



(Bayesian) Information Updating under Psychosocial Stress

Lubomír Cingl & Jana Cahlíková
Charles University in Prague

Introduction – part of bigger picture

Aim:

Find effect of stress on individual **propensity to herd**

Best task – information updating

herding = when individuals mimic others (Scharfstein and Stein (1990), p.446)

stress = a threat of disruption of homeostasis, leading to a compensatory reaction
Goldstein & McEwen (2002)

Why:

- ▶ Behavior under stress different, instinctively - no will control
- ▶ Difference in decision-making may be important
 - ▶ Examples – herding in fin. markets, bursting bubbles, panic in general

Drivers of herd behavior

▶ (1) Rational **information updating**

- ▶ People as (imperfect) Bayesian updaters
 - ▶ Information cascades - Bikhchandani et al. (1992)
 - ▶ Imperfections of updaters – conservativeness, representativeness
 - Kahneman and Tversky (1972), Fiedler (2000), Bodsky & Gjerstad (2012)
 - ▶ overweighting private information (Weizsäcker, 2010)
 - ▶ Only information taken into account
- ▶ *Needs to be processed by Cerebral cortex – needs logic*

▶ (2) **Behavioral driver**

- ▶ Psychologic and social forces
 - ▶ Personality differences (Baddeley et al., 2010)
 - ▶ Preferences for conformity (Sanfey, 2007)
 - ▶ Low confidence (Asch, 1951)
- ▶ *Does not need logic for decision*

Neuro-insights

- ▶ Stress causes deterioration of activity in **pre-frontal cortex (PFC)**
 - ▶ McEwen (2007)
 - ▶ Dorsolateral PFC – executive function, including updating acc. new info
- ▶ *"logic" of the brain is affected by stress*
- ▶ activity in **ventral striatum (VS)** tracked the degree of influence on pax's decisions arising from the observation of others' decisions (Burke et al. (2010))
 - ▶ VS is associated with social, emotional and motivational aspects of behavior
- ▶ *Can be affected by stress as well*
 - *New study py Porcelli, Lewis and Delgado – identify effect on VS*

Hypotheses

- ▶ Evidence: stress leads to deterioration of "executive" center in brain
 - ▶ **Information updating should be altered under stress**
- ▶ Stress may lead to change in activity of ventral striatum
 - ▶ **Information updating wrt public signal may be different under stress**

Methodology

Treatments

- ▶ Treatments: Stress vs. No stress (control)
- ▶ Between subject design
- ▶ Task: precision of informational updating

- ▶ **Measures**
 - ▶ **Theoretically predicted vs. actually stated probabilities**
 - ▶ Stress measures - cortisol & heart-rate, MDMQ qnr
 - ▶ Risk preferences
 - ▶ "Big Five" personality traits inventory
 - ▶ Time to make decision



Research design - **Task**

- ▶ Two bags with balls of two colors
- ▶ Aim of subjects – guess which bag was randomly chosen
- ▶ N draws = private signals
- ▶ After each draw subjective probabilities stated
 - ▶ paid based on the QSR
- ▶ After private signals, choices of others shown
- ▶ Re-state probability
- ▶ Based on Anderson and Holt (1997)

Your own signal:



8 blue
5 yellow

Your own decision:

50% blue X yellow 50%

You get:

If the bag is Blue: 75 ECU

If the bag is Yellow: 75 ECU



8 yellow
5 blue

OK



Your own signal:



8 blue
5 yellow

Your own decision:

47% blue X yellow 53%

You get:

If the bag is Blue: 72 ECU

If the bag is Yellow: 78 ECU



8 yellow
5 blue

OK



Your own signal:



What if decisions of others are:



8 blue
5 yellow

Your own decision:

50% blue X yellow 50%

You get:

If the bag is Blue: 75 ECU

If the bag is Yellow: 75 ECU



8 yellow
5 blue

OK



||



Research design - Stressor

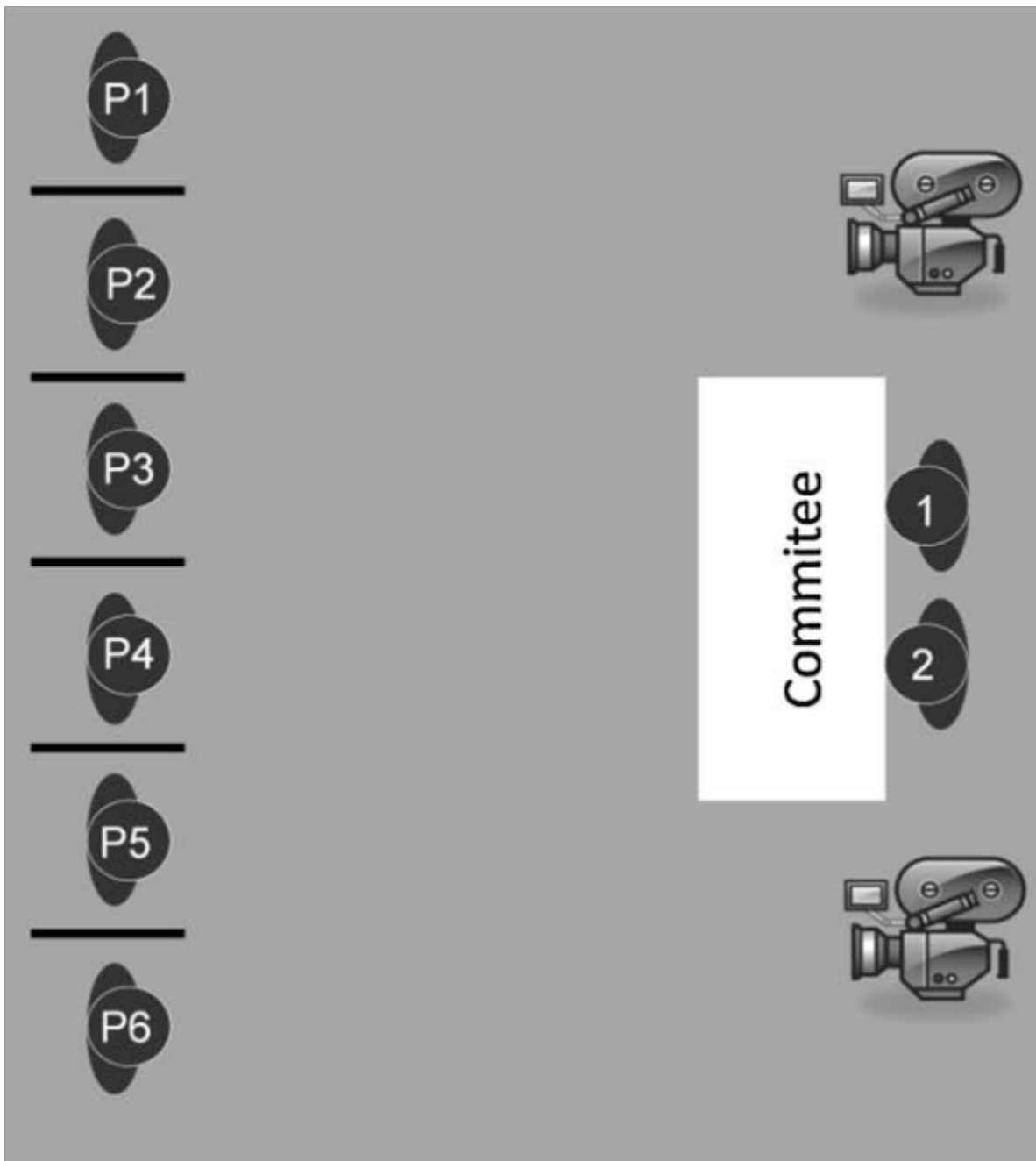
- ▶ Best stressor – Dickerson and Kemeny (2004)
 - ▶ uncontrollable
 - ▶ social evaluation
 - ▶ no feedback

- ▶ **Trier Social Stress Test (TSST, Kirschbaum, 1993)**
 - ▶ Standardized psychological protocol
 - ▶ Applicable for groups (von Dawans et al., 2011)
 - ▶ 1st part – **public speaking task**
 - ▶ 2nd part – **mental arithmetic task**
 - ▶ White coats, videocameras, no feedback

- ▶ Control group: similar nature of tasks, no stress

Research design – TSST





Preliminary results

Very very very preliminary

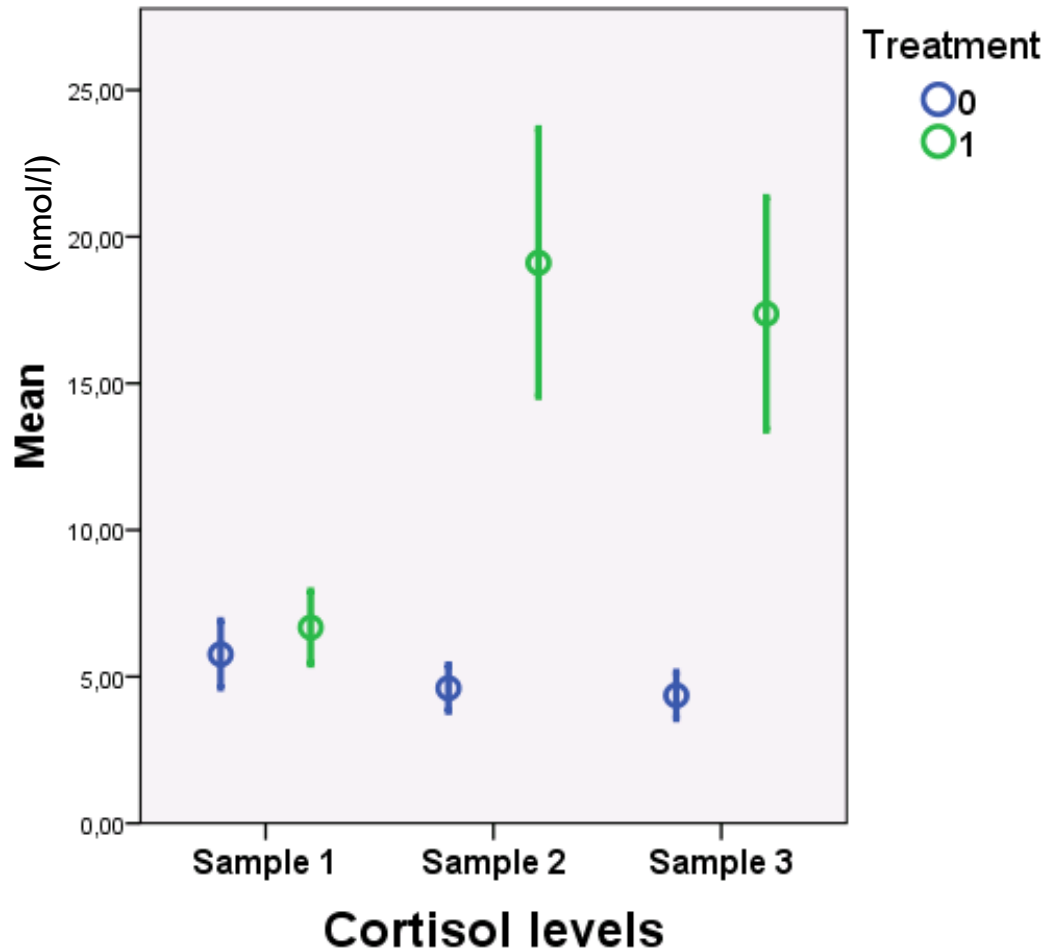
Preliminary Results – Sample Char's

- ▶ 81 (70) healthy subjects
- ▶ Mostly Czech undergrads studying economics or business
- ▶ 51 males, 30 females (evenly distributed)
- ▶ Avg payment 20€ (SD=3,01) per two hours

- ▶ Stress procedure mostly successful:

		Treatment	
		0	1
cortisol-response - Participant stressed	0	37	5
	1	3	36

Preliminary Results – Salivary Cortisol



Error Bars: 95% CI

Preliminary Results

- ▶ "Mistake" = Theoretically predicted prob – stated prob
- ▶ Mistake after private signal - Stress vs. No Stress
 - ▶ No significant difference in levels
 - ▶ conservativeness
- ▶ Mistake after private + public signal – Stress vs. No Stress
 - ▶ No significant difference in levels

Preliminary Results

- ▶ "Improvement" – mistake decreases after new signal
- ▶ Looking on probability of improvement after public signal
- ▶ Probability of improvement after receiving public signal 10%** higher in stressed group
- ▶ Holds when controlling for previous mistake level, time trend and other observables

		Reaction after receiving a public signal		
		Worse	No-change	Improvement
Before TSST	Control	61.43%	9.52%	29.05%
	Treatment	63.33%	8.57%	28.10%
After TSST	Control	60.54%	10.00%	29.46%
	Treatment	51.43%	9.64%	38.93%

That's all

Questions? Comments?

Contact: **Lubomir.Cingl@gmail.com**

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Basic HPA functioning

