Levator and sternocleidomastoid EMG: Motivational direction during anger and disgust inducing films
Lauritz W. Dieckman, Michael R. Medrano, Jonathan Tate, Laura Zambrano-Vazquez & John J.B. Allen
University of Arizona

**Background**

- Levator has previously been found to be associated with self-reported pathogenic and moral disgust (Chapman, Kim, Susskind & Anderson, 2009).

**Hypothesis 1:** Levator activity can be used to differentiate anger and moral disgust when they are co-reported (mixed)

- Preliminary analyses indicated increased frequency of “looking away” during avoidance related emotional stimuli.
- The sternocleidomastoid (SCM) is involved in horizontal movement of the head and will measure looking away

**Hypothesis 2:** SCM muscle activity will increase with self-reported avoidance.
- Dynamic emotional stimuli are associated with fluctuation in emotional experience reflected by changes in expression.

**Exploratory data analysis** of EMG peaks can be used to locate emotional “hotspots” and individual variability in dynamic emotional stimuli.

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**Participants**

18 (11 females) psychology students

**Stimuli**

8 film clips validated in preliminary study: 2 disgust, 2 neutral & 4 anger –which also evoked mixed disgust. Duration: 1.5 to 2 minutes

**Electromyography**

Specifications: Online Bipolar Ag/AgCl electrodes, 1000 Hz sample rate, band-pass filtered 0.03-200 Hz, notch filtered 60 Hz, online. Offline highpass 15 Hz 96 dB/oct, signals rectified

Recorded over levator facial muscle group and SCM neck muscle group.

**Post film rating**

Rate 0-8 Anger, Grossed-Out, Sad, Moral Disgust, Sympathy, Boredom, Happiness, Fear, Protective, Vengeful.

**Motivational direction**

“To what extent did you feel compelled to ___...”

1.) Approach or 2.) Avoid “...the situation?”

Rated from “I didn’t feel like moving” to 1.) “I really wanted to step in” or 2.) “leave the scene”.

**Analyses**

Within participant Pearson correlations were calculated for each participant across films, to produce a correlation between mean muscle activity during each film and the ratings for each film. These correlations were then Fisher Z-transformed, averaged across participants, and inverse Z-transformed for display. One-sample T-tests were used to test significance.

**Exploratory Data Analysis**

A dendrogram of hierarchical clusters was plotted for within participant correlations with Levator (Fig. 4). Branches of the tree indicate the smallest distance (Euclidean) between clusters (Martinez, Martinez & Solka, 2011).

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**Results**

To examine the contributions of each participant to the median waveform across subjects, the peaks for each participant was plotted for each movie (e.g. Figs. 5-6). Peaks were defined as time points (1000 Hz) with an amplitude greater than 4 standard deviations above the mean z-score for each participant. The sum logical of peaks (1 or 0 at each time point) was calculated. The number of peaks per time point may suggest cross-participant reactions to movie stimuli and indicate “hotspots” where activity is similar. These hotspots will be used for future studies on affective chronometry and individual differences.

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**Fig. 1** EMG recording locations –Levator (left) & Sternocleidomastoid (right)

**Fig. 2** Within subject correlations across films, between Levator and self-report emotion ratings. Avoidance related emotions are positively correlated. This functionally differentiates between anger and moral disgust. Hypothesis 1.

**Fig. 3** Within subject correlations across films, between SCM and self-report emotion ratings. SCM is highly correlated with self-reported avoidance and grossed out. Hypothesis 2.

**Fig. 4** Dendrogram of Levator correlations- Length of branches represent the distance between hierarchical clusters. This pattern provides further illustration of Hypothesis 1.

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**References**

