NYU PSYCH CNS

Toward a quantitative model of feeling beauty

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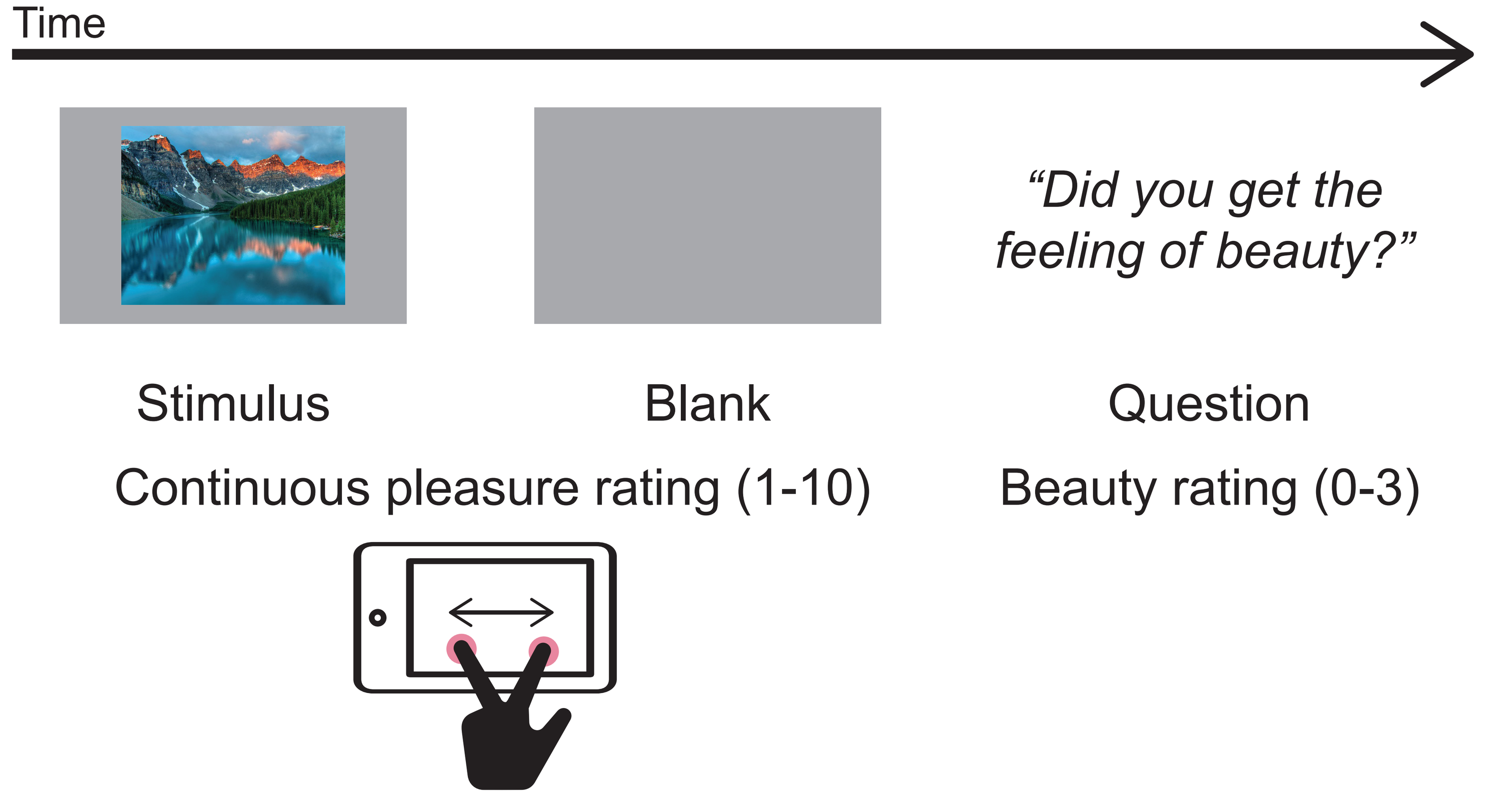
What's the relation between pleasure and beauty?

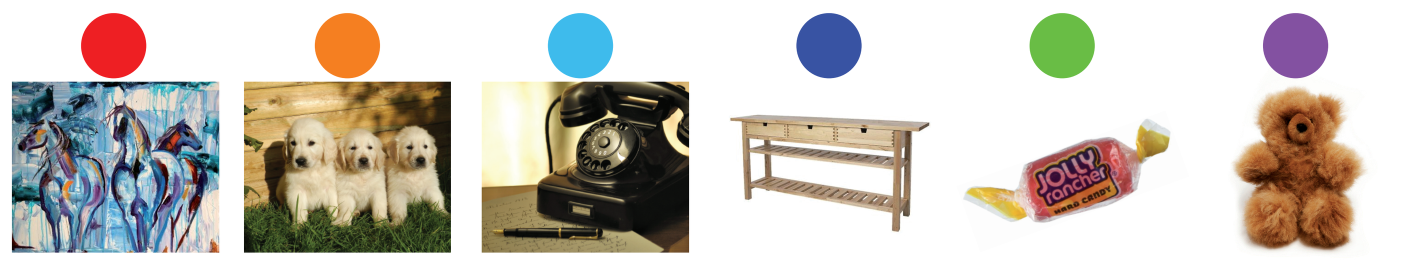
Philosophers and common sense agree: Beauty is pleasure [1,2].
Theories of aesthetic judgment acknowledge the role of pleasure [3,4].
We present the first mathematical model that describes the relation between pleasure and beauty.

Procedure



Custom touchscreen web app emotiontracker.com

Stimulus kinds



Environment manipulation

Distraction: During half of the trials, participants simultaneously performed an auditory 2-back task [5].

Citation

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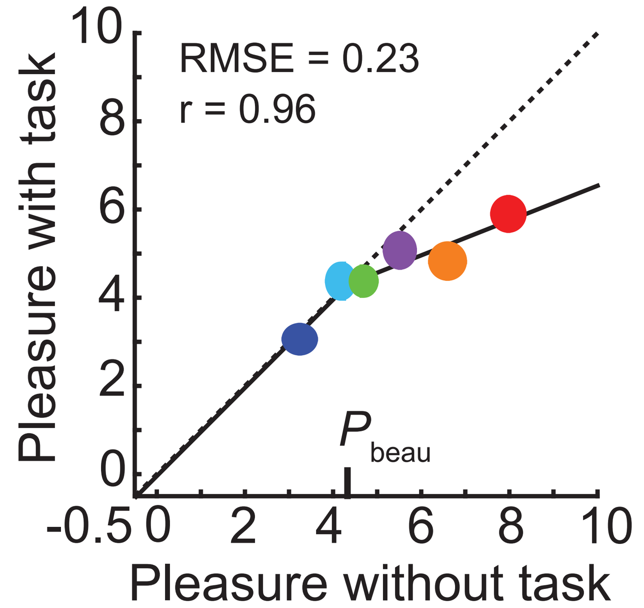
https://psych.nyu.edu/pelli/posters.html • https://aennebrielmann.wordpress.com/publications

A simple model fits beauty and pleasure ratings.

The internal representations of stimulus, pleasure, and beauty are one-dimensional and linearly related, except for a nonlinear attenuation of high pleasure when the observer is distracted.

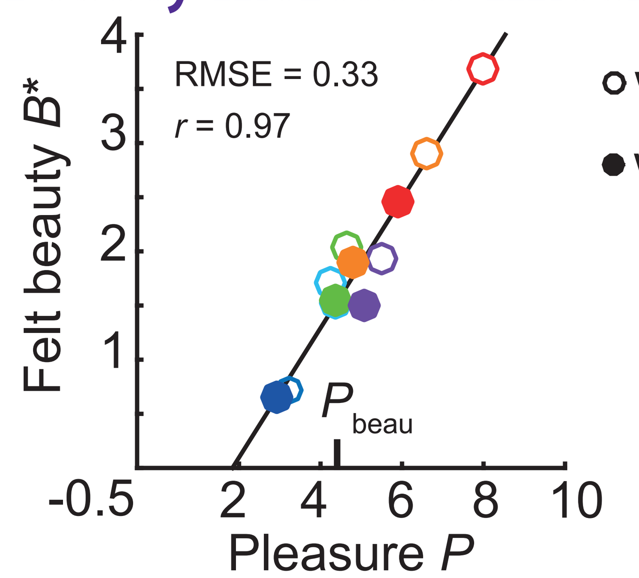
Our model has 13 free parameters:
1 stimulus value s per stimulus kind C
1 gain factor g per added environmental condition E
1 threshold for pleasure attenuation: P_{beau}
2 linear coefficients translate pleasure to beauty: a, b
3 variances: σ^2 $\sigma^2_{P^*}$ $\sigma^2_{B^*}$

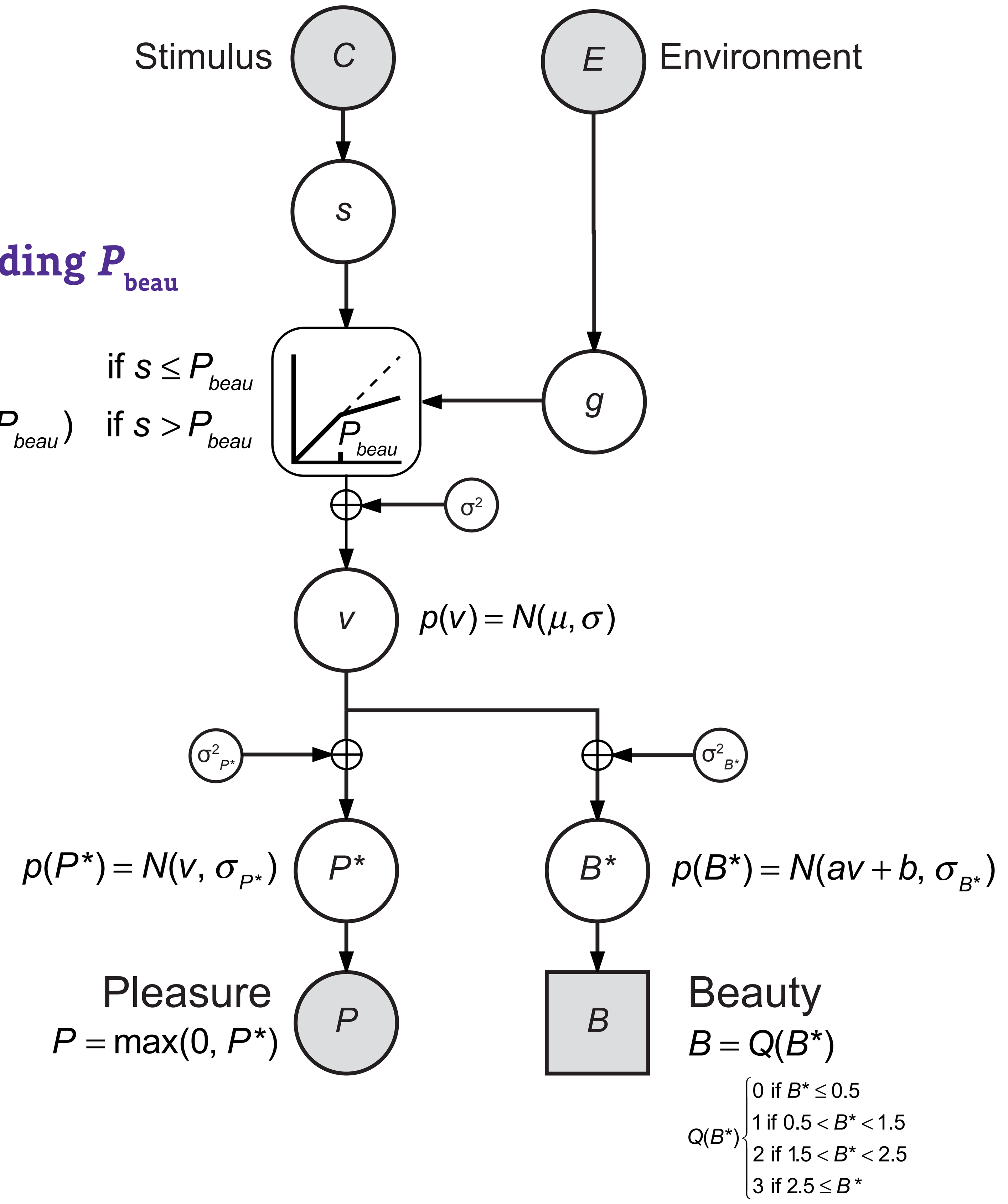
Task affects only strong pleasures, exceeding P_{beau}



$$\mu(s) \begin{cases} s & \text{if } s \le P_{beau} \\ P_{beau} + g(s - P_{beau}) & \text{if } s > P_{beau} \end{cases}$$

Beauty increases linearly with pleasure.





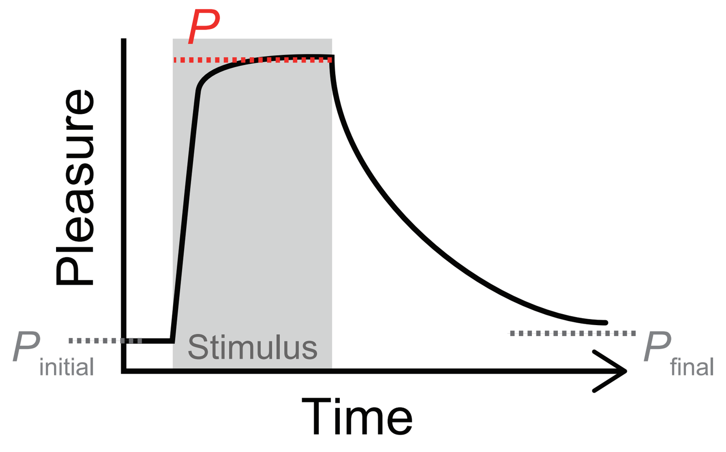
Pleasure dynamics are well-fit by a one-parameter model.

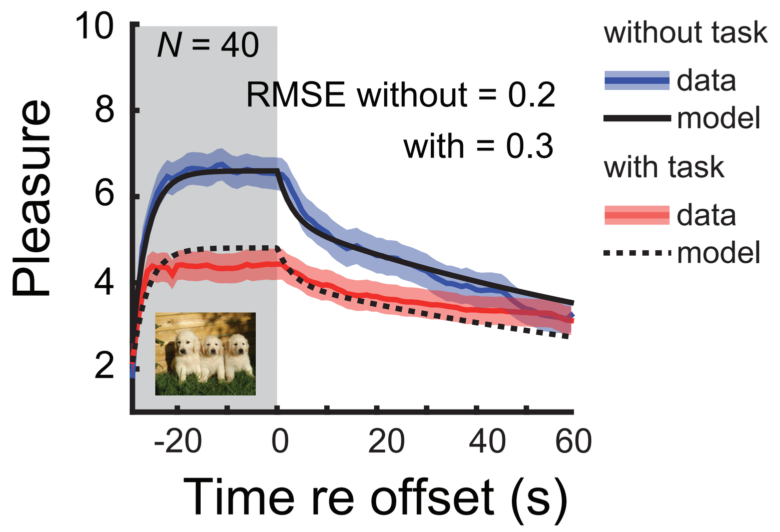
All parameters but P are constant across conditions.

$$\hat{P} = \alpha_{onset}(t)P_{initial} + (1 - \alpha_{onset}(t))(\alpha_{offset}(t)P + (1 - \alpha_{offset}(t))P_{final})$$

$$\alpha_{onset}(t) = \exp\left(\frac{-\lfloor t - t_{offset} \rfloor}{\tau_{short}}\right)$$

$$\alpha_{offset}(t) = w_{short}\exp\left(\frac{-\lfloor t - t_{offset} \rfloor}{\tau_{short}}\right) + (1 - w_{short})\exp\left(\frac{-\lfloor t - t_{offset} \rfloor}{\tau_{long}}\right)$$





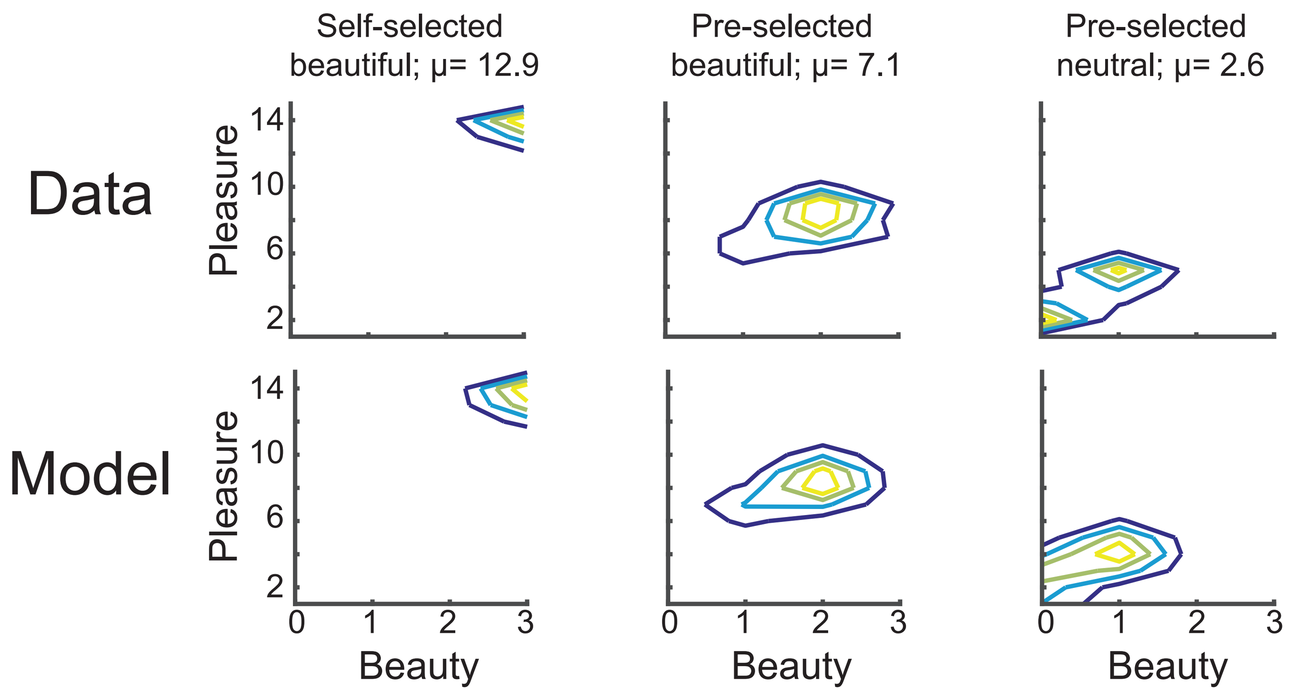
Pleasure and beauty share one source. Except for some added noise, each is a linear transform of the other.

Pilot data

We are currently conducting experiments that show the same stimulus repeatedly to participants.
The results will allow us to:
1) constrain the variances.
2) assess inter-individual differences in stimulus values, the linear relation between pleasure and beauty, and the variances.

Our model fits the joint distribution of pleasure and beauty.

Pilot data for AAB n = 30 per stimulus kind; 2 items per kind
σ = 1.0; σ_{P^*} = 0.7; σ_{B^*} = 0.1; a = 0.2; b = -0.06; R^2 = 0.82



Acknowledgments

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