**Acute stress enhances the sensitivity for facial emotions: a signal detection approach**

Gregor Domes and Patrick Zimmer

*Department of Biological and Clinical Psychology, University of Trier, D-54290 Trier, Germany*

**Supplemental Materials**

1. **Supplemental methods**
   1. ***Facial Emotion Detection Task – Stimuli selection and pilot study***

In order to create comparable subjective intensity steps (low, medium, high) for happy and angry faces we used a subjective detection threshold from a pilot study for normalization. Intensity thresholds for the correct detection was estimated based on pilot data using six different identities (3,8,9,20,34,36) from the NimStim Face Database (Tottenham et al., 2009). Faces were cut out and embedded on a light gray background. For each identity, faces were then morphed in 1%-steps from neutral to full basic emotions (anger, happiness). The resulting series of pictures were presented consecutively with increasing intensity. Each run lasted eight seconds, thus each single frame was shown for 80 msec.

In a pilot study, participants were asked to stop the presentation as soon as they became aware of the target emotion and decide between different emotion labels. The pilot sample comprised n=20 healthy participants (age: 38.2 +/- 10.5; male/female: 8/12). The average detection intensity for happy faces was 35.0 +/- 9.7 percent, and for angry faces 61.8 +/- 11.7. Low, medium, and high intensity levels were set at 40, 70 and 100% of the detection threshold, resulting in the selection of the following intensity levels for the final stimulus set: 14%, 24%, and 35% for happy faces and 25%, 43%, and 62% for angry faces.

* 1. ***Biochemical analyses***

Seven saliva samples were taken via Salivettes (Sarstedt, Nümbrecht, Germany) throughout the course of the experiment in order to determine salivary cortisol and alpha amylase (sAA) concentration. After the experiment saliva samples were stored at – 20°C until biochemical analysis by the University Laboratory. For cortisol analysis, a time-resolved fluorescence immunoassay was used, as described elsewhere (Dressendörfer, Kirschbaum, Rohde, Stahl, & Strasburger, 1992). 100µl (50µl per well) of saliva were used for duplicate analysis. The Intra-assay coefficient of variation was between 4.0% and 6.7% and the corresponding inter-assay coefficients of variation were between 7.1% -9.0%. For sAA analysis, the chromogenic molecule 2-Chloro-4-nitrophenyl-a-D-maltotrioside was used as the substrate, as described by Lorentz, Gütschow, and Renner, (1999). Saliva was diluted 1:200 with assay diluent. 16µl (8µl per well) of the diluted saliva were used for duplicate analysis. The intra-assay coefficient of variation was between 2.8% and 6.3%, and the inter-assay coefficients of variation were between 5.5% - 7.6%.

1. **Supplemental results**

Descriptive statistics for the Facial Emotion Detection Task.

Table S1.

Discrimination index d’ for both groups separated by emotion and displayed intensity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Anger | | Happiness | |
|  | TSST VR | Control VR | TSST VR | Control VR |
| Displayed Intensity | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Low | 0.97 (0.50) | 0.80 (0.41) | 0.90 (0.61) | 0.63 (0.68) |
| Medium | 2.22 (0.76) | 1.86 (0.77) | 2.18 (0.80) | 2.12 (0.91) |
| High | 2.65 (0.93) | 2.20 (0.86) | 3.43 (0.83) | 3.01 (0.84) |

*Note.* M = Mean. SD = Standard deviation.

Table S2.

Response bias c for both groups separated by emotion and displayed intensity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Anger | | Happiness | |
|  | TSST VR | Control VR | TSST VR | Control VR |
| Displayed Intensity | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Low | 0.74 (0.60) | 0.65 (0.59) | 1.48 (0.51) | 1.42 (0.60) |
| Medium | 0.27 (0.54) | 0.24 (0.48) | 0.64 (0.47) | 1.01 (0.60) |
| High | -0.01 (0.54) | 0.08 (0.58) | 0.10 (0.48) | 0.36 (0.55) |

*Note.* M = Mean. SD = Standard deviation.

Table S3.

Response latencies in msec for both groups separated by emotion and displayed intensity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Anger | | Happiness | |
|  | TSST VR | Control VR | TSST VR | Control VR |
| Displayed Intensity | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Low | 852 (174) | 1060 (335) | 910 (252) | 1084 (481) |
| Medium | 806 (132) | 1019 (343) | 934 (235) | 1047 (253) |
| High | 705 (135) | 857 (260) | 712 (120) | 973 (301) |

*Note.* M = Mean. SD = Standard deviation.

**References**

Dressendörfer, R. A., Kirschbaum, C., Rohde, W., Stahl, F., & Strasburger, C. J. (1992). Synthesis of a cortisol-biotin conjugate and evaluation as a tracer in an immunoassay for salivary cortisol measurement. *The Journal of Steroid Biochemistry and Molecular Biology*, *43*, 683–692.

Lorentz, K., Gütschow, B., & Renner, F. (1999). Evaluation of a direct α-amylase assay using 2-chloro-4-nitrophenyl-α-D-maltotrioside. *Clinical chemistry and laboratory medicine*, *37*(11-12), 1053-1062.

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A., … Nelson, C. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research*, *168*, 242–249.