Assaying social learning in Borderline Personality Disorder

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Abstract

Objective: Social dysfunction is a prominent and disabling aspect of borderline personality disorder. We reconsider traditional explanations for this problem in terms of recent developments in computational psychiatry.

Methods: To quantify social learning, we use a psychological task delivered on a computer. The task is built to include orthogonal periods of volatility for factual and social information. Therefore, we can separately quantify learning and quantify each. We also included a qualitative analysis of women describing the experience of the task. To test one potential mechanism for changes in social learning in BPD, we modified an embodied cognition task.

Results: Women with Borderline Personality Disorder (BPD) do learn both from experience and from advice in the social learning task. However, they attend more to very recent social data than do women without BPD. After the task, we disclosed a deception: that the advice did not come from another person, but instead from the computer. Hearing this, women in the control group expressed surprise and dismay, but women in the BPD group reported that they expect betrayals like this one. Initial piloting of the embodied cognition task reveals appropriate attention to the stimuli and that at least one subject with BPD was able to complete the task without difficulty.

Conclusions: We can apply methods in the computational psychiatry to better describe and understand social dysfunction in Borderline Personality Disorder. Future studies will relate social learning in BPD to real-world and clinical experience, aiming to personalize treatment strategies for these patients.

Study Methods

20 adult women with BPD	**Diagnosis:** SCID I and II, BSL-23
20 adult women without PD	**Schizotypy** Chapman Peters Delusion Inventory Levenson's locus of control scale 10 item Persecution and Deservedness scale
→ No substance dependence	
→ Can read scales (WRAT, NAART)	**Mood and Emotion Regulation** Beck Anxiety Inventory BDI - II STAXI-2 Barratt Impulsiveness Scale Difficulties in Emotion Regulation PANAS-now
→ Not currently in depressive episode	
	Relationships Working Alliance Inventory (WAI-SR) Dyadic adjustment scale (DAS-4) Interpersonal support eval. List (ISEL) Inventory of Interpersonal Problems (IIP-32) Self reports of real and virtual networks Social distance measure

Hypotheses

1) Women with BPD will attend more to social cues than to factual cues overall, and will pay more attention to current trial data than do control subjects.

2) Women with BPD will use bodily cues differently than do controls:

-- we can use a sentence-reading task to evaluate the impact of peripheral body posture on emotional processing in BPD

-- subjects may be using a more model-free (habit) than model-based strategy: bodily feedback may not change emotion processing

-- subjects may need a stronger cue to change an emotional model: an enforced bodily state may <u>facilitate</u> emotional processing

-- previously observed negativity bias may facilitate processing of unpleasant emotional cues, and processing of these cues may be less impacted by bodily feedback

Part I: A task to measure social learning[a,b]

Orthogonal periods of volatility allow us to quantify the weight each subject assigns to social vs. factual information as she makes decisions.
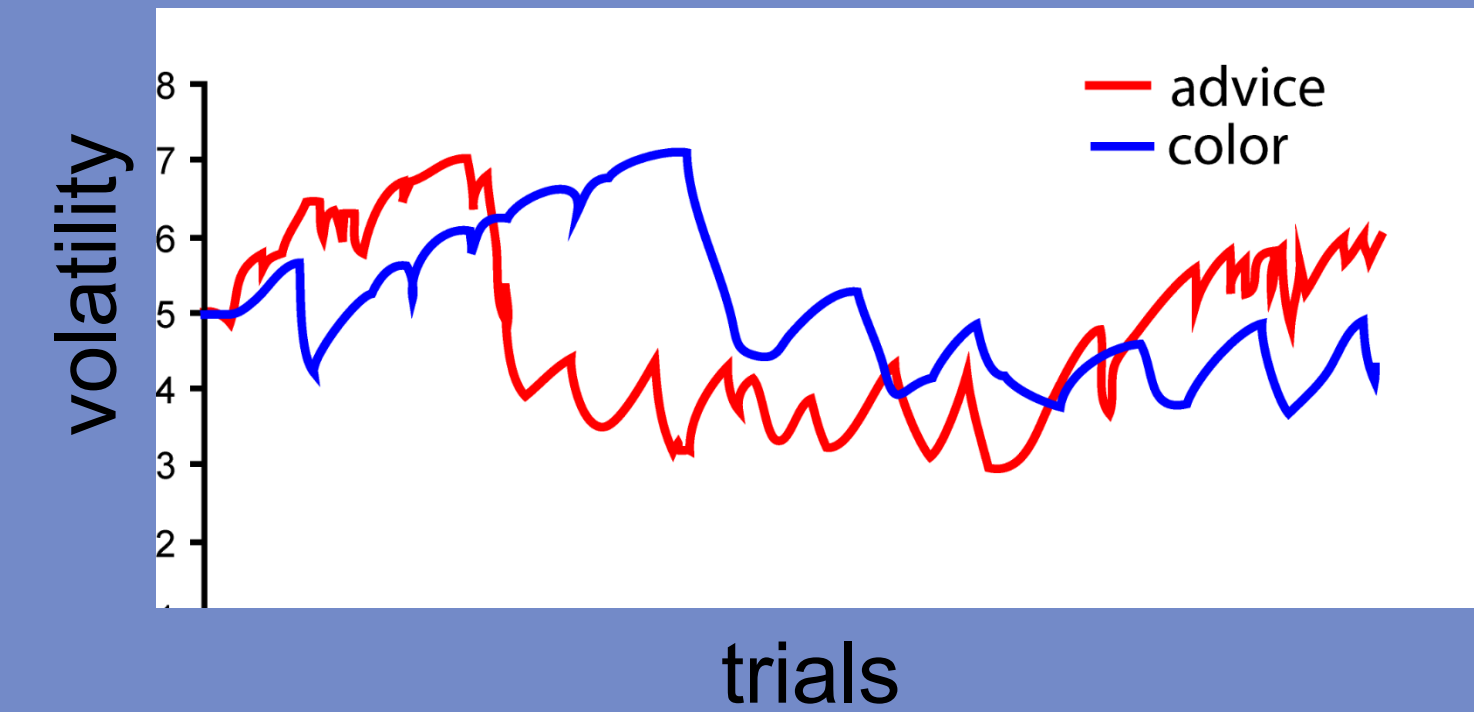

Each subject (1) interacts with a confederate (2).

Subject can use her own experience of:
- **Facts** (based on feedback after each choice)
- **Social data** (confederate's advice – red box)
- **Potential reward** (points shown in each box) to choose green or blue in each of 290 trials.

Accumulated points (red bar) increase toward goals (silver = $10, gold = $20).

Subject knows that the confederate's goals (silver and gold ranges) may not align with her own.
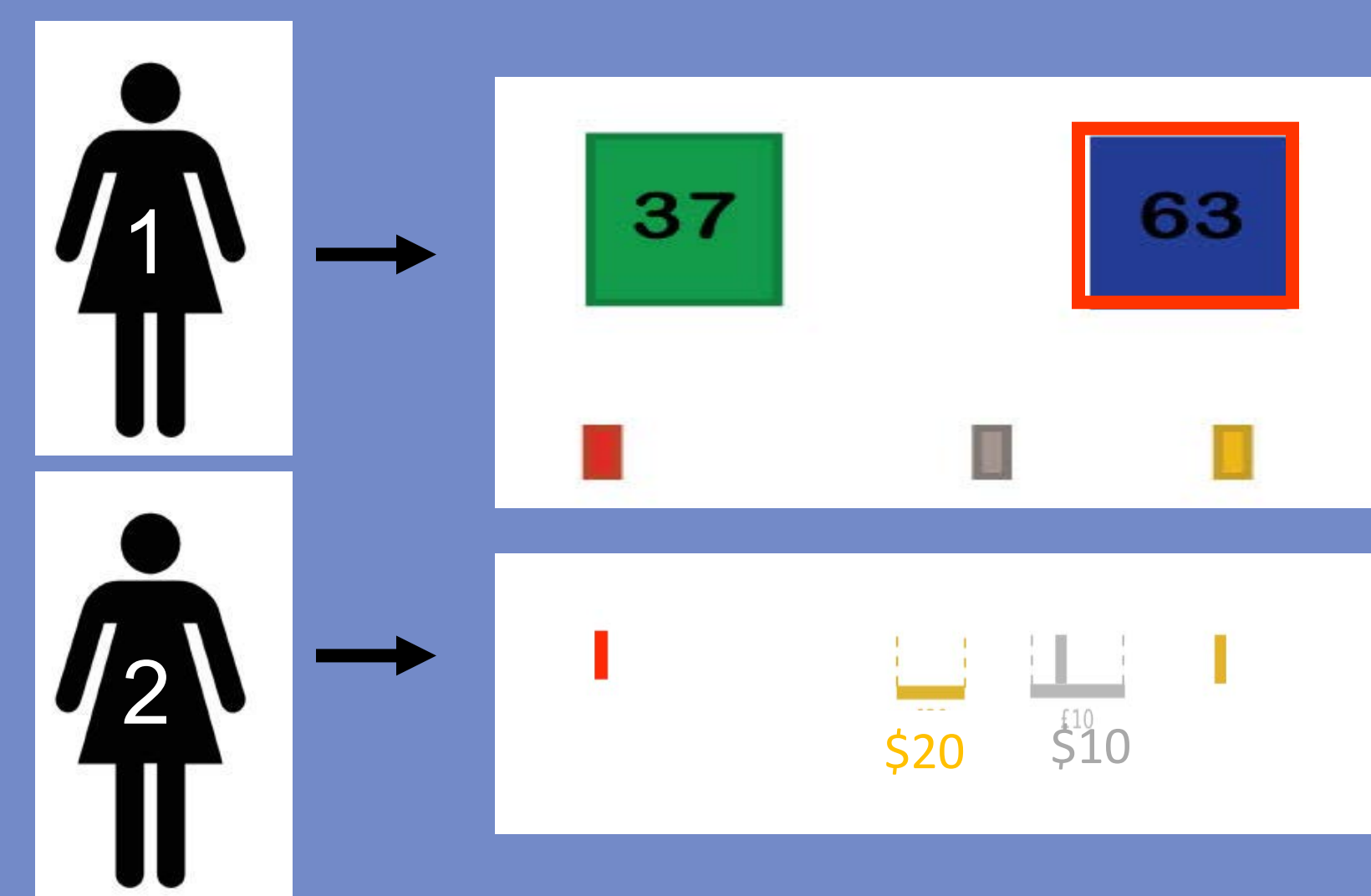

### BPD subjects report less surprise at the deception

Control comments:
Said she thought confederate would give advice at random, not trying to trick her. Not trying to help or hurt her. Said she went with gut feeling more than advice from other player

BPD comments:
Said confederate was "trying to mess with me a little" and expressed she did not know what kind of person the other player was, and was trying to figure that out
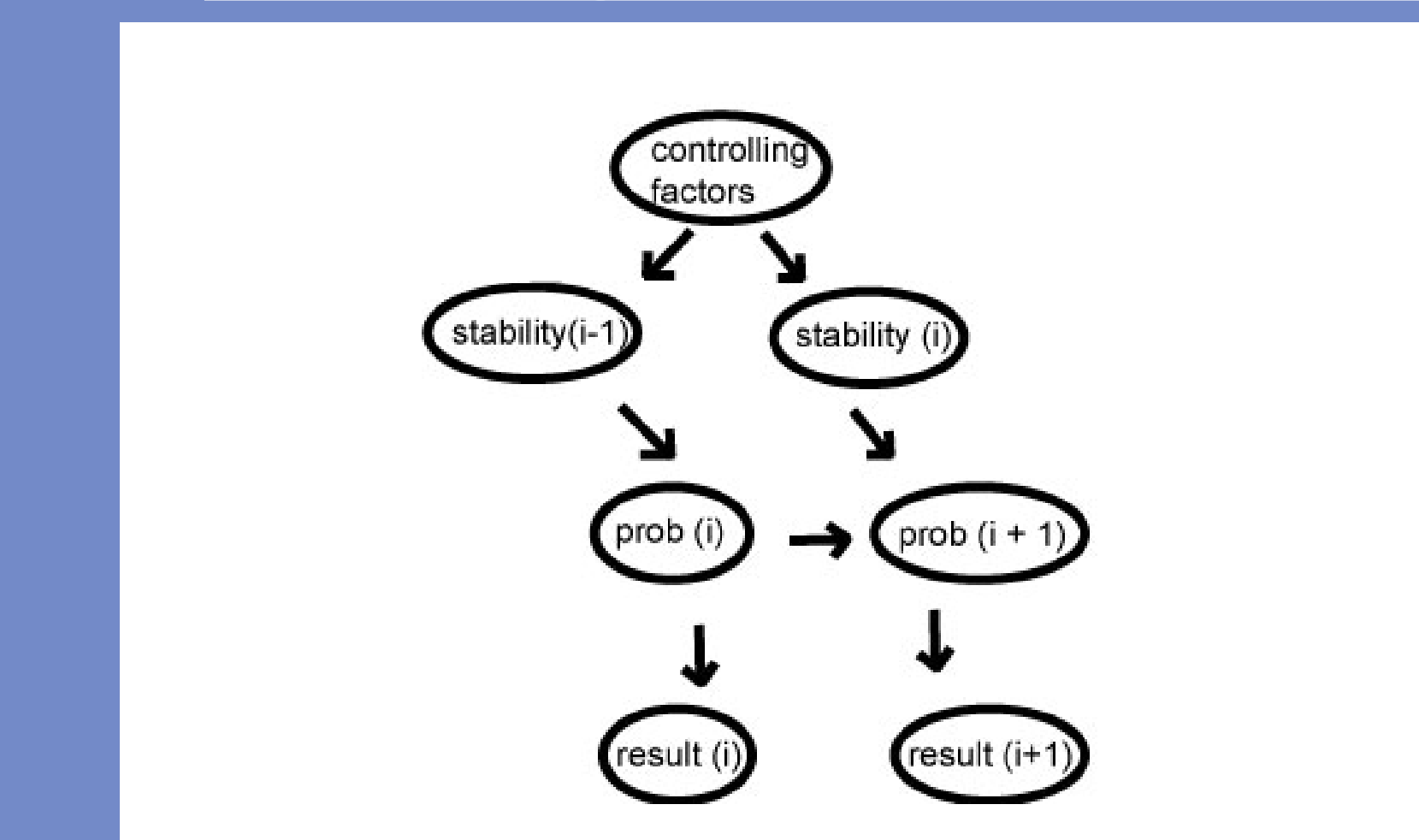
Talks extensively about confederate's possible state of mind and motivations
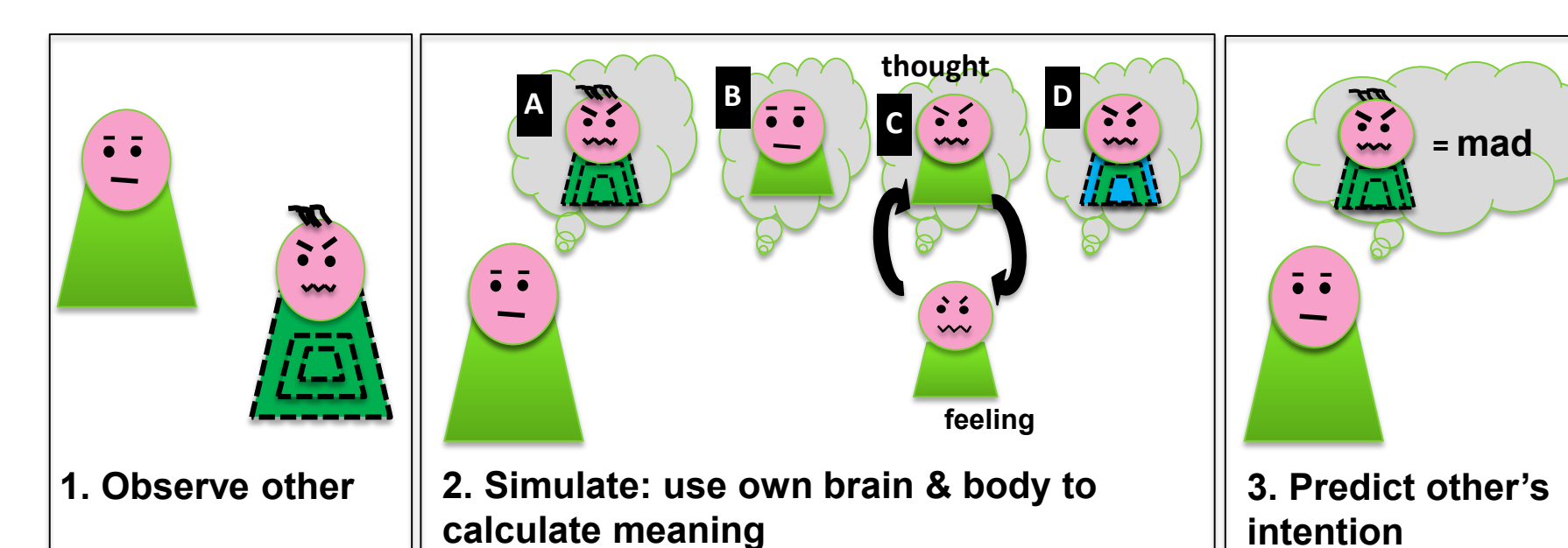

Expressed surprise
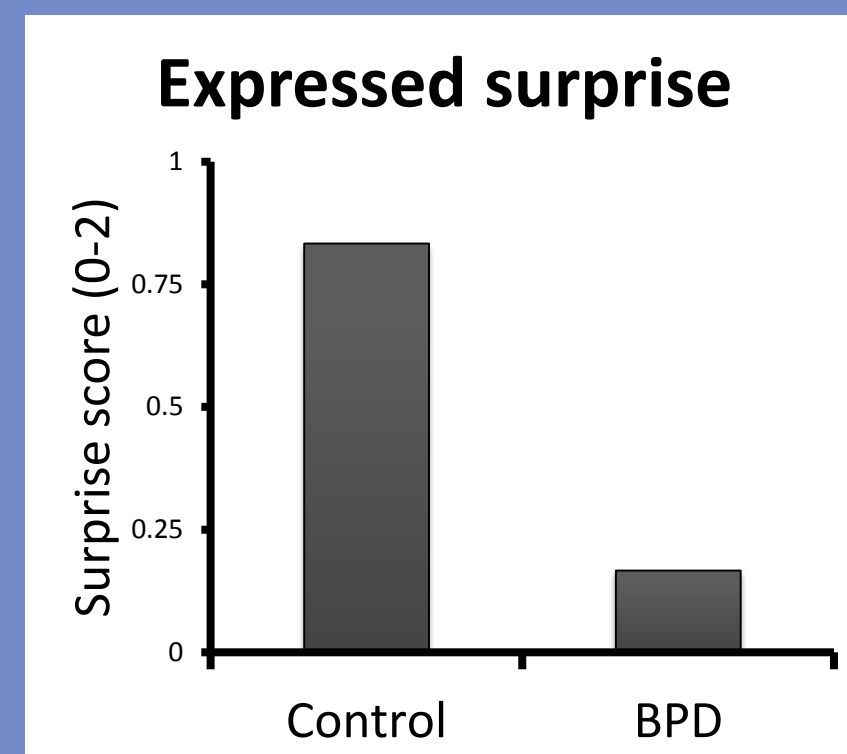
In a small preliminary sample, both groups use the overall history of facts and advice to make decisions. BPD subjects may be paying more attention to the current trial social data.
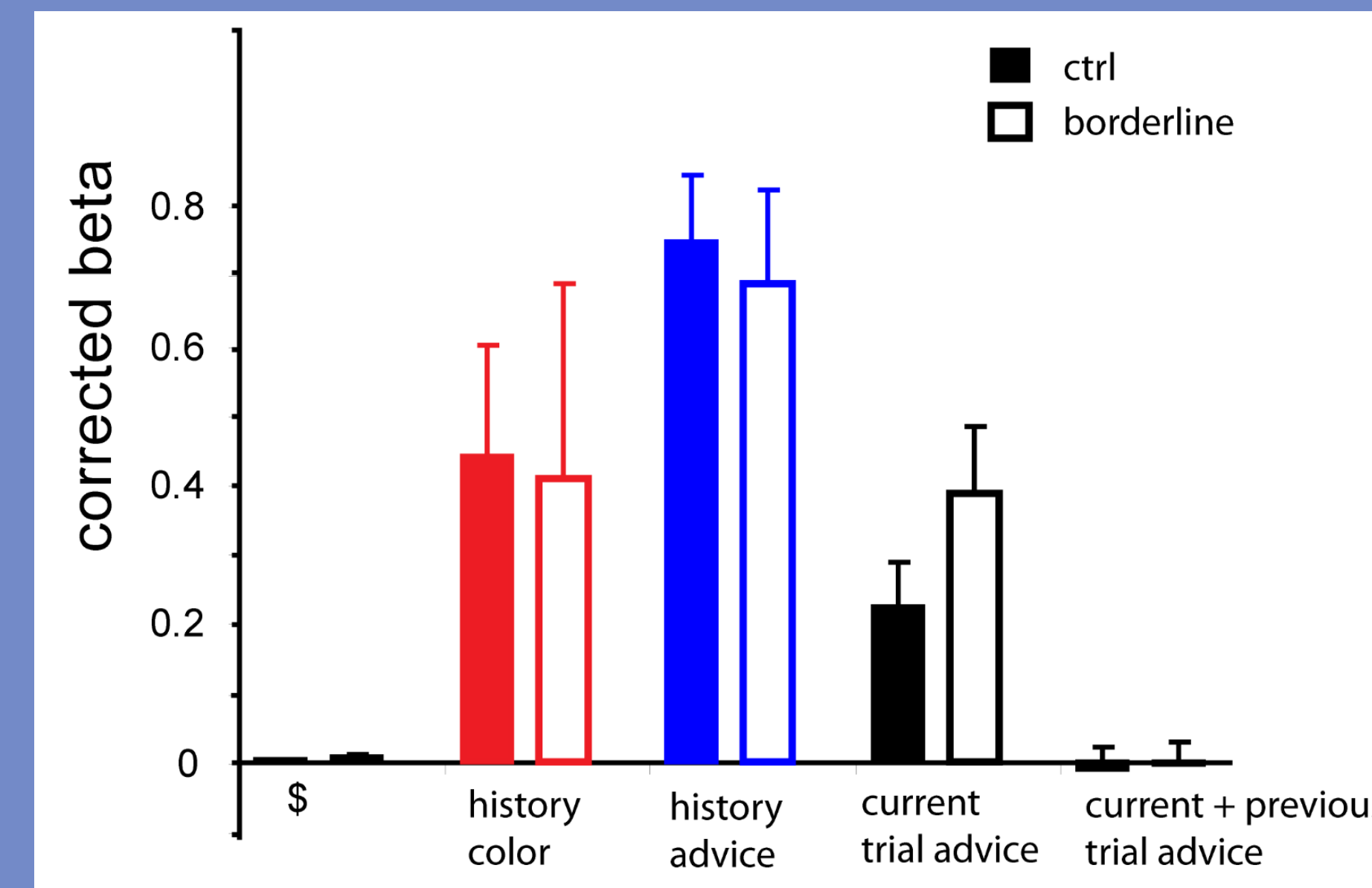

Modelling an uncertain world

Part II. Updating the model with feedback from the peripheral body

1. Observe other
2. Simulate: use own brain & body to calculate meaning
3. Predict other's intention

Embodied simulation is a computational path from observing an action (such as scrunched eyebrows and mouth) in someone to making a prediction about that action's meaning (mad). Panel 2 describes several aspect of this process, described as sequential steps here for clarity: (A) imagining the other's action, (B) imagining oneself, (C) thinking of one's own experiences with that action, low level activation of motor program to <u>do</u> that action, and (D) development of model based on observed other and personal simulated thoughts/feeling. The model can be used to predict the other's intentions (Panel 3) (Figure adapted from reference c)

Face muscles respond to and modulate emotional reading[d,e]
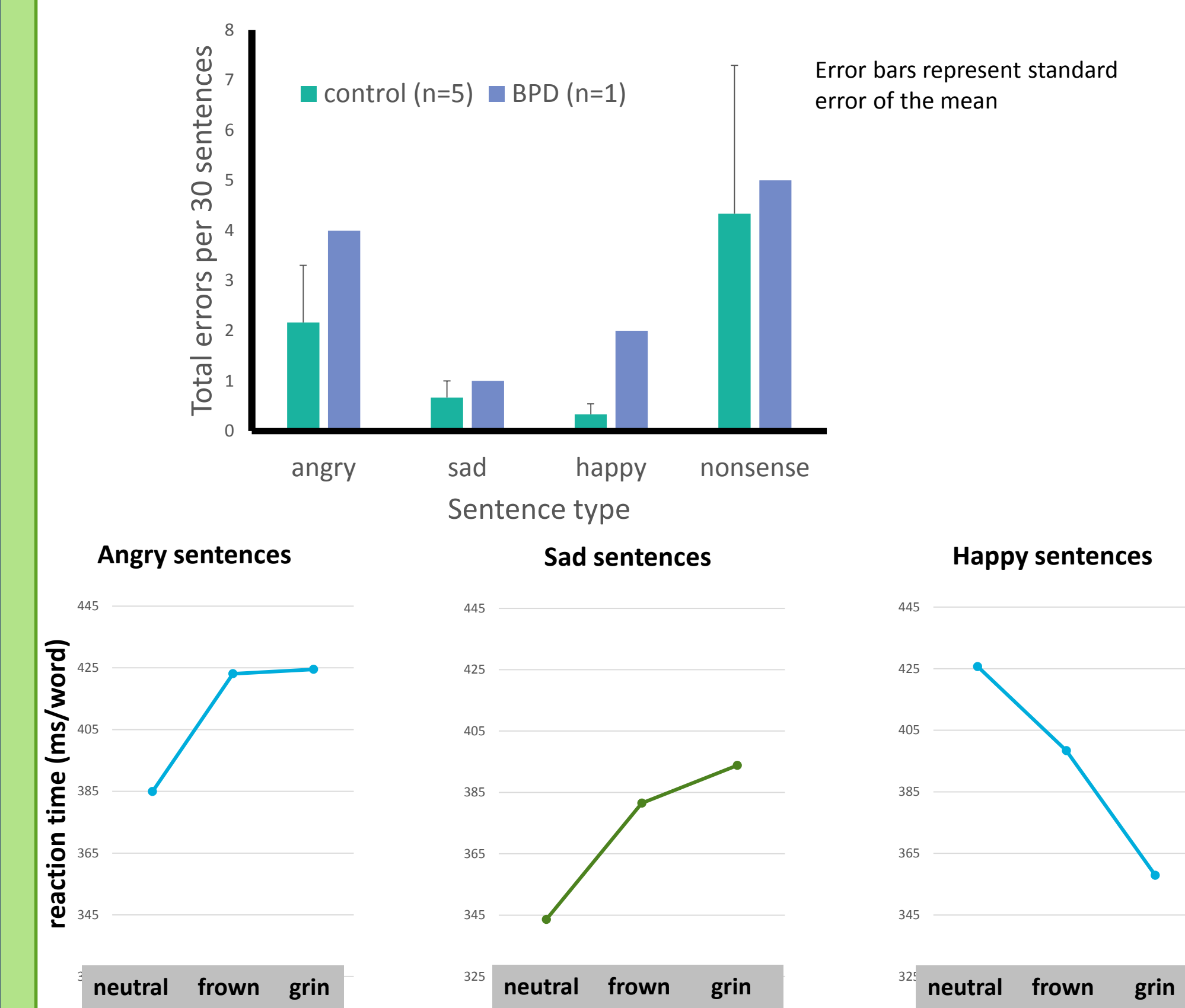
EMG   BOTOX
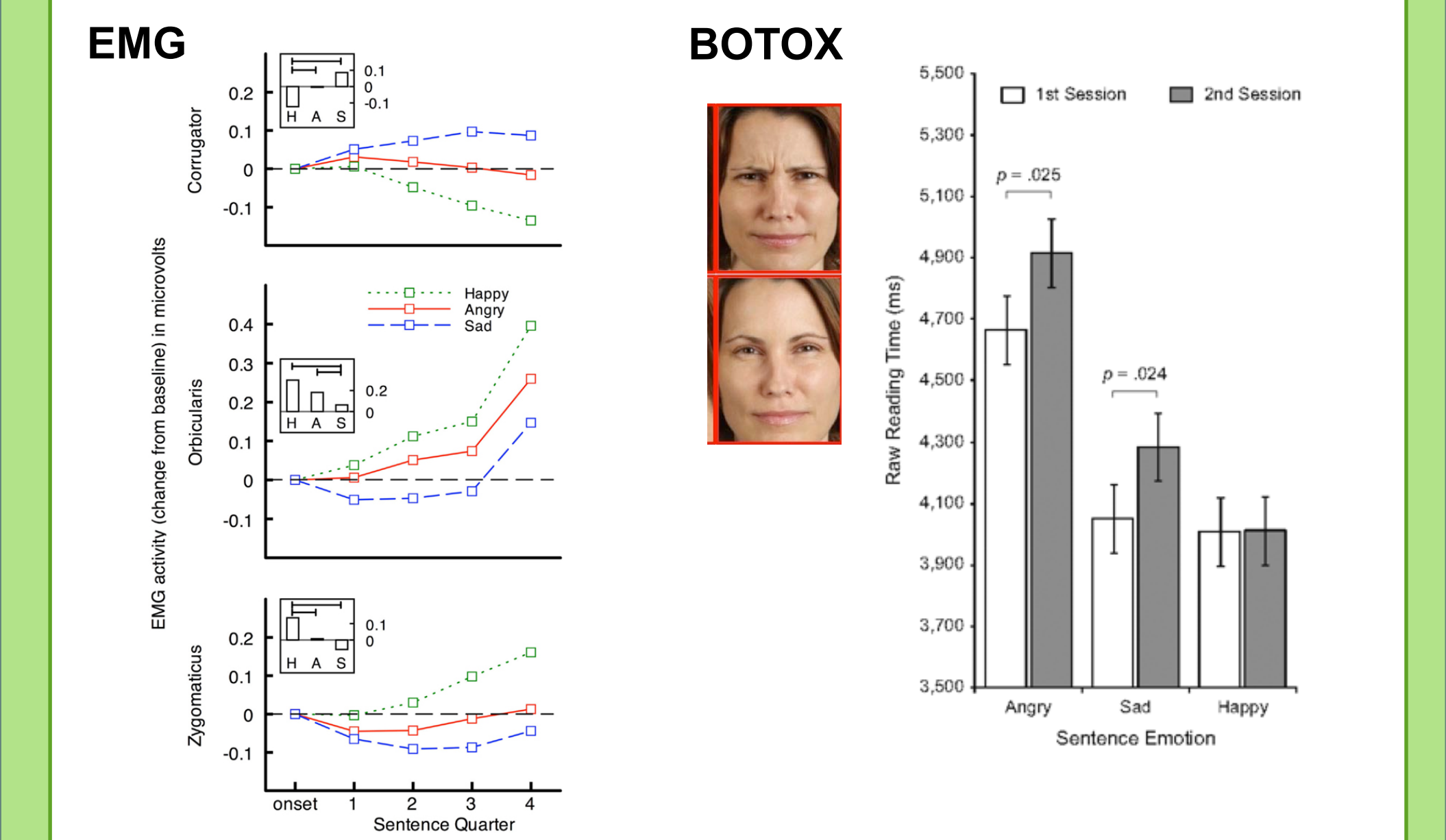
3 face positions
(2 blocks each)

grin   frown   neutral
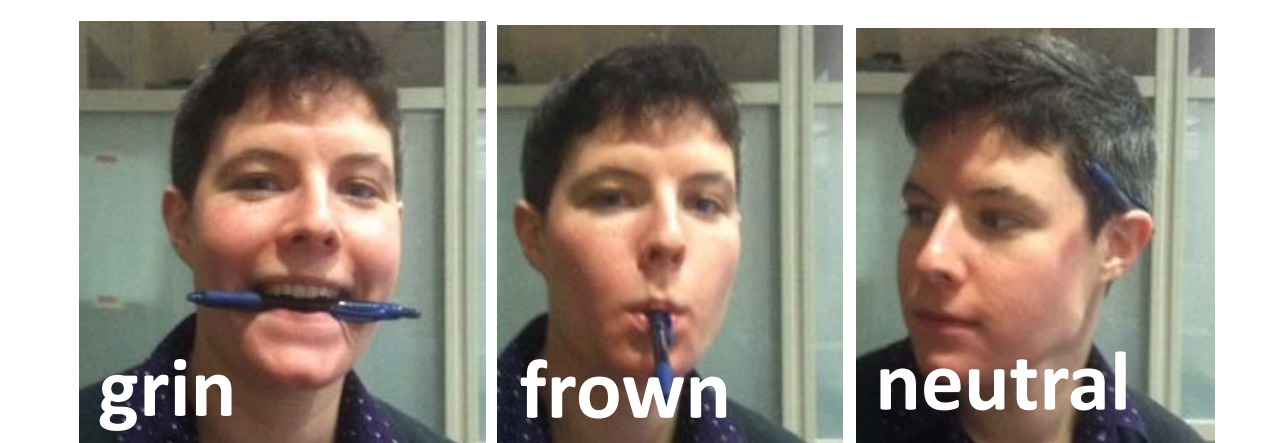
X

4 sentence types
(5/block):

NONSENSE	HAPPY
ANGRY	SAD

= 120 sentences

Subjects score each: makes sense or not.

Task Validation:
subjects pay attention and tolerate the task

References
a. Behrens T, *et al.* Nature Neuroscience 2007; 10:1214—21.
b. Behrens T, *et al.* Nature 2008; 456:245—9.
c. Fineberg S, *et al.* Frontiers in Psychiatry 2014.
d. Neidenthal Science 2007.
e. Havas et al. Psychonomic Bulletin and Review 2007.

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