

PRIMARY AFFECTIVE RESPONSES MAY BE IMMUNE TO PERSONALITY



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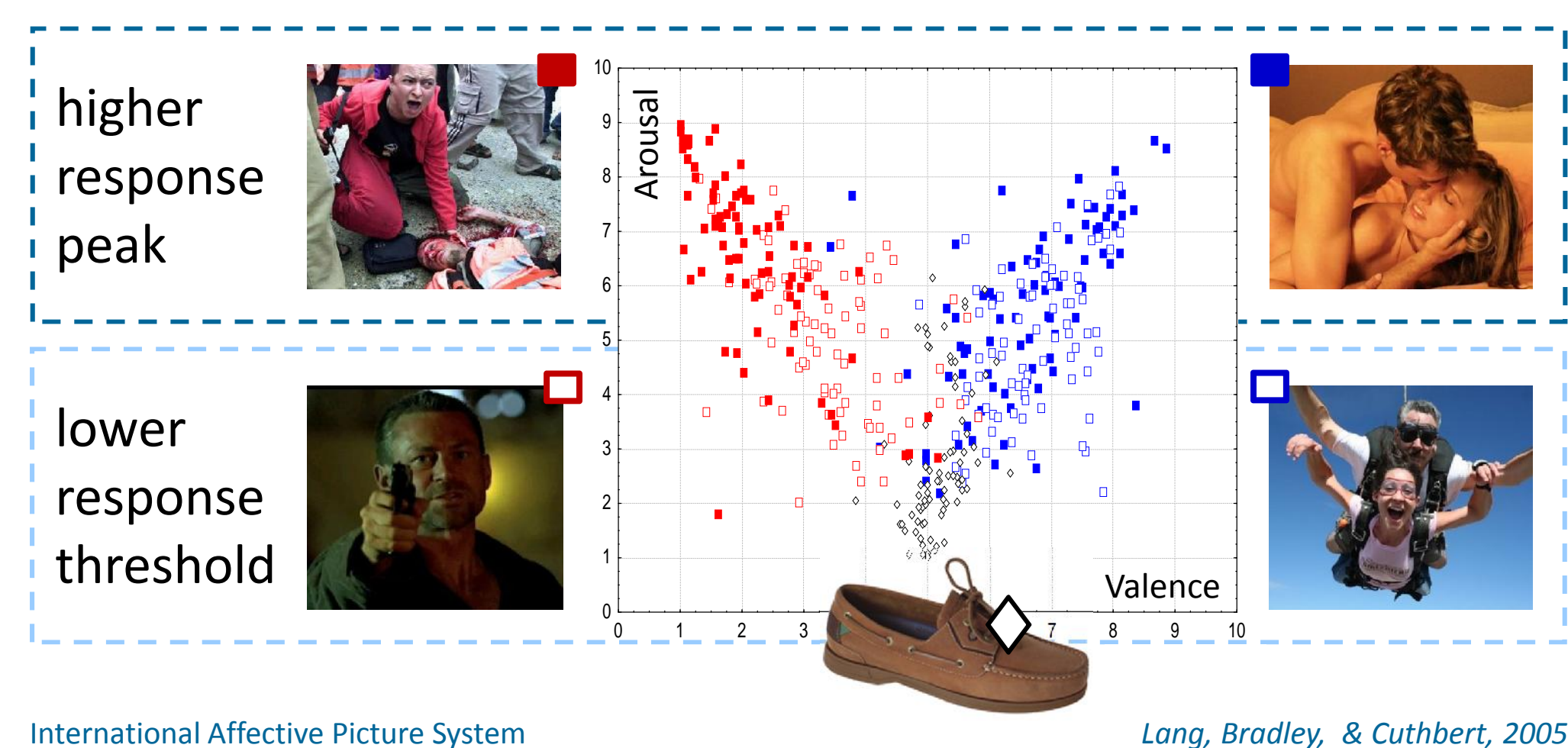
Personality should be reflected in affective responses

Personality traits are thought to originate from individual differences in basic functions of the mind. However, it is unclear which specific mechanisms are involved.

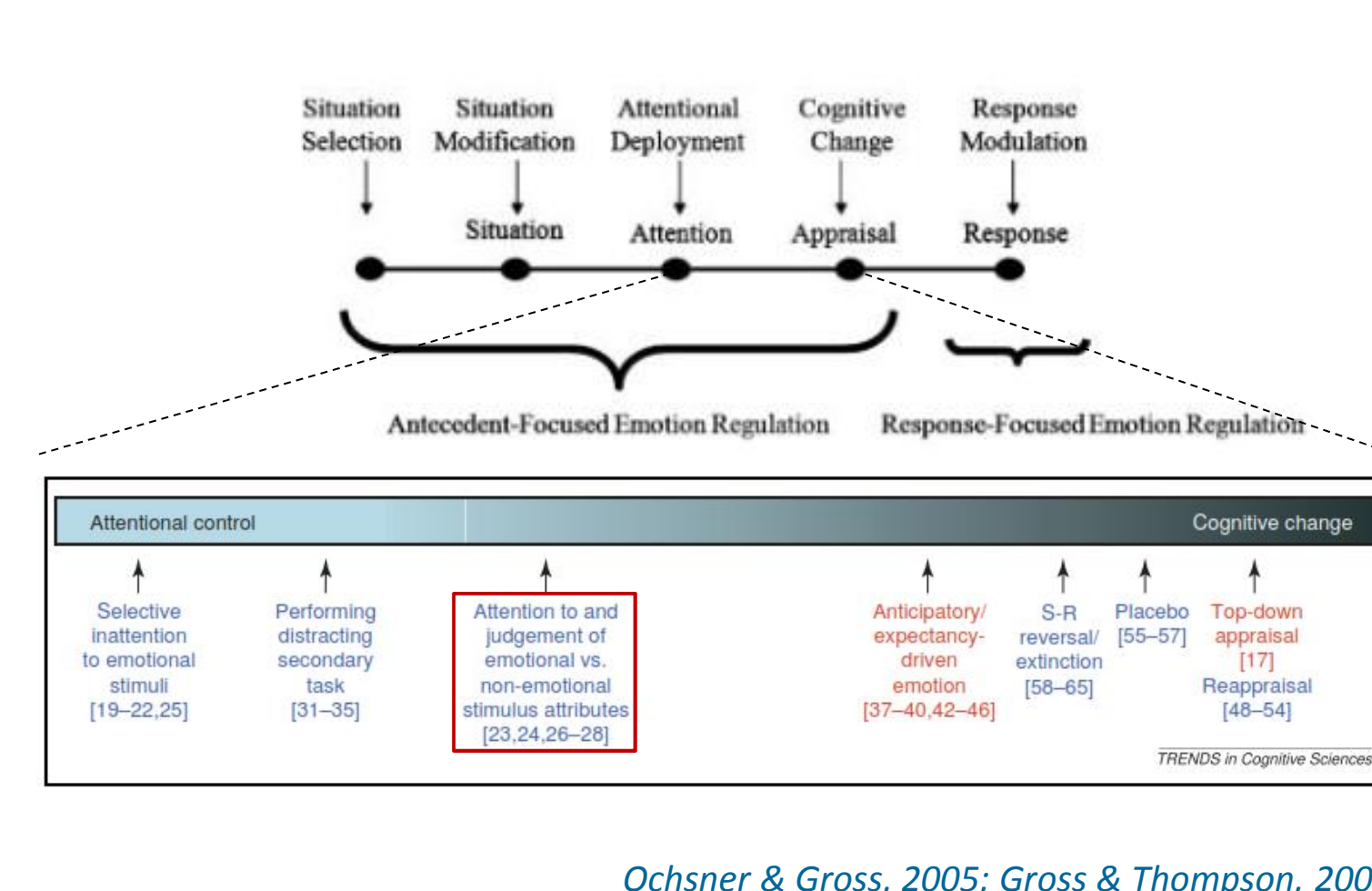
Avoidance	Neuroticism
Approach	Extraversion
Information processing	Openness
Empathy	Agreeableness
Self-control	Conscientiousness

DeYoung & Gray, 2009

Neuroticism and Extraversion should involve increased sensitivity to unpleasant and pleasant stimuli respectively. IAPS pictures were used to elicit affective states occupying distinct regions of the valence-arousal space. Two arousal levels enabled testing two conceptualisations of differential sensitivity.



Conscientiousness should moderate the effectiveness of emotion regulation. Emotion regulation was manipulated by asking participants to make affective or nonaffective evaluations which modulated the extent of attention devoted to affective content.



80 university student participants (33 males). 5 categories comprising 12 IAPS images each (aversive, negative, neutral, positive, erotic) presented randomly in 3 repetition blocks. Direct (evaluate valence and arousal) and indirect (evaluate luminance and number of objects) tasks were presented in counterbalanced order (using two stimulus sets with equal ratings, semantic content and ERPs). Each trial comprised of fixation cross (1.5s); stimulus (1.5s) and two consecutive rating scales (self-paced). Groups experiencing different orders of tasks, stimulus sets and times of day of the measurement were balanced in terms of gender and Big Five personality traits (assessed by EE-PIP-NEO).

Affective responses are captured by LPP

30 scalp electrodes offline referenced to linked ears + 4 EOG channels. Average of CP1/2, P3/4 and Pz analysed here.

Offline 0.25 Hz high-pass (12 dB/oct) and 40 Hz low-pass (48 dB/oct).

3-step dynamic artefact rejection using EEGLAB:

1. Rejection of extremely noisy channels (visual inspection) and segments (*rejspec* 30–40 Hz and *rejtrend* slope > 200 μ V with $R^2 > 0.2$).

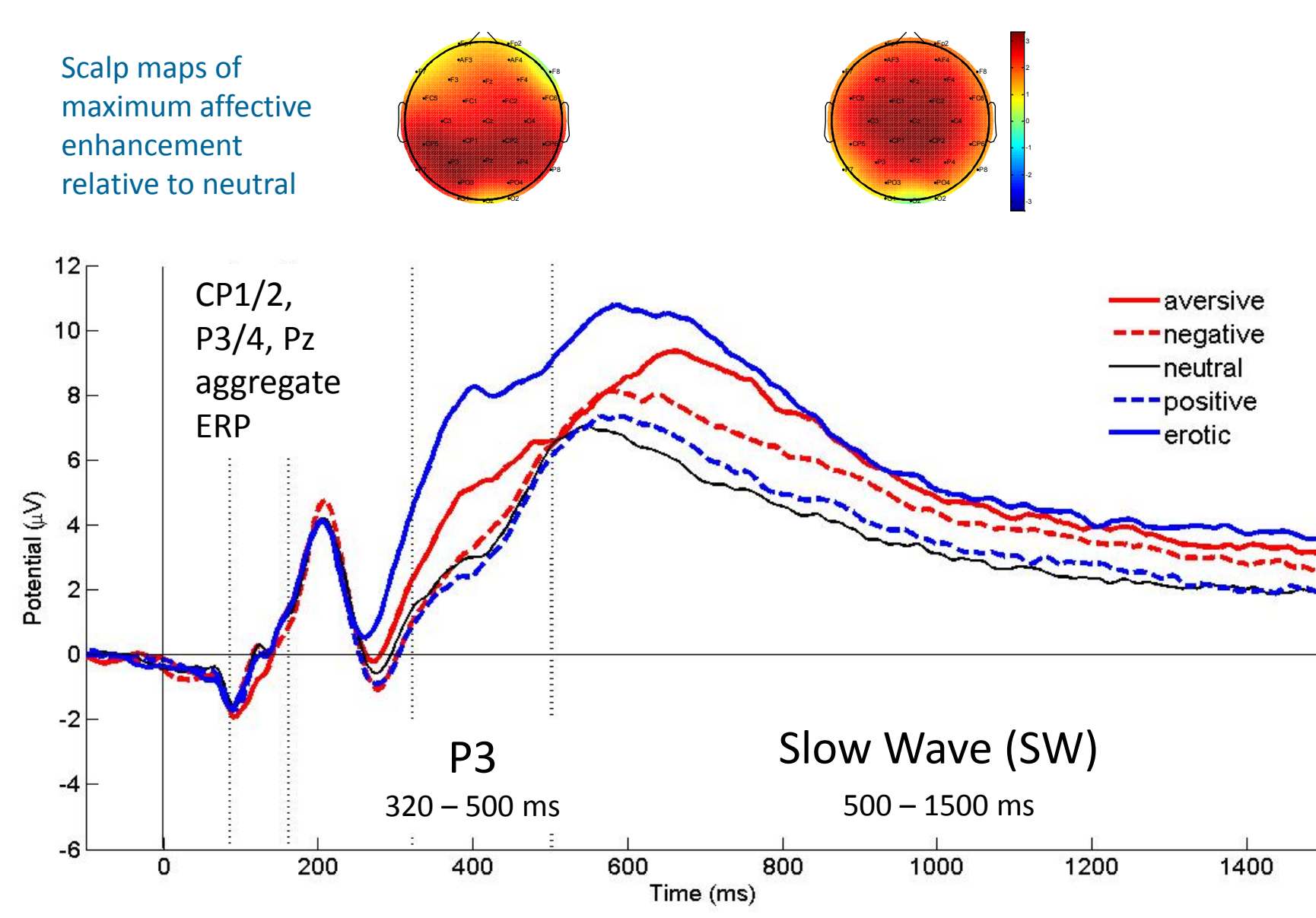
2. Removal of ocular activity using Infomax ICA (manual detection of ICs corresponding to blinks as well as vertical and horizontal eye movements).

3. Rejection of fine artefacts (individually selected limits for *rejthresh* and *rejtrend* algorithms).

93.56% of all trials remained ($SD = 5.69$, range 75.28–99.72%).

Mean amplitudes and fractional area latencies calculated for P3 (320–500 ms) and SW (500–1500 ms) windows.

Late Positive Potential (LPP, consists of P3 and SW) is enhanced by affective arousal independently of perceptual stimulus features. It probably reflects subcortical amplification of cortical processing triggered by motivational relevance.



EEG is potentially capable of capturing the strength as well as temporal structure of affective responses.

As traditional peak latency estimation is unreliable on slow components such as the LPP, fractional area latency estimates were defined as points in time when the area under waveform reaches 50% of total within a given time window.

Olofsson, Nordin, Sequeira, & Polich, 2008; Hajcak, MacNamara, & Olvet, 2010; Luck, 2005

LPP contains global as well as conditional differences

Sensitivity differences may emerge as global and/or conditional interindividual variability.

$$Y = \beta_0 + \beta_1 S + \beta_2 P + \beta_3 SP + \epsilon$$

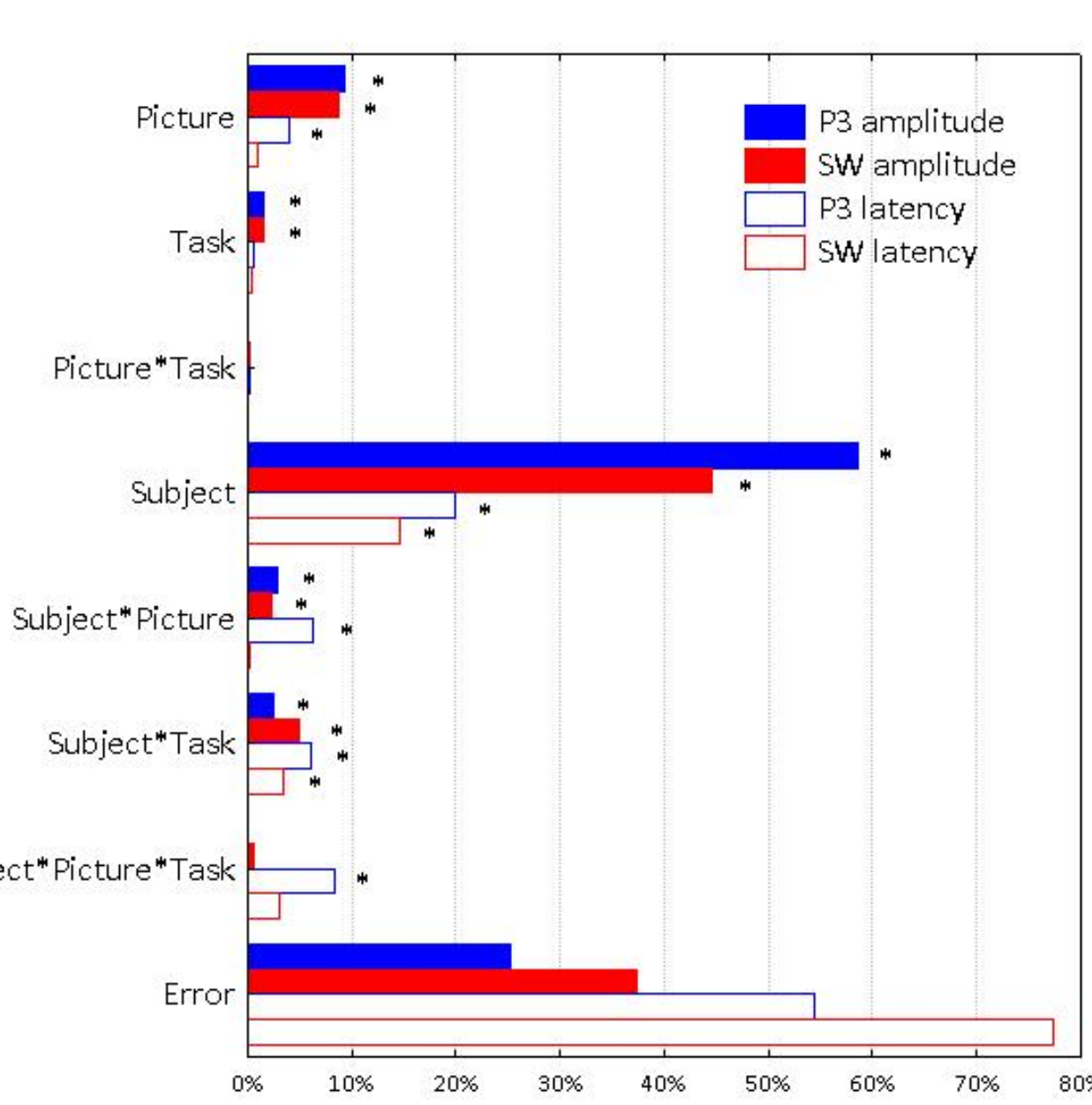
situation

global sensitivity

conditional sensitivity

A random effects ANOVA was used to fit a similar model to P3 and SW amplitude and latency data. The results were used to

- test the significance of manipulation effects;
- assess the proportions of variance accounted for by each component;
- derive individual scores corresponding to global and conditional sensitivities.



Expected manipulation effects were found

Erotic, aversive and negative stimuli elicited higher P3 and SW amplitudes as well as faster P3 and slower SW latencies. Affective evaluations increased amplitudes for all image categories. See Picture category main effect ERP figure on the left.

Beyond dominant global individual differences small but significant conditional sensitivities also emerged

Global individual differences were the largest contributor to all LPP parameters. In addition, participants differed in terms of amplitude as well as latency contrasts between tasks and several pictures. See variance proportions and significances on the figure on the right.

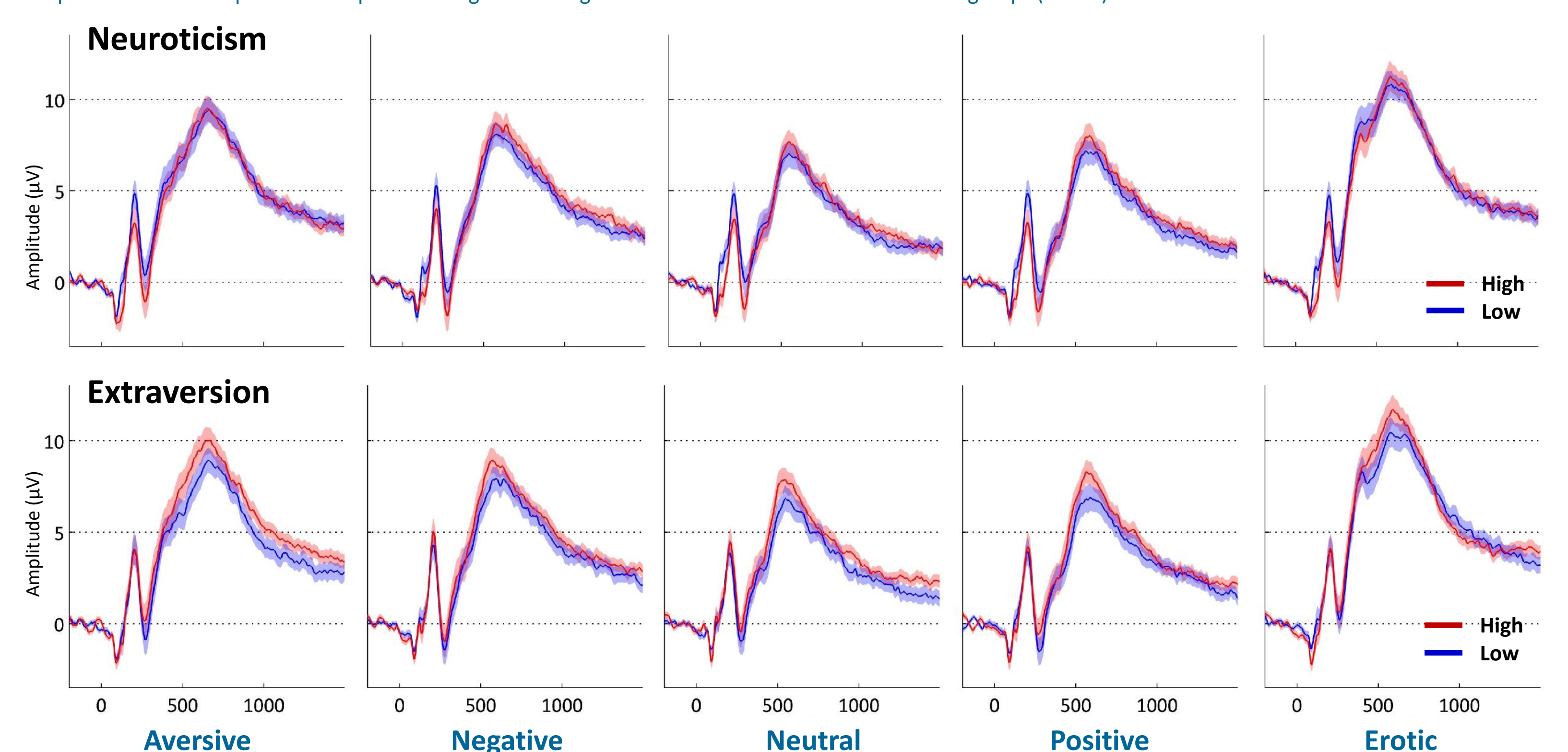
Yet the differences are not related to personality

Relations between global and conditional sensitivities and Big Five traits were insignificant and inconsistent

Correlations between personality traits and scores reflecting global and conditional individual difference components of LPP amplitude and latency variability.

	P3 amplitude					P3 latency					SW amplitude					SW latency								
	GLOBAL	AVERSIVE	NEGATIVE	POSITIVE	EROTIC	TASK	GLOBAL	AVERSIVE	NEGATIVE	POSITIVE	EROTIC	TASK	GLOBAL	AVERSIVE	NEGATIVE	POSITIVE	EROTIC	TASK	GLOBAL	AVERSIVE	NEGATIVE	POSITIVE	EROTIC	TASK
N	.08	-.19	-.10	-.09	-.19	-.06	-.04	.06	-.06	.07	-.10	-.06	.18	-.14	-.11	-.07	-.01	-.09	-.04	.07	.11	.04	.18	-.09
O	.11	.12	.03	.00	.13	-.04	-.01	.04	-.07	-.11	.08	.04	.02	.20	.18	.08	.08	.05	-.05	.10	.01	-.02	-.01	.15
E	.11	.08	.14	.00	.13	.04	-.08	-.03	.01	.09	.14	-.05	.09	.14	.11	-.01	.11	-.03	-.04	.17	.03	-.10	-.13	.00
A	.04	-.02	-.02	-.01	-.13	-.03	.08	-.12	-.13	-.09	-.07	-.11	-.11	.09	.10	.11	.02	.13	.06	-.09	-.15	.02	-.13	-.11
C	.00	.07	-.18	-.04	.07	.01	-.03	.02	.16	-.11	.05	.00	.10	-.06	-.11	-.06	-.01	-.10	.13	-.11	-.27	.06	-.22	-.20

Comparisons of ERP responses to all picture categories for high and low Neuroticism and Extraversion groups (n = 40). Shaded areas denote standard errors.



Summary and conclusions

- Replications of expected within-subjects affective modulations of LPP illustrate the viability of associating this measure with primary affective responses
- However, the expected relationships between LPP and personality traits failed to emerge despite the large sample, meticulous pre-processing and comprehensive statistical approach
- It is possible that a) crucial aspects of affective responses remain invisible in ERPs or b) detection of personality effects requires an order of magnitude larger sample
- However, it is also likely that personality simply does not moderate primary affective responses to the widely believed extent

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