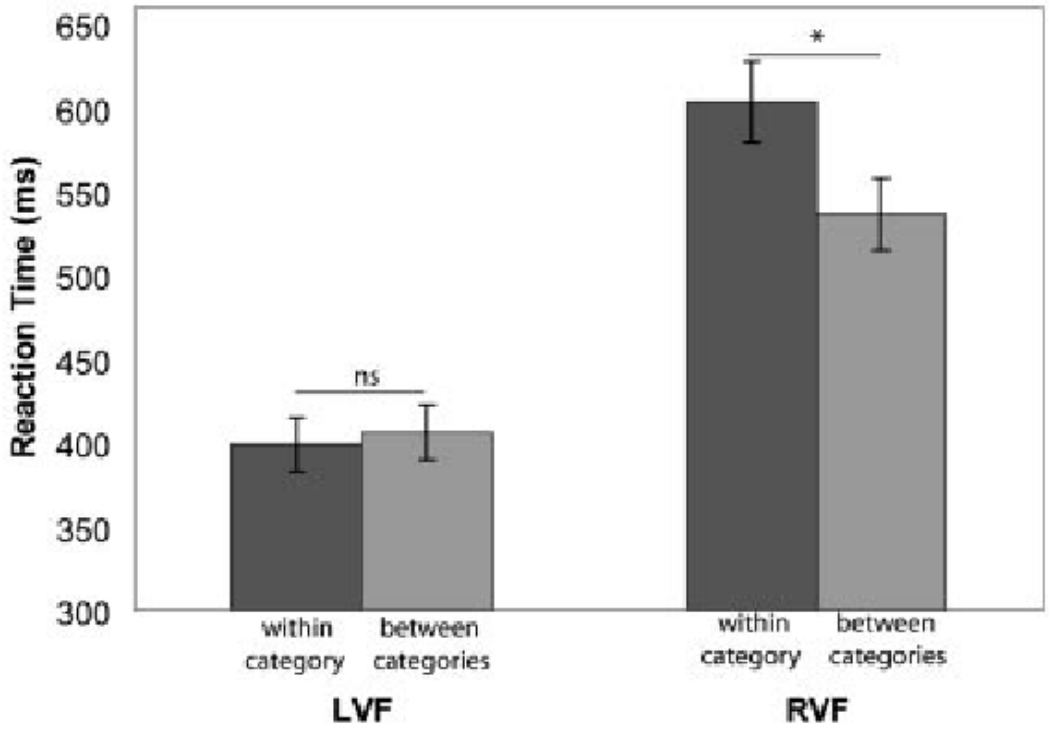
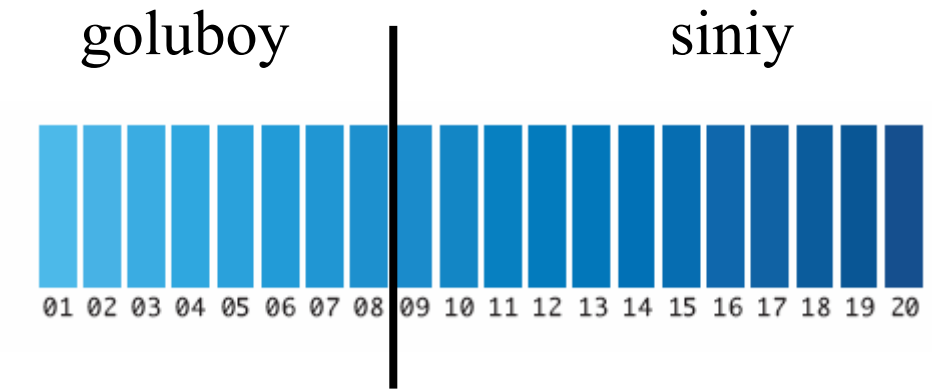


Fig. 3. Lexical categories influence perception in the RVF of a callosotomy patient. *, $P < 0.05$, two-tailed t test, $df = 1$; ns, nonsignificant.

Gilbert, A. L., Regier, T., Kay, P., & Ivry, R. B. (2006). Whorf hypothesis is supported in the right visual field but not the left. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(2), 489-494.

If time: Another example of colour terms influencing colour perception.

- English and Russian colour terms divide the colour spectrum differently.
  - Russians have different words for light blue ("goluboy") and dark blue ("siniy").
  - Does this have an impact on how quickly we can categorize colours? Perhaps colours across the boundary are more highly salient for Russian speakers.



Which of the two bottom colours matches to top one? Pick the colour as fast as you can.

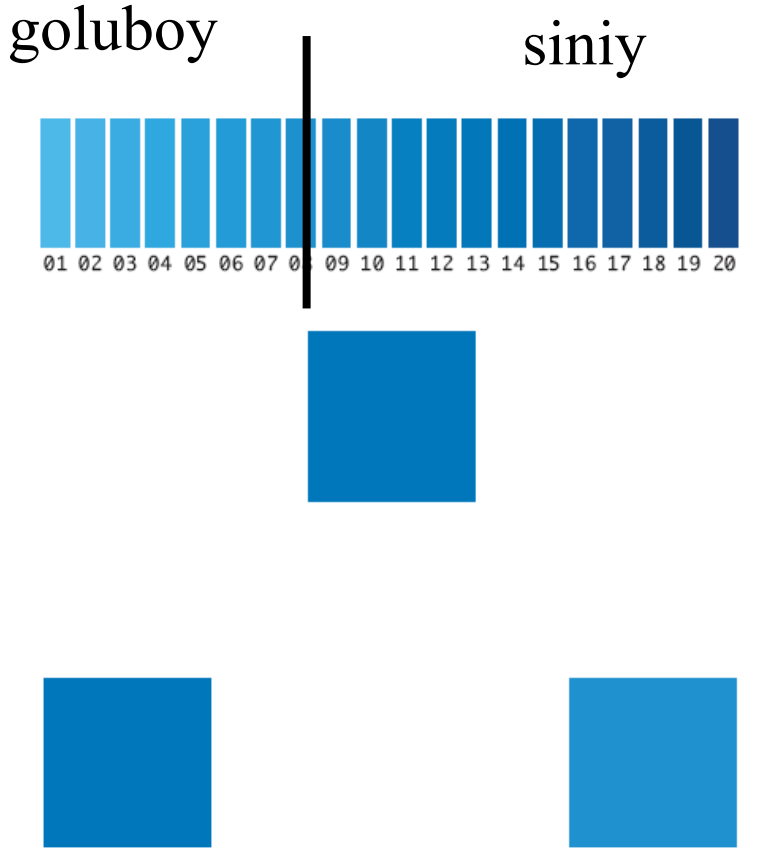


Fig. 1. The 20 blue colors used in this study are shown at the top of the figure. An example triad of color squares used in this study is shown at the bottom of the figure. Subjects were instructed to pick which one of the two bottom squares matched the color of the top square.

Question: Are Russian participants faster when one of the bottom colours has a different name than that top colour?

Results

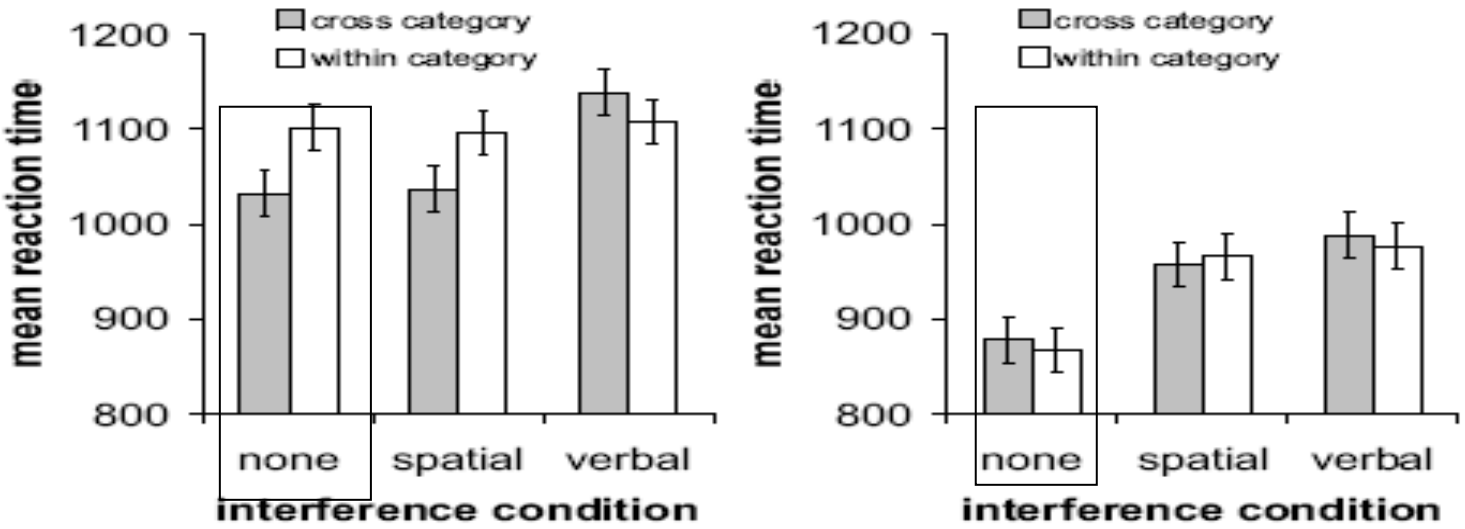


Fig. 2. Russian speakers' (*Left*) and English speakers' (*Right*) reaction times (msec) shown for the no-interference, spatial-interference, and verbal-interference conditions. Both near-color and far-color comparisons are included in these graphs. Error bars represent one SE of the estimate of the two-way interaction between category and interference condition.

In verbal interference, participants rehearsed digits (STM task).
In spatial interference task, participants tried to remember a spatial pattern of squares in a grid.

Winawer, J., Witthoft, N., Frank, M. C., Wu, L., Wade, A. R., & Boroditsky, L. (2007). Russian blues reveal effects of language on color discrimination. *Proceedings of the National Academy of Sciences*, *104*(19), 7780-7785.