

博士学位論文審査要旨

2017年12月18日

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 旨:

本論文は、感情喚起刺激に対する表情表出時に、通常の前在化した表出に先行して、本論文提出者が“premier expressions”と名付けた、無意識的かつ“真”の感情を反映する反応が存在する可能性を検討することを目的とする。本論文では、感情喚起刺激による表情表出過程を、刺激に対しまず現れる第1反応と、それに続く、誇張や、抑制など様々な心理的調整が加えられた第2反応に分けてとらえている。この第1反応が“premier expressions”である。この反応の理論的根拠は Tomkins (1962) の感情理論の中に見られるが、その存在は実証されていない。

本博士論文は3つの実験で構成される。第1実験では、自然表出条件と表出抑制条件を設け、計算課題遂行中に驚愕刺激(90dBの音)を1秒間、無作為に呈示し、皺眉筋と大頬骨筋の2か所から表情筋電図を導出した。その結果、驚愕刺激の呈示後500ms以内では両条件の筋活動に差は見られなかったのに対し、500ms以降では自然表出条件における筋活動が有意に大きくなった。この結果は、premier expressionの存在を示唆すると考えられた。しかしながら、この実験からは、驚愕刺激に対する最初の反応が、驚愕反応あるいは定位反応であり、感情を反映したものではない可能性を棄却できなかった。

第2実験では、誘意性、覚醒度の異なる感情喚起刺激(映像)に対するpremier expressionの存在と中枢の感情情報処理過程との関係を検討した。感情喚起刺激に対し、自然表出群と表出抑制群を設け、表情筋電図に加え事象関連電位(ERP)を測定した。さらに、定位反応を除去するため、刺激の反復呈示を行った。その結果、不快感情を反映する皺眉筋活動にのみ、第1実験の初期反応と同様の反応が見られ、不快感情に対してpremier expressionが生じることが示された。また感情喚起刺激呈示後150msですでにある程度中枢の処理が行われており、刺激呈示後150ms-300msで最初の感情表出として表情筋活動の増加が生じることが示唆された。

第3実験は、感情喚起語を刺激として用い、第2実験と同様の目的とパラダイムで実験を行った。その結果、強度の比較的弱い感情喚起刺激である感情語においても、第2実験と同様の結果が得られ、premier expressionは不快及び覚醒度の高い刺激に対して生じた。また、相互相関分析の結果、中枢での処理の後約120msで、premier expressionが生じることが明らかになった。

以上の結果より、premier expressionは、主に不快な感情喚起刺激に対する反応であり、中枢における最初の不快と快の刺激弁別処理を反映する反応である可能性が高いと考えられる。

本論文は、感情喚起刺激に対し、一般的に表情として扱われている前在化した表出に先行して、脳内の快-不快処理を反映すると考えられるpremier expressionが生じることを実証した最初

の報告であり、感情研究に新しい知見を提供するものである。従って本論文は、博士（心理学）（同志社大学）の学位を授与するに相応しいものと認められる。

総合試験結果の要旨

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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 旨：

上記審査員3名は、2017年12月18日午後15時30分より約2時間にわたり、学位申請者に面接試問を行った。提出論文に対する質疑に対して、適切な応答と説明がなされ、本論文の学術的価値が実証された。さらに申請者は、感情心理学はもとより、精神生理学、心理学一般についての十分な知識を有することが認められ、引き続き行った語学試験(英語)についても十分な学力を確認することができた。

以上より、総合試験の結果は合格であると認める。

博士學位論文要旨

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

氏名： 朱 映菡

要旨：

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 supercillii 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 supercillii 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 examine whether the premier expression varies with different discrete emotions (e.g., fear, anger, disgust).