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How does facial feedback modulate emotional experience?

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ABSTRACT

Contracting muscles involved in facial expressions (e.g. smiling or frowning) can make emotions more intense, even when unaware one is modifying expression [e.g. Strack, F., Martin, L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A non-obtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology, 54*(5), 768–777]. However, it is unresolved whether and how inhibiting facial expressions might weaken emotional experience. In the present study, 142 participants watched positive and negative video clips while either inhibiting their facial expressions or not. When hypothesis awareness and effects of distraction were experimentally controlled, inhibiting facial expressions weakened some emotional experiences. These findings provide new insight into ways that inhibition of facial expression can affect emotional experience: the link is not dependent on experimental demand, lay theories about connections between expression and experience, or the distraction involved in inhibiting one's expressions.

1. Introduction

After a stressful day, have you ever become aware of just how tightly you were clenching your jaw, furrowing your brow, or squinting your eyes? Such facial expressions can show the world what we are feeling inside. They are, after all, the result of our emotional states. But is it possible that the reverse is also true – that our emotional states are the result of our facial expressions?

Historically, there has been great interest in this question (Darwin, 1872; Izard, 1971; Laird, 1984; Niedenthal, 2007; Tomkins, 1962). One of the first arguments that expressions influence emotional experience came from William James and Carl Lange. For James and Lange, the direct perception of a particular somatic state (visceral, postural, or facial), was the essence of what it meant to have a particular emotional experience (for review see Fehr & Stern, 1970; James, 1884, 1890, 1894; Lange, 1885/1912). Although the James–Lange theory pertained to expressions throughout the body in addition to facial expressions, their theory anticipated later work on the facial feedback hypothesis (FFH) (Ekman, Levenson, & Friesen, 1983; Izard, 1971; Tomkins, 1962, 1963; Tourangeau & Ellsworth, 1979) that focused on facial expressions alone and their influence on emotional experience.

Different versions of the FFH make different claims about the relative importance of facial feedback in emotional experience. According to the *necessity hypothesis*, without facial feedback there can be no emotional experience (Keillor, Barrett, Crucian, Kortenkamp, & Heilman, 2002). Keillor et al. studied a woman with total facial paralysis, who nevertheless demonstrated typical emotional responses to emotionally evocative photographs, effectively ruling out this hypothesis. According to the *sufficiency hypothesis* (e.g. Ekman et al., 1983), facial expressive muscle activity on its own can produce emotional experience. There has been support for this hypothesis; for example, directing people to contract muscles that are associated with facial expressions of emotion can be sufficient to elicit the associated emotions (Levenson & Ekman, 2002). Finally, the *modulation hypothesis* (e.g. Strack, Martin, & Stepper, 1988) holds that facial expression can modulate emotional experiences that have been elicited by some external stimulus, something other than one's own facial actions. It is this modulation hypothesis that is tested in the present study. In particular, we seek to address gaps in existing research that have left this hypothesis unresolved.

There have been two main approaches to examining how changes to facial expression can modulate emotional responses. The most well-studied approach asks participants to generate facial expressions, and records any resulting changes in self-reported emotional experience. This research is perhaps best exemplified by the now classic study by Strack et al. (1988), which found that asking participants to generate smile-related expressions led them to report enhanced positive affect, whereas having them inhibit smile-related expressions by activating opposing muscles weakened positive affect. Strack et al.'s methods have since been replicated by other researchers, with similar results (e.g. Soussignan, 2002). Other research on how generating facial expres-

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sions can modulate emotional experience that is in response to stimuli tends to support these findings (for reviews see Adelman & Zajonc, 1989; Capella, 1993; Laird 1984; Matsumoto, 1987; McIntosh, 1996; Soussignan, 2004). In general, smiling makes a person feel more positive, and frowning makes a person feel more negative.

A second approach examines the effects of inhibiting facial expression on emotional experience. This approach has been employed by only a handful of studies, in which participants view emotional stimuli and, rather than being asked to generate an expression, are instructed to keep a constant neutral expression on the face, and to not allow emotional expressions to appear. Although the FFH would predict that inhibiting facial expression should decrease the strength of emotional experience, results have been mixed. Studies have variously shown: (a) a decrease in negative emotional experience when participants inhibited facial and bodily expressions (Duclos & Laird, 2001), (b) a decrease in positive emotional experience when participants inhibited facial expression (Bush, Barr, McHugo, & Lanzetta, 1989), and, with inhibition of micro-expressive changes in facial expression, (c) both a decrease in positive and a marginal decrease in negative emotional experience (McCanne & Anderson, 1987). Finally, although Strack et al. did not guide participants to hold a neutral expression, they did find lower positive affect when participants inhibited smile-related activity by activating opposing muscles (Strack et al., 1988).

The emotional effects of inhibiting facial expression also have been examined in experiments in which participants are instructed to suppress the expression of their emotions as a form of emotion regulation (Gross, 1998a). Although suppression studies direct participants to hide all behavioral expressions of emotion, and not just those on their faces, for present purposes they are informative because the face is likely the dominant channel of emotional expression (Darwin, 1872; Tomkins, 1962, 1963), especially in laboratory experiments. This implies that the expressions that are most inhibited in a suppression study are those that are on the face. To date, studies of suppression have focused primarily on inhibiting expressive responses to negative emotions, again with mixed results. Studies have variously shown: (a) a decrease in the strength of various negative emotions for older, but not middle-aged and younger adults (Magai, Consedine, Krivoshekova, Kudadjie-Gyamfi, & McPherson, 2006), (b) no effect on negative emotion (Gross, 1998b), (c) a significant drop in negative emotion (Goldin, McRae, Ramel, & Gross, 2008), and, in two of only three studies that we are aware of to look at both positive and negative emotion, (d) a decrease in positive but not negative emotional experience in one instance (Gross & Levenson, 1997), and no reported differences as compared to spontaneous expression in the other (Zuckerman, Klorman, Larrance, & Spiegel, 1981).

Taken together, this previous work is at least partly consistent with the idea that the inhibition of facial expression decreases the magnitude of emotional experience in response to emotional stimuli. However, at least four important questions remain about the effects of facial expression inhibition on experience that limit the strength of the conclusions that can be drawn from prior work.

First, there is the question of whether inhibition affects positive and negative emotions equally. To date, few studies have considered both positive and negative emotions in the same study. This leaves a critical gap in the logic of the argument, because considering positive or negative emotion alone cannot dissociate an increase or decrease in the strength of emotional experience from a general shift towards feeling more positive or more negative. For example, posing a frown might make one feel more negative, or it might simply disrupt or weaken any emotional experience, positive or negative. Although a few studies have included both positive and negative stimuli (Gross & Levenson, 1997; McCanne & Anderson, 1987; Zuckerman et al., 1981), they have not addressed each of the additional considerations listed below.

Second, there is the question of whether the documented effects of inhibition are indirectly the consequence of the distraction of devoting resources towards inhibiting facial expressions while also attempting to watch video clips or fill in questionnaires related to emotion. Extant experiments on inhibition report changes in emotional experience in terms of overall decreases in emotional experience, which could also be caused by distraction. Indeed, in research on the relative value of different emotion regulation strategies, participants asked to think distracting thoughts rather than ruminate on their depression or anger experienced less negative emotion as a result (e.g. Nolen-Hoeksema & Morrow, 1993; Rusting & Nolen-Hoeksema, 1998). Two studies have addressed the question of how distraction might compare to inhibiting facial expression in response to emotional stimuli (Duclos & Laird, 2001; Richards & Gross, 2006). Richards and Gross (2006) explicitly instructed participants to either distract themselves with "thoughts that have nothing to do with [an emotional video clip]" or to inhibit (specifically to suppress) their emotional expressions while watching video clips. They found that distraction reduced self-reported emotional experience, whereas expressive suppression did not (Richards & Gross, 2006). These data suggest that distraction and inhibition of expression are not identical. Duclos and Laird induced negative affect by having participants in two groups recall sad or angry life experiences. Each group was then asked to perform one of the following tasks: either to sort a deck of cards by suit and order (distraction), or inhibit their emotional expressions. Each group then switched to the other emotion and then performed the task they had not yet performed (distraction or inhibition). The authors found that both distraction and inhibition of expression decreased the strength of negative affect (Duclos & Laird, 2001). Although the reasons for these discrepant results are not immediately apparent, our point here is that these studies included only negative stimuli, and asked participants to inhibit not only their facial expressions but all behavioral manifestations of emotion. Thus, the relative effects of facial inhibition, *per se*, as opposed to distraction, on both positive and negative responses have not yet been examined. Furthermore, the type of attentional control required for facial inhibition is akin to that in a divided attention study in which participants must attend to perceptual stimuli while simultaneously attending to and controlling their facial expressions. This may be importantly different from simply shifting one's attention away from a stimulus, as was done in prior research.

The third question concerns participants' awareness of the experimental hypothesis. In the Strack et al. studies of posing facial expressions, as well as subsequent studies employing variants of those methods, a carefully constructed cover story was used to ensure that participants were not aware that the study pertained to facial expression or emotion. It was thus possible to attribute changes in emotional experience to facial feedback, and not to experimental demand or other effects on self-reports that might follow from participants' holding conscious expectations about how expression and experience should connect. Studies of facial inhibition have not emphasized cover stories to the same degree, however (e.g. Bush et al., 1989; Duclos & Laird, 2001; McCanne & Anderson, 1987). Furthermore, related studies of expressive suppression have explicitly instructed participants to "hide their emotions" so that others could not tell what the participant is feeling, an instruction that could engender expectancies in participants regarding how much their self-reported emotional experience should be independent of their facial expression. Thus, it is not yet clear whether the effects of facial inhibition on experience should be attributable to the lack of feedback *per se*.

A fourth and final question is whether participants who are instructed to inhibit their facial expressions engage in cognitive