

Disentangling the RED effects

The importance of emotional arousal and potency in processing red

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Implicit affective associations to red

- Studies showed that **exposure to “red”** influences subsequent cognitive-affective processing (e.g., Elliot & Maier, 2007). Red supposedly signals danger or sexual readiness depending on the context.
- Other research into affective processing suggests that such red effects might emerge from this colour’s non-categorical, cognitive-affective meaning such as negative **valence** (Moller et al, 2009), high **arousal** (physical excitement) and **potency** (power or control) (see Adams & Osgood, 1973; Suk & Irtel, 2008; Valdez & Mehrabian, 1994).
- We argue that the valence dimension cannot explain the observed heterogeneous effects of red, while the arousal and especially the potency dimension may better explain previous findings.
- We investigated if red has implicit connotations with high potency and arousal but not with negative valence.

Subliminal activation of the concept red facilitates the automatic processing of words with a high potency or arousal connotation, but not with a negative connotation

Table 1. Affective properties and ratings of target word groups representing seven combinations of emotion dimensions

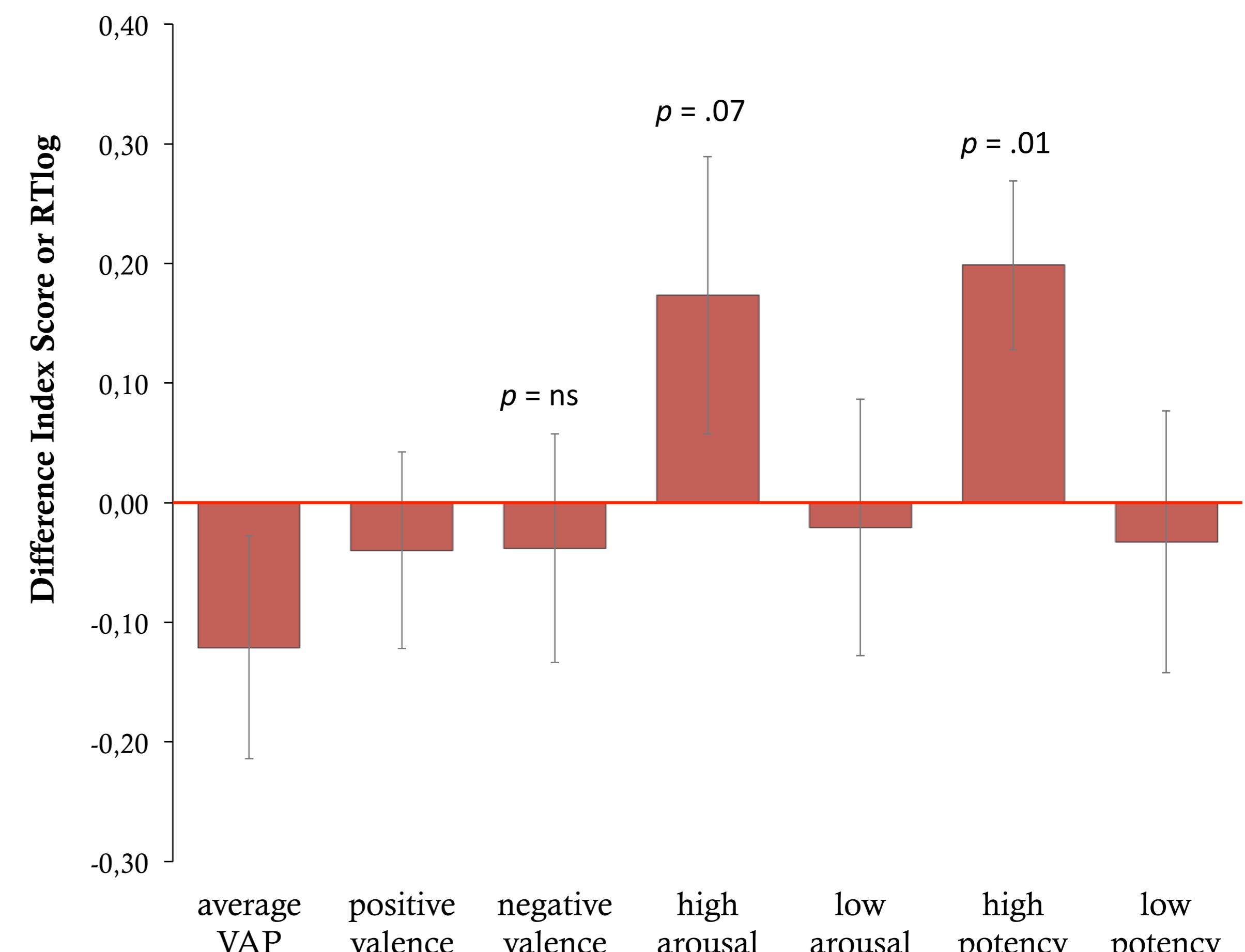
Emotion dimension	LDT			Mean rating (1-9)			
	Valence	Arousal	Potency	Target words	Valence	Arousal	Potency
POSITIVE	average	average	average	héritier, horizon, mince, pastèque, peinture	7.11	4.41	5.24
NEGATIVE	average	average	average	absent, arrêt, épreuve, humide, lourd	3.65	3.90	4.31
average	HIGH	average	average	anxieux, ardeur, bruyant, extrême, sauvage	4.22	6.86	4.96
average	LOW	average	average	chaise, pelouse, sobre, soupir, statue	5.77	2.96	5.14
average	average	HIGH	average	accès, donneur, maîtrise, reflet, union	6.81	5.06	6.03
average	average	LOW	average	douteux, gardien, période, règles, voyou	3.79	4.69	4.38
average	average	average	average	labeur, pilule, statut, terrasse, usage	5.22	4.18	5.10

Results

We tested the effect of the red prime on lexical decision using one-sample t-tests on the difference index scores against zero (= no difference, priming effect) per word group (Figure 3).

- Significant reduction of RT of high potency words after the red (“rouge”) prime compared to the neutral (“gerou”) prime
 $t(23) = 2.45, p = .01$ (one-tailed), $d = .50$
- The RT reduction for high arousal words was only marginally significant
 $t(23) = 2.45, p < .07$ (one-tailed), $d = .31$
- No difference in RT for other emotion categories

Figure 3. Bars represent the DI score in reaction times for the red versus neutral prime trials per word group, where positive values indicate a RT reduction for red prime trials (error bars +/- 1 SE)



Method

We used an experimental **priming paradigm** (Figure 1) to disentangle the affective associations to red. Participants (N=24 native French speakers) performed a lexical decision task (LDT) on preselected target words (see below and Table 1). Before the target word appeared we briefly presented a word prime (“rouge” or neutral non-word “gerou”) followed by a visual mask, limiting overt processing of the word prime (Figure 2).

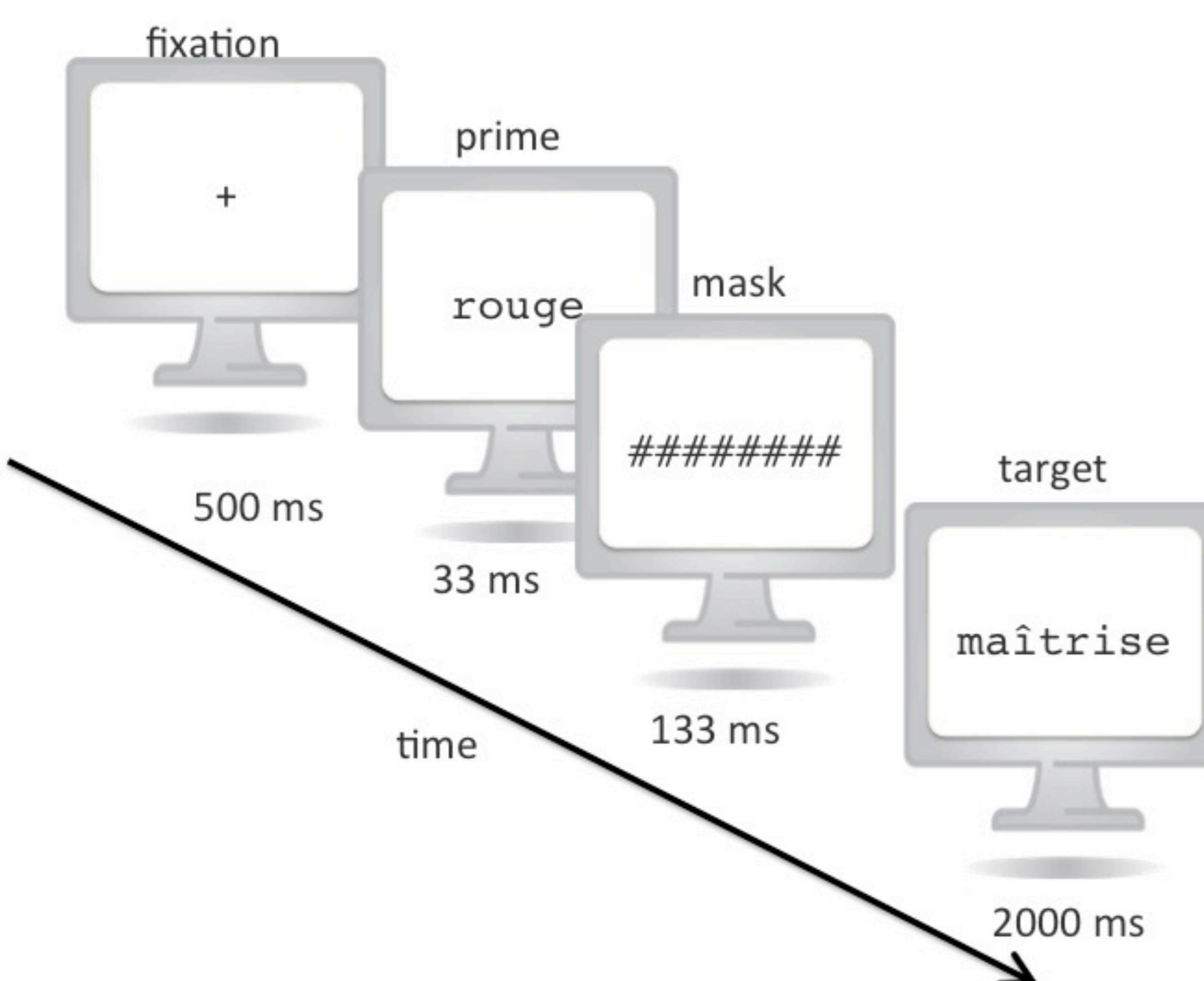
Based on previous **affective ratings** on English words (Bradley & Lang, 1999), we selected target words so that each word would score either high or low on one dimension, while average on the other dimensions so to disentangle how red primes words of each dimension separately. Table 1 lists the words that belong to the respective categories.

Target words were back-translated to French by two bilingual English-French speakers. After completion of the LDT, participants rated the words on the original valence, arousal and potency dimension (Table 1).

We calculated Difference Index scores of the reaction times to measure the **priming effect**:

$$DI = (RT_{log} \text{ neutral prime} - RT_{log} \text{ red prime}) / (RT_{log} \text{ neutral prime} + RT_{log} \text{ red prime}) * 100$$

Figure 2. Sequence and latencies of the experimental priming procedure (red prime trial example)



Summary

The reduced response latency on red prime trials compared to neutral prime trials indicates a priming effect of the colour word red on semantically unrelated words with high potency (strong) connotation.

Conclusion

- The emotional connotations of colour concepts can be processed and assessed covertly
- Red concept priming did *not* facilitate the processing of negative words
Thus red does not carry a general negative meaning
- Red concept priming facilitated lexical decision of high potency words
Thus red has an affective connotation/property of high potency (power/control)

Future steps

Current findings merit further investigation into the relative contributions of potency and arousal in particular. In further exploration of other colours’ affective connotations, dimensional theories of emotions may help to understand (un)commonalities of categorical colour-emotion associations.

References

Adams, F. M., & Osgood, C. E. (1973). A Cross-Cultural Study of the Affective Meanings of Color. *Journal of Cross-Cultural Psychology*, 4(2), 135–156.
 Bradley, M. M., & Lang, P. J. (1999). Affective norms for English words (ANEW). Gainesville, FL: The NIMH Center for the Study of Emotion and Attention, University of Florida.
 Elliot, A. J., & Maier, M. A. (2007). Color and Psychological Functioning. *Current Directions in Psychological Science*, 16(5), 250–254.
 Moller, A. C., Elliot, A. J., & Maier, M. A. (2009). Basic hue-meaning associations. *Emotion*, 9(6), 898–902.
 Suk, H., & Irtel, H. (2008). Emotional response to color across media. *Color Research & Application*, 35(1), 64–77.
 Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of Experimental Psychology: General*, 123(4), 394–409.