



Commentary: Electrophysiological Evidence Reveals Differences between the Recognition of Microexpressions and Macroexpressions

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A Commentary on

Electrophysiological Evidence Reveals Differences between the Recognition of Microexpressions and Macroexpressions

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Shen et al. (2016) examined whether perceptions of short (40 and 120 ms) and long (200 and 300 ms) expressions were associated with distinctive electrophysiological processes. Using an “affective priming paradigm,” the researchers presented pairs of fearful, happy, and neutral expressions with positive and negative emotion words while participants’ electroencephalograms (EEG) and Event Related Potentials (ERP) were assessed. Expressions presented at 40 and 120 ms were similar to each other but different from expressions presented at 200 and 300 ms in their ERP and Event Related Spectral Perturbation (ERSP) characteristics. Analyses also suggested that the brain regions responsible for these differences included the inferior temporal gyrus and regions of the frontal lobe and that the left hemisphere was more involved than the right in processing expressions at 200 and 300 ms.

The methods and findings from this study have novel implications concerning facial expressions of emotion (hereafter *FEE*). Below we discuss four such implications with the goal of inspiring further research and insights into this important topic.

IMPLICATIONS FOR EMOTION RECOGNITION AND PROCESSING: IMPORTANCE OF A 200 MS THRESHOLD

Shen et al. (2016) operationalized recognition in their study as a memory task that assessed whether participants remembered seeing face-word pairs. Almost two decades ago we compared different expression presentation speeds and demonstrated that *FEE* presented at 200 ms were associated with the greatest degree of individual differences in emotion recognition accuracy (Matsumoto et al., 2000). Although our study examined emotion labeling, quite a different task, Shen et al.’s (2016) findings dovetailed nicely with ours in that 200 ms presentations appear to be a threshold at which facial expressions begin to be seen and held in short term memory (corresponding with the Shen et al., 2016, findings) and labeled (corresponding with our findings, Matsumoto et al., 2000). Thus, 200 ms presentation speeds appear to be important for neurophysiological and psychological processes to occur.

IMPLICATIONS FOR THE NEUROPHYSIOLOGY OF BRIEF FACIAL EMOTION RECOGNITION

Shen et al.'s (2016) findings also add to a small but growing literature on the neurophysiological correlates of perceptions of very brief FEE. Although much research has been conducted on the neurophysiology of FEE presented for longer durations (Adolphs, 2002; Atkinson and Adolphs, 2011), the study of very brief FEE is new. In addition to Shen et al. (2016), Zhao et al. (2017) studied neural responses to fearful and surprised expressions presented at 100, 300, or 500 ms and reported both common and separate neural activations associated with their recognition. Relatedly, Peng et al. (2017) developed a dual temporal scale convolutional neural network that could recognize spontaneously produced microexpressions better than feature-based methods. Other novel research involving more traditional physiological assessment (sympathetic responses) combined with observation also suggest promising avenues to deciphering FEE (Wesley et al., 2012).

Shen et al.'s (2016) findings also have implications for other important theoretical questions about expression judgment. For instance, as they suggested, perception of expressions at varying durations have different implications for top-down or bottom-up processing in perceivers. In their study, incongruent word-face combinations produced different electrophysiological profiles than did congruent combinations, implicating top-down processing of the stimuli at even very brief exposures. This suggested that the decoding of emotional stimuli involves the influence of learned rules, labels, values, and associations, providing a cultural component to emotion decoding despite strong biological bases for emotions and expressions in the first place, especially vis-à-vis the type of decoding required.

IMPLICATIONS FOR EXPRESSION PRODUCTION

The findings from Shen et al.'s (2016) study and others have implications for expression production. That participants cannot reliably label expressions under 200 ms (Matsumoto et al., 2000) and that the neurophysiological correlates of their perception are different than those of longer expressions (Shen et al., 2016) raise questions about the nature of FEE, and more specifically, the speed of microexpressions. Until recently, the only studies to examine microexpression production had operationalized them as occurring between 1/25th and 1/5th s (i.e., *under* 200 ms) and had shown that they rarely occurred (Porter and ten Brinke, 2008; ten Brinke et al., 2011; Porter et al., 2012; ten Brinke and Porter, 2012). Recently, however, we examined the occurrence of FEE occurring ≤ 0.20 , ≤ 0.30 , ≤ 0.40 , ≤ 0.50 , ≤ 1.00 , 1.00 – 6.00 , and ≤ 6.00 s in a mock crime paradigm (Matsumoto and Hwang, 2018) and demonstrated that microexpressions ≤ 0.40 and ≤ 0.50 s occurred with sufficient frequency to differentiate truth-tellers and liars (We also replicated the previous

non-findings that expressions ≤ 0.20 s rarely occurred). These latest findings also dovetailed nicely with Shen et al.'s (2016) and ours (Matsumoto et al., 2000) and collectively have implications concerning which expressions are called micro and which macro. We contend that the term “microexpressions” should be reserved for those that occur faster (i.e., ≤ 0.50 s) than empirically documented speeds of normally occurring, non-suppressed, non-concealed spontaneously produced facial expressions of emotion (0.50–4.00 s; see Ekman et al., 1980, 1998; Ekman and Friesen, 1982; Ekman and Fridlund, 1987; Frank et al., 1993).

Shen et al.'s (2016) findings also have implications for other important theoretical questions about expression production. For instance, expressions at different durations have different implications for a voluntary-involuntarily produced distinction, as well as conceptual issues concerning possible overlap with macroexpressions; future research needs to examine these issues. Other questions exist: Is there a duration criterion that can differentiate when an expression is voluntarily as opposed to involuntarily produced? Is there a duration criterion concerning when expressions are signs of concealed emotional states? Are there morphological differences in expressions—micro and macro—produced with these different psychological states? And are there different neural correlates of these different psychological processes? All of these are questions that the Shen et al. (2016) article implies and that should be examined in the future.

IMPLICATIONS FOR DECEPTION DETECTION

Finally, the findings by Shen et al. (2016) and a growing number of other studies have implications for deception detection. As mentioned above, microexpressions do occur when individuals lie and they differentiate truth-tellers from liars (Matsumoto and Hwang, 2018). Microexpression recognition ability is associated with deception detection accuracy (Frank and Ekman, 1997; Matsumoto et al., 2014) and microexpression recognition skills can improve through training and are retained after training (Matsumoto and Hwang, 2011; Hurley, 2012). Individual difference variables are associated with microexpression recognition ability, including openness, conscientiousness, affective empathy, and emotion dysregulation (Matsumoto et al., 2000; Hurley, 2012; Hurley et al., 2014; Svetieva and Frank, 2016). And brain activity differs when individuals perceive microexpressions above a 200 ms threshold (Shen et al., 2016). For all these reasons, microexpression recognition may be one (of many) important skills in detecting deception, having implications for a wide range of real life concerns as well as for future research and theory.

AUTHOR CONTRIBUTIONS

DM and HH authors contributed equally to the ideas presented. The DM wrote the first draft of the paper. Both authors contributed equally to editing the first draft to its final version.

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Conflict of Interest Statement: The authors declare that they are employees of Humintell, a for-profit company that sells microexpression related products.

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