

博士學位論文要約

論文題目： Attending to Negative Affect: The Premier Expression Serves as the Source of Initial Output

ネガティブ感情の最初の反応としての Premier Expression に関する検討

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要約：

This research consists of three experiments aiming to determine the existence of the premier expression and its features. We defined the premier expression as a primitive, reflex-like, automatic facial response to evoked emotion that cannot be modified by one's conscious or unconscious effort because of its initiating timing and speed. However, a facial response develops after the premier expression that corresponds to a generally recognized facial expression, which is easily concealed or modified by display rules or social context. The premier expression is regarded as the first response to induced emotion, and might not even be visible to the naked eye because of its speed and subtlety. This postulation is based on Darwin's first principle of expression (1872/2009) and Tomkins' (1962) hypothesis that the face is the primary site of affect and has priority over the outer skeletal and inner visceral behaviors (i.e., blood pressure, heart rate, skin conductance) for the expression of emotion, since it is a faster, more precise and visible display.

We conducted three experiments to determine the existence of the premier expression. We continuously measured the facial electromyography (fEMG) activity in the corrugator supercilii and zygomaticus major muscles as indexes of unpleasant and pleasant affect, respectively, in response to surprise-evoking auditory tones, affective pictures, and emotional words. Given that the premier expression is regarded as the initial affective response, its occurrence should be after perceptual processing of the emotional stimulus. Accordingly, in the second and third experiments, event-related potential (ERP) components that are considered to reflect initial affective processing were recorded simultaneously with the fEMG activity. Such measurements are suitable for our purpose because they have high temporal resolution, which allowed us to examine the data in milliseconds. Since the premier expression is considered not to be affected by individuals' effort, we established two conditions in all three experiments: control and suppression conditions. This allowed us to compare the initial facial response between conditions, which was a key point in revealing the nature of the premier expression.

In the first experiment ("Your Face is Even More Surprised Than You Are: Evidence from Facial Electromyography Exposing Genuine Surprise"), we investigated the existence of facial expressions representing the first innate affective response to a given stimulus and examined the features of these expressions using fEMG recordings of the corrugator supercilii and zygomaticus

major muscles in 53 undergraduates. The participants were asked to perform a 5-minute calculation task. During this task, white noise (90 dB) was randomly presented for 1 second as a surprise-evoking stimulus. All participants completed 2 sessions. In the first session, they were asked to focus on the task without any inductions of expression (control condition), while in the second session they were additionally asked to keep their faces neutral (suppression condition). We found that the initial responses to the stimulus (within the first 200 ms) in the suppression condition were similar to those in the control condition. Specifically, muscle activity radically increased during the first 200 ms after stimulus onset, which lends strong support to our hypothesis. These results provide evidence for the premier expression as patterns of subtle muscle activity in response to emotional stimuli that can be captured by fEMG.

In the second study (“The Initial Emotional Output Cannot be Modified: the Premier Expression”), we examined the properties of the premier expression—namely, the first display of emotional information in the facial muscles, which appears between 150 and 300 ms after the onset of an emotional stimulus. We specifically examined whether this expression varied with the valence and arousal of the emotional stimuli. We also sought to confirm whether the premier expression is indeed an emotional response by correlating its occurrence with event-related potentials (ERPs) that represent primary emotional processing. The results showed that the premier expression did occur, but only for unpleasant visual stimuli. Furthermore, its intensity varied with the arousal of those stimuli. We also found that the activity representing the premier expression correlated with the peak-to-peak amplitudes of the P1 and N1 components, and occurred after these components appeared. Taken together, these results support the existence of a premier expression, which appears to be most sensitive to unpleasant stimuli.

Finally, in the third study (“The Face and Brain in the Emotional Loop: Event-related Potential Correlates of the First Facial Response to Emotional Words”), we replicated previous findings on the existence of the premier expression (i.e., the first affective response to emotional stimuli, emerging between 150 and 300 ms after stimulus onset). We examined whether the premier expression could be observed in response to mild-emotion-inducing words. By recording fEMG activity in the corrugator supercilii and zygomaticus major muscles along with event-related potentials (ERPs) in 63 undergraduates, we found that the premier expression in response to negative emotional words was generated in the corrugator supercilii muscle. We also found positive correlations between this fEMG activity and various ERPs reflecting discrimination between unpleasant and pleasant stimuli, which indicates a relationship between the visual input of emotional words and their responses. We believe that our study makes a significant contribution to the literature because it suggests that the premier expression is primarily a negative-valence, asymmetrical facial response that is positively correlated with various ERPs.

To summarize, the results of these three experiments provide evidence for the existence of the premier expression as a negative asymmetrical facial response. In other words, it is observed only in response to unpleasant stimuli during the first 300 ms after stimulus onset and mainly in the corrugator supercilii muscle. Furthermore, it increases with the intensity of the unpleasantness and

arousal levels, is resistant to modification by suppression, and can be observed in response to a surprise tone, and unpleasant pictures and words. Given that the premier expression occurs subsequent to ERPs reflecting initial emotion processing, it can be regarded as the first affective output. These findings are in accordance with the negativity bias and attentional bias theories, which suggest that negative affect might weight more than positive or neutral affect, and influence individuals in the earliest stages of affective processing, before overt facial actions or behavior occur. Further research is needed to exam whether the premier expression varies with different discrete emotions (e.g., fear, anger, disgust).