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The Social Amplification View of Facial Expression

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Decades of empirical research into facial expressions have yielded two important results (among others). The first is an *attribution agreement*: under the right conditions, there is impressive cross-cultural agreement as to which emotions are expressed by some facial expressions. The second is an *audience effect*: people are more likely to produce some spontaneous facial expressions in social interactions than when alone, even when their underlying emotions are the same. Both results have been challenged, but for the purposes of this paper I shall assume that both may be taken at face value.[1]

Psychologists have developed two competing views of facial expression, and while each explains one result with relative ease, it struggles to explain the other. According to the *Neurocultural View* (NCV), emotions are basic adaptive processes that trigger species-typical facial expressions.[2] NCV predicts the attribution agreement, but not the audience effect. Indeed, NCV predicts that spontaneous facial expressions of emotion should occur more frequently in solitary than in social contexts, since in some social situations individuals suppress their facial expressions. Yet the research indicates that some spontaneous facial expressions occur less frequently in solitary contexts than NCV predicts.

[1] Reviews of the studies supporting attribution agreement include Elfenbein & Ambady (2002) and Matsumoto et al. (2008). Critiques of these studies may be found in Russell (1994), Barrett (2006), Gendron et al. (2014), and Crivelli et al. (2016). Studies supporting the audience effect include Kraut & Johnston (1979), Fridlund (1991), Chovil (1991), Fernandez-Dols & Ruiz-Belda (1997), and Parkinson (2005), among others. A critique may be found in Frank & Ekman (1993).

[2] The *locus classicus* of this view is Ekman (1972). Philosophical discussions of NCV include Green (2007) and Scarantino (2017).

According to the *Behavioral Ecology View* (BEV), facial expressions are strategic signals of social intentions rather than involuntary outpourings of emotion.[3] BEV predicts the audience effect, but not the attribution agreement. Indeed, BEV predicts that people should be worse at matching faces with emotions than they in fact are.

In this paper I will propose a new view, a synthesis of NCV and BEV, which inherits the strengths of both and the weaknesses of neither.[4] According to my *Social Amplification View* (SAV), emotions are basic adaptive processes that trigger species-typical changes in facial muscle activation, although these muscle activations are not always noticeable under normal viewing conditions. Social interactions then trigger the *amplification* of these muscle movements, making them easier to detect. SAV predicts both the attribution agreement and the audience effect. There is an attribution agreement because the same emotions activate the same facial muscles in neuro-typical humans. There is an audience effect because facial muscle contractions are at times too slight to be detected in solitary contexts, yet become amplified in social interactions. I argue that this synthesis of NCV and BET outperforms past syntheses and is most consistent with the empirical data considered.

1. The Attribution Agreement

In what is often called a "*cross-cultural judgment study*," subjects from various cultural backgrounds are presented with a series of facial expressions, and then asked to interpret them. Typically, subjects are presented with photographs, but in some cases they are presented with video recordings or computer animations. More often than not, subjects are given a list of emotion terms to choose from (e.g. joy, sadness, anger, surprise, fear, and disgust), but sometimes they are instructed to supply their own names for emotions, and in rare occasions they are given no instruction whatsoever as to how to categorize the facial expressions. More than a hundred judgment studies have been conducted over the past few decades,

[3] The *locus classicus* of this view is Fridlund (1994). Philosophical discussions of BEV include Green (2007) and Scarantino (2017).

[4] Other attempts to synthesize NCV and BEV may be found in Green (2007), Griffiths & Scarantino (2009), and Scarantino (2017). I discuss each in §6.

and the majority of them—more than 96%, according to one meta-analysis (Elfenbein & Ambady 2002)—suggest that there is substantial cross-cultural agreement in how to categorize at least some facial expressions.

In one classic study (Ekman & Friesen 1969; as reported in Ekman & Friesen 2003, 25), experimenters presented subjects from the U.S., Brazil, Chile, Argentina, and Japan with black-and-white photographs of Americans performing various facial expressions, and then asked the subjects to name the emotion expressed from a list that included happiness, surprise, fear, sadness, anger, and disgust. The experimenters found that the majority of subjects from each culture agreed in their categorizations. In response to a photograph of a woman wrinkling her nose and depressing the corners of her lips, 92% of U.S. subjects answered "disgust," as did 97% of Brazilian subjects, 92% of Chilean and Argentinian subjects, and 90% of Japanese subjects. In response to a photograph of a woman grinning, 97% of U.S. subjects answered "happiness," as did 95% of Brazilian and Chilean subjects, 98% of Argentinian subjects, and 100% of Japanese subjects. Even the photograph depicting a gasp ("fear face"), which many subjects categorized as surprise, boasted higher-than-chance levels of agreement: 85% of U.S. subjects, 67% of Brazilians subjects, 68% of Chilean subjects, 54% of Argentinean subjects, and 66% of Japanese subjects categorized the expression as one of fear. These findings suggest that, at least in experimental settings, there is substantial cross-cultural agreement about which emotions correspond to some facial expressions.

To bolster these findings, the same researchers conducted a follow-up study (Ekman & Friesen 1971), in which they tested whether subjects from the South East Highlands of New Guinea, who had little to no exposure to other cultures, would categorize facial expressions in the same way. In this study, the researchers read a short vignette to the subject, presented the subject with three photographs of Caucasian Americans performing different facial expressions, and then asked the subject to select the photograph that best fit the vignette. The vignettes included "Her friends have come, and she is happy," "He is angry, about to fight," and "She is looking at something that smells bad." Consistent with the researchers' hypothesis, the majority of adult and child subjects selected the same photographs to describe the same vignettes. For instance, when told the happiness vignette and presented photographs of a grin ("joy"), a scrunched

nose ("disgust"), and a scowl ("anger"), 100% of adult respondents selected the photograph of a person grinning. From these results, the experimenters concluded that there is cross-cultural attribution agreement for many of the facial expressions depicted. (The gasp or "fear face" performed worst, with subjects labeling it as surprise as often as they labeled it fear.)

There are two hasty generalizations that we must be careful to avoid. First, we shouldn't assume that *cross-cultural* agreement implies *universal* or *pan-cultural* agreement. An experiment that shows agreement between U.S. Americans, Brazilians, Chileans, Argentinians, and Japanese subjects does not guarantee universal agreement any more than an experiment that shows agreement between U.S. Americans and Papua New Guineans. There may still be other cultures that disagree. As we shall see, some psychologists have independent reasons to believe that attribution agreement will be universal in some cases, and use the aforementioned judgment studies to support this hypothesis, but these judgment studies do not conclusively demonstrate the strong claim of universality. Cross-cultural agreement, defined as agreement across two or more cultures, is entirely consistent with cross-cultural disagreement, defined as disagreement across two or more cultures (e.g. Gendron et al. 2014; Crivelli et al. 2016).

Second, we shouldn't assume that attribution agreement for *one* facial expression implies attribution agreement for *all* facial expressions. As we have seen already, cross-cultural attribution agreement for grins is very high, whereas cross-cultural attribution agreement for gasps ("fear face") is significantly lower. Again, some psychologists have independent reasons to believe that a certain set of facial expressions will enjoy cross-cultural attribution agreement, but with the judgment studies mentioned thus far, the attribution agreement for each facial expression ought to be considered on its own merits.

Another bad inference we should avoid is the inference that because there is cross-cultural agreement that one face expresses an emotion, there will be no other face that subjects from these cultures will agree also expresses that same emotion. In other words, it can be tempting to infer *uniqueness* (not only one emotion per face, but also one face per emotion) from cross-cultural judgment studies, when in fact these studies support only the "one emotion per face" rule. Many emotions can be expressed

with an open or closed mouth and with open or closed eyes. Although there are differences among the faces that express fear, for instance, subjects nonetheless agree in categorizing all these fear faces as fear. As in the previous two cases, there may be independent reasons to assert the "one face per emotion" rule, but the judgment studies considered are consistent with the hypothesis that some emotions are expressed by multiple faces, each obeying the "one emotion per face" rule.

With these qualifications in mind, I take the judgment study literature to support, at the very least, the conclusion that *some* facial expressions admit of *some* cross-cultural attribution agreement under certain experimental settings. This conclusion is admittedly weaker than the conclusion that some researchers draw, namely that *many* facial expressions enjoy *universal* attribution agreement, and not only under constrained laboratory conditions, but also in the wild. The weaker conclusion, but not the stronger, is consistent with instances of attribution disagreement, or cases in which members of two or more cultures disagree as to which emotion (or other state) is expressed by a particular face.

Although many studies have replicated these findings (Elfenbein & Ambady 2002; Matsumoto et al. 2008), critics claim that there are flaws in the experimental design (Russell 1994; Barrett 2006). Most judgment studies rely on posed, rather than spontaneous, facial expressions, which may be exaggerated (see Matsumoto et al. 2008 for a response). Most provide subjects with a short list of emotion words to choose from, which may inflate agreement (see Haidt & Keltner 1999 for a response). And most present facial expressions stripped of any social context, which may interfere with normal processing (see Keltner et al. 2016 for a response). Critics worry, in effect, that subject performance in these judgment studies does not reflect facial expression processing in the wild. I share some of these concerns, but in any case, an adequate theory of facial expression ought to be able to explain why there is attribution agreement *in these narrow experimental settings*, and as we shall see, some views offer a better explanation than others.

2. The Audience Effect

In what is often called a "*component study*," subjects are presented with stimuli that are presumed to elicit a particular emotion, and then researchers observe which facial expressions (if any) immediately follow. Often, subjects are presented with comedic, sad, or disgusting scenes from movies. Sometimes, they are read vignettes designed to elicit different emotions. And in some experiments, they are exposed to sweet- or foul-smelling odors.

In one famous set of studies (Kraut & Johnston 1979), experimenters visited a bowling alley and recorded league bowlers' facial expressions during play. For one study, the experimenters observed league bowlers who were practicing by themselves. The experimenters recorded the number of pins that the bowler knocked down and then recorded the facial expression that the bowler performed upon witnessing the outcome of the roll. We might expect that the bowler would smile upon getting a good roll (strike or spare), and not smile upon getting a bad roll (neither strike nor spare). However, the experimenters found that the bowlers tended not to perform *any* facial expressions in response to their rolls. Smiles followed only 4% of the good rolls, and, perhaps even more surprisingly, smiles followed 3% of the bad rolls.

The experimenters then observed league bowlers who were playing in groups. They recorded the outcome of the roll and the bowler's facial expression as he or she turned around to face the other players. In this case, the experimenters found that 30% of the good rolls prompted smiles, and that 23% of the bad rolls prompted smiles. Apparently, what predicted smiling was not the outcome of the roll, but rather sustained eye contact with another player. In light of these findings, the experimenters hypothesized that smiles are not involuntary outpourings of emotion, but rather social signals that serve context-sensitive social functions.

A more recent study (Fridlund 1991) measured contractions of the *zygomatic major* (part of the hypothesized facial expression of joy) in four different scenarios: (A) as a subject watched amusing videotapes alone; (B) as a subject watched amusing videotapes alone after being told that her friend was in the next room completing a survey; (C) as a subject watched amusing videotapes alone after being told that her friend was in the next

room watching the same videotapes; and (D) as a subject watched amusing videotapes in the same room with her friend. The experimenters found that subjects smiled least frequently in A, somewhat more frequently in B, and most frequently in C and D.

Most studies have focused on smiling, but a small number of studies have investigated audience effects in other facial expressions. Chovil (1991) found that subjects grimaced and gasped more frequently when listening to a story about a close-call when face-to-face with the person telling the story than when listening to the same story over a telephone, across a partition, or from an audiotape. Similarly, Fridlund et al. (1992) found that brow muscles contracted more when subjects imagined being sad in a social setting compared to when they imagined being sad in a solitary setting, and that brow and mouth muscles contracted more when subjects imagined being afraid in a social setting compared to when they imagined being afraid in a solitary setting. (However, mouth muscles contracted less when subjects imagined being angry in a social setting compared to when they imagined being angry in a solitary setting). Finally, even dogs produce more facial expressions when an experimenter faces toward them versus away from them in a variety of emotion conditions (Kaminski et al. 2017). These studies appear to show that some facial expressions other than smiles increase in frequency as the subject is placed in increasingly social situations.

As in the case of the attribution agreement, there is a hasty generalization that we must take care to avoid. The claim that *one* facial expression, especially smiling, demonstrates an audience effect does not imply that *all* facial expressions will demonstrate an audience effect. It may well turn out that there are some facial expressions that occur just as frequently, or even more frequently, in solitary than in social settings. Each facial expression ought to be considered on its own merits.

Another bad inference we should beware is the inference that if sociality is more predictive of a facial expression than is an emotion, then this facial expression does not signal or express that emotion. A face could signal the emotion *and* something about the social interaction. Or the face could signal *only* the emotion, despite it correlating more strongly with something about the social interaction. Correlations often serve as evidence of

signaling relations, but much more needs to be said to determine whether and what a face signals.

In light of these qualifications, I take the component study literature to support the conclusion that *some* facial expressions occur more frequently in social than in solitary contexts, even once differences in emotional experience are accounted for. This conclusion is significantly weaker than the conclusion that some researchers draw, namely that *all* facial expressions exhibit this pattern or that *no* facial expression is triggered by an emotion independent of social proximity.

This body of research has also been criticized. One complaint is that Kraut and Johnston failed to distinguish between "enjoyment smiles" and "social smiles," which involve contractions of different muscles (Ekman & Keltner 1997, 41; but see Crivelli et al. 2015 for a response). Another worry is that experimenters cannot guarantee that the subjects' emotions remain constant across experimental conditions. Perhaps people are more likely to perform facial expressions in social settings because they are more likely to experience emotions in those settings, or perhaps their emotions tend to be more intense in those settings (Parkinson 2005, 295; however, see Fridlund et al. 1992). For the purposes of this paper, I will assume that the audience effect is real for at least some spontaneous facial expressions, and that subjects who experience the same corresponding emotions at the same intensities are more likely to perform facial expressions when interacting with others than when alone.

3. The Neurocultural View (NCV)

In light of these findings, psychologists have proposed two general views of facial expression. I'll discuss the first in this section and the second in the next.

The first view is Paul Ekman's "Neurocultural View" (NCV), sometimes called the "Affect Program View" or the "Emotions View." According to NCV, there is a short list of basic emotions that are hardwired in the mammalian brain (Ekman 1972, 1992). The list typically includes joy, fear, anger, sadness, disgust, and surprise. Some have whittled the list down to four, suggesting that surprise and fear are variants of one

underlying emotion, and that anger and disgust are variants of another (Jack, Garrod, & Schyns 2014; see also Pochedly et al. 2012). Others have supplemented the list, adding shame, contempt, embarrassment, and others (e.g. Tomkins 1984; Ekman 1992). One recent paper suggests that the list may include more than twenty emotions, although some items on the list arguably aren't emotions, such as "pain" and "coy" (Keltner et al. 2016, 469). Whatever list we end up with, the basic emotions purportedly share the following characteristics (among others).

First, for each emotion there are purportedly *universal antecedent events*, or types of events that trigger the same emotion across all cultures (Ekman 1994; Boucher 1983). It doesn't matter where you come from, the sight of a charging rhinoceros will trigger fear, the sight of a thief stealing from you will trigger anger, the sight of a rotting, maggot-infested corpse will trigger disgust, and an unexpected loud sound will trigger surprise. Ekman emphasizes that culture plays a significant role in determining the antecedent events of emotions (hence the "cultural" in "Neurocultural"), but he looks for cross-cultural similarities in designating some emotions as "basic."

Second, each emotion purportedly has a unique *neuroanatomical basis.* Jaak Panksepp has identified key brain regions for each of the basic emotions. He claims that fear, for instance, is activated in the central and lateral amygdala, the medial hypothalamus, and the dorsal periaqueductal gray (2006, 24; see also Panksepp & Biven 2012). To support these mappings, he demonstrates that specific neuromodulators, which target specific parts of the brain, can reliably elicit or suppress particular emotional responses. Fear, for instance, can be influenced by glutamate, corticotrophin releasing hormone (CRH), cholecystokinin, and alpha-Melanocyte-stimulating hormone (α-MSH), among other neurochemicals (Panksepp 2006, 24). Some researchers are skeptical of attempts to localize emotions in the brain (e.g. Barrett 2006), but this is a fertile and ever-developing research project.

Third, each emotion purportedly has a unique *facial expression*. Joy often involves the contraction of the *orbicularis oculi (pars orbitalis)* and *zygomatic major* muscles, resulting in the cheeks being raised and the corners of the lips being pulled up and out. Sadness often involves the contraction of the *frontalis (pars medialis), depressor glabellae (depressor*

supercilii), and *depressor anguli oris (triangularis)* muscles, resulting in the inner brows being raised, the outer brows being lowered, and the corners of the lips being pulled down. And so on for the other basic emotions. NCV holds that these facial expressions evolved, at least in part, to signal emotions to observers (Shariff & Tracy 2011). It's advantageous to let others know when one is happy, sad, and angry, and so these facial expressions are designed to broadcast our emotions (Frank 1988). Individuals often attempt to suppress facial expressions when they do not want to share their emotions, but subtle micro-expressions may nonetheless reveal their feelings (Ekman 2007, 214).

Finally, the basic emotions purportedly tend to be what Ekman calls *unbidden occurrences*, or events that occur independently of the will. Upon seeing a charging rhinoceros, the nervous system will react as it was designed to, without requiring any deliberation or planning. We tend to think of emotions as passive, or as things that we suffer rather than as things that we choose. To say that emotions are unbidden is not, however, to say that we have no control over them whatsoever. We can and do manage our emotions in real time (Webb et al. 2012), often in observance of culturally-specific "display rules" (Ekman 2007, 4). If it is socially improper to express fear, for instance, then an individual who becomes frightened may succeed in suppressing the facial expression of fear. But the initial onset of emotion, given an eliciting stimulus, tends to occur regardless of whether we want it to or not.

The most important point for our purposes is the idea that the basic emotions automatically trigger facial expressions, which have been designed by evolution to signal these emotions to others. Although it is possible in some cases to willfully intervene and suppress or modify these expressions, it requires effort to do so, and in many cases the person will fail to successfully hide her emotions (Ekman 1972). Our facial expressions often betray our emotions, even when we don't want them to.

NCV explains the attribution agreement as follows. People everywhere tend to categorize facial expressions in the same way because people everywhere are hardwired with the same basic emotions, and these emotions are expressed with same facial expressions. Fear triggers an immediate and automatic fear expression; anger triggers an immediate and automatic anger expression; and so on for each of the basic emotions.

Facial expression *categorization* is universal, on this view, because facial *expression* is universal.

NCV appears, however, to be inconsistent with the audience effect. NCV holds that emotions automatically trigger facial expressions, and so unless the person suppresses the expression, every instance of an emotion will trigger an instance of a corresponding facial expression (Ekman 1972). Thus, NCV predicts that facial expressions of the basic emotions will occur abundantly in solitary contexts. Yet research on the audience effect shows that this prediction is sometimes false. Some basic emotions trigger facial expressions less frequently in solitary than in social contexts.

4. The Behavioral Ecology View (BEV)

The second general view of facial expression is Alan Fridlund's "Behavioral Ecology View" (BEV). According to BEV, facial expressions are not automatic outpourings of emotions, but rather strategic signals of social intentions. A so-called happy face signals a "readiness to play or affiliate," a so-called sad face signals a "recruitment of succor or request for restitution," and a so-called fear face signals a "readiness to submit" (Fridlund 1994, 129). Granted, these social intentions may correlate with emotions—I'm likely to be afraid when I'm ready to submit, happy when I'm ready to play or affiliate, etc.—but the content or referent of the facial expression is the social intention, not the emotion.

The claim that facial expressions are strategic signals does not imply that these expressions are always voluntary. At times we voluntarily contort our faces in ways that we believe will manipulate others, but more often than not expressions occur independently of the will (they are unbidden, as Ekman would say). In the course of interacting with others we smile, frown, and pout without intending to. These expressions may be automatic, and it often requires deliberate effort to suppress or modify them. BEV holds that these expressions are triggered by emotion-independent social cognitive processes. In the same way that we unconsciously adopt the body language, intonation, and laugh of interlocutors, we unconsciously smile, frown, and pout when engaging with others. The mistake, according

to BEV, is to assume that these facial expressions are triggered by emotions.[5]

At first blush, BEV appears to have an easy time explaining the audience effect. The reason why facial expressions occur more often in social than in solitary contexts, even when the emotions are the same, is that a person is more likely to have social intentions in social than in solitary contexts. Although I can be sad when I'm alone, I'm unlikely to be ready to submit unless there is someone to submit to. That being said, BEV stumbles somewhat in explaining why we sometimes *do* perform facial expressions when we are alone. Granted, I may laugh less at a comedy movie when I'm watching it by myself, but occasionally I do laugh, and it seems unlikely that I have a social intention to play or affiliate, since there is no one to play or affiliate with. Fridlund (1991, 1994) explains solitary facial expressions by claiming that they are implicitly social. I laugh at the movie when I'm alone because I imagine other people present.

BEV also stumbles somewhat in explaining the attribution agreement. If facial expressions don't signal emotions, then we'd expect *less* agreement in matching faces with emotions and *more* agreement in matching faces with social intentions. Yet the experimental data we have do not line up with these predictions. Although one published study reports similar levels of agreement in matching faces with emotions and faces with intentions (Yik & Russell 1999), another reports higher levels of agreement in matching faces with emotions compared to faces with situations (Haidt & Keltner 1999). Studies that challenge the cross-cultural matching of faces to emotions, which advocates of BEV marshal in support of their view, tend to be double-edged swords in that they often show attribution *disagreement* for some faces while showing attribution *agreement* for others (e.g. Gendron et al. 2014). So while advocates of BEV may have good reasons to reject NCV's extrapolations from the judgment study literature, they have arguably not done enough to show that BEV is consistent with the raw data reported in this literature.

[5] Barrett (2006; 2017) and Russell (2009) hold that emotions are *constructed* out of several non-emotional processes, including whatever processes give rise to facial expressions. So their views may allow for facial expressions to be triggered by non-emotional social cognitive processes yet still, in a way, express emotions.

5. The Social Amplification View (SAV)

So far we have two empirical results—the attribution agreement and the audience effect—and two general views of facial expression—the Neurocultural View (NCV) and the Behavioral Ecology View (BEV). Given these results, neither view is entirely satisfactory. In what follows I will suggest a third view, a synthesis of NCV and BEV, which I call the "Social Amplification View" (SAV). To preview the basic idea: SAV posits that emotions are basic adaptive processes that trigger species-typical changes in facial muscle activation, although these muscle activations are not always noticeable under normal viewing conditions. A separate social cognitive mechanism then triggers the *amplification* of these muscle movements in social contexts, making them easier to detect. Let's look again at why NCV comes up short.

NCV holds that emotions reliably trigger facial expressions, but component studies suggest otherwise. People who experience some emotions tend not to perform spontaneous facial expressions when alone as often as NCV predicts, and it's unlikely that these people are actively suppressing these expressions. The audience effect is grist for BEV's mill, since BEV claims that facial expressions are triggered by a social cognitive process, rather than by an emotional process.

In the component studies mentioned, facial expressions are typically operationalized as *visible contractions of the facial muscles*. A smile, for instance, involves visible contractions of the *zygomatic major* and *orbicularis oculi* muscles. Muscles contract to varying degrees, however, and not all muscle contractions are detectable to the naked eye under normal viewing conditions. Furthermore, there can be changes in muscle activity that do not result in contraction. If a person lifts a heavy box with arms extended, then the muscles will tense considerably, yet without actually contracting. Scientists use a technology called electromyography, or EMG, to detect changes in muscle activity that may go unnoticed by normal observers. Basically, the procedure consists in attaching a sensor to the skin covering a muscle, and then a needle registers changes in muscle activity much as a seismograph registers motion in the Earth during an earthquake.

Studies suggest that emotions *do* reliably trigger changes in facial muscle activity, even when these changes do not rise to the level of

noticeable contractions (Fridlund et al. 1984; Dimberg 1990; Levinson, Ekman, & Friesen 1990; Partala et al. 2006; Tan et al. 2012; Tan et al. 2016).[6] Thus, although the person who experiences joy by herself may not smile, an EMG is likely to detect changes in activity in her *zygomatic major* and *orbicularis oculi* muscles. These changes may be so slight, quick, or irregular, however, that they go unnoticed, and thus it may appear to an observer that the emotion has not triggered any facial expression.

At this point I shall stipulate a distinction between a *facial expression* and a *facial reflex*. Both may involve activation of the same muscles, but a facial expression involves the *easily recognizable* contraction of these muscles while a facial reflex involves any changes in muscle activation *triggered by an emotion*, whether recognizable or not.[7] I'll discuss empirical support for the following claim shortly, but let us grant, for the sake of argument, that the basic emotions automatically trigger facial reflexes but not necessarily facial expressions. Anytime a person experiences a basic emotion, whether alone or with others, there will be patterned changes in muscle activity, although this activity will only sometimes rise to the level of noticeable contractions, which onlookers can recognize as a facial expression of emotion.

I propose that we view facial expressions as *amplifiers* of facial reflexes. Oren Hasson (1989; 2000) defines an "amplifier" as a signal that

[6] There is ongoing disagreement, however, as to whether there are patterns of facial muscle activation corresponding to each of the basic emotions hypothesized by NCV, or whether there are only patterns of facial muscle activation corresponding to more basic affective states, such as positive, negative, and neutral states of affective arousal. It's also possible that there are patterns of facial muscle activation corresponding to some, but not all of the basic emotions hypothesized by NCV. Time will tell which (if any) of these hypotheses is right. However, for the purposes of this paper I shall assume that there are patterns of facial muscle activation corresponding to each of the basic emotions hypothesized by NCV.

[7] To be more precise, a facial expression is a patterned contraction of muscles that observers could consistently match with emotion words when viewed in real time. Facial reflexes may not be easily recognizable for several reasons: the muscle activations may be too slight to be noticed, they may be too quick to be noticed, or they may be noticed but, for whatever reason, fail to be consistently categorized as the expression of a particular emotion. As I shall explain shortly, SAV holds that emotions trigger facial reflexes, and that a separate mechanism amplifies these reflexes in social settings so that they may serve as social signals. Facial expressions serve communicative functions; facial reflexes may serve other functions.

increases the perceptibility of an existing cue or signal.[8] Female pipefish attract mates by changing colors, thereby making it easier for males to assess their length (Bogaardt & Johnstone 2016). Length carries information about reproductive quality, and the color change amplifies (i.e., makes it easier to detect) the pipefish's length. Analogously, facial reflexes are automatically triggered by emotions, and so carry information about emotions. However, facial reflexes can be difficult to detect, and so facial expressions amplify these reflexes, making them more readily recognizable.[9] Slight muscle contractions may pass unnoticed, but pronounced, prototypical muscle contractions are hard to miss.

Facial expressions make it easier to detect facial reflexes, and hence emotions. Amplification does not, however, exhaust a facial expression's signaling value. Facial expressions serve a variety of rich, context-dependent social functions, beyond merely broadcasting an emotional state. They convey pertinent information about the environment ("this food is spoiled"), they instruct other on how to behave ("don't eat this food!"), they predict the signaler's subsequent behavior ("I am about to vomit"), and much, much more (Scarantino 2017). My claim that facial expressions amplify facial reflexes is consistent with the claim that facial expressions communicate a great deal more than what facial reflexes communicate. Regardless of whatever else a facial expression signals, SAV posits that it also amplifies a facial reflex and hence also broadcasts an emotion.

Given the signaling value of many facial expressions, the possibility of performing these expressions dishonestly—that is, in the absence of the emotion purportedly expressed—comes into play. Even assuming that joy reliably triggers activation in the *zygomatic major* and *orbicularis oculi* muscles, these muscles can be activated in the absence of joy, for instance when a person voluntarily performs a dishonest expression of joy for the sake of deception.[10] Furthermore, subjects can suppress facial expressions,

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[8] I shall remain neutral on the question of whether amplifiers are distinct from what Maynard Smith & Harper (2004) term "indices"; see Stenseth & Saetre (2004) and Harper (2006).

[9] Panksepp (2006) provides an account of the neuroanatomical basis of what I'm calling "facial reflexes" (see §3). I have not provided an account of the neuroanatomical basis of the mechanism that amplifies facial reflexes. SAV would, ultimately, require such an account.

[10] Ekman & Friesen (1982) hypothesized that the so-called Duchenne smile is a reliable indicator of joy insofar as the *orbicularis oculi* muscles cannot be contracted at will.

especially when the expression violates a social norm (Ekman 2007, 4), leaving the false impression that a subject is not experiencing a particular emotion. Many facial expressions can be faked, then, but they are faked at a cost (Sterelny 2012, 111-112). Research shows that it is mentally taxing to feign emotions in the face, and that too much feigning can even lead to psychological burnout (Jeung et al. 2018). The following is speculative at this point, but I propose that the emotional process that triggers facial reflexes may additionally impede the activation of other facial muscles. Thus, it is at least plausible that, when experiencing joy for instance, it may be more difficult to voluntarily contract facial muscles other than the *zygomatic major* and *orbicularis oculi*. Thus, emotions may alter the costs of performing different emotional expressions. Emotions make it easier to perform honest expressions and (possibly) harder to perform dishonest expressions. This is a mechanism that would increase the reliability of facial expressions.

So far I've proposed that emotions trigger facial reflexes rather than facial expressions, and that we may view many facial expressions as amplifications of facial reflexes. The question remains: what triggers the amplification? Here, I think we can accept BEV's answer. The amplification of a facial reflex is triggered by an emotion-independent social cognitive process. This process needn't be voluntary or self-conscious. Just as we involuntarily mirror the body language and accents of interlocutors, without realizing it, so too may we involuntarily amplify the subtle changes to facial muscle activation that occur amidst emotional arousal when in the presence of onlookers, without realizing it. The visible contraction of the *zygomatic major* and *orbicularis oculi* muscles may feel like an automatic outpouring of joy, but it may in fact be prompted by a friendly face in the visual field.

We could call SAV a "Two-Factor Theory of Facial Expression," recalling Schachter and Singer's (1962) "Two-Factor Theory of Emotion." Schachter and Singer hold that emotions result from the interplay of two processes: physiological arousal followed by the cognitive labeling of that

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However, recent studies suggest that many people can contract these muscles at will (Gunnery et al. 2012), and thus that the facial expression of joy can be faked. I am working on the assumption that most facial expressions can be faked, but SAV in no way hangs on this assumption. SAV is consistent with the hypothesis that many facial expressions cannot be faked.

arousal. SAV, by contrast, holds that spontaneous facial expressions of emotion result from the interplay of two processes: an emotional process that produces a facial reflex followed a social cognitive process that amplifies this reflex.

Evolutionary considerations support the idea that two processes, not one, are involved in the production of spontaneous facial expressions. Darwin (1872/2009) hypothesized that facial expressions first occurred for reasons unrelated to communication (Burkhardt 1985, 360). Heinroth (1911) and Huxley (1914) hypothesized that behaviors become social signals through a process of "ritualization," in which they become more pronounced and stereotypical in appearance. The idea that emotional expressions first evolved for reasons unrelated to communication, and later became "ritualized" to function as social signals, has been taken up and developed by some contemporary psychologists (most notably Shariff & Tracy 2011, 396). SAV refines this proposal by positing that facial *reflexes* first evolved for reasons unrelated to communication, and that these reflexes are amplified in facial *expressions* so that they may function effectively as social signals. Separate selection pressures shaped each of the two mechanisms involved.

SAV allows us to synthesize NCV and BEV in a way that is consistent with the attribution agreement and the audience effect. SAV predicts the attribution agreement because it hypothesizes that the same emotions activate the same facial muscles in neuro-typical humans. SAV predicts the audience effect because it hypothesizes that these facial muscle contractions are often too slight, quick, or irregular to be detected in solitary contexts, yet become amplified in social interactions. I call SAV a "synthesis" of NCV and BEV because it accepts core claims of each. It accepts NCV's claim that emotions are basic adaptive processes hardwired in the mammalian brain that trigger facial responses (facial reflexes, not facial expressions). It also accepts BEV's claim that emotions are often not sufficient to trigger facial expressions, and that a social cognitive process is required. Finally, it accepts BEV's claim that facial expressions serve rich and varied social functions, beyond merely broadcasting an emotion. I will now consider empirical support for SAV.

In §2 I mentioned a study by Fridlund (1991), in which he measured contractions of the *zygomatic major* (part of the hypothesized facial

expression of joy) in four different scenarios, using EMG: (A) as a subject watched amusing videotapes alone; (B) as a subject watched amusing videotapes alone after being told that her friend was in the next room completing a survey; (C) as a subject watched amusing videotapes alone after being told that her friend was in the next room watching the same videotapes; and (D) as a subject watched amusing videotapes in the same room with her friend. Fridlund found that subjects smiled least frequently in A, somewhat more frequently in B, and most frequently in C and D. Although Fridlund offers this study as evidence favoring BEV over NCV, I believe that it also favors SAV over BEV. The reason is that although contractions of the *zygomatic major* were weakest in A (the most solitary context), they were still greater than zero. In other words, the emotion apparently *did* result in a change to muscle tension, although it resulted in less of a change compared to when the emotion occurred in a social context. BEV predicts no change, NCV predicts a drastic change, and SAV predicts a subtle change. The results match SAV's prediction.

Another study, reported by Hess et al. (1995), compared changes in facial activity given changes in emotional intensity and sociality. This study found that the intensity of the facial contraction was predicted neither by the intensity of the emotional experience nor by sociality alone, but by the combination of the two. To simplify the results somewhat, the experimenters found that the facial contraction was greatest when the emotional experience was intense and occurred in a social context. NCV holds that the intensity of emotional experience will predict the degree of muscle contraction, BEV holds that the level of sociality will predict the degree of muscle contraction, and SAV holds that the combination of both will predict the degree of muscle contraction. The results of the experiment match SAV's prediction.

Another, albeit indirect, piece of evidence can be found in the study of animal signals. In their summary of the research on expressive animal vocalizations across many species, Marler and Evans (1997, 147) conclude that sociality predicts a *modulation* of some expressive sounds, but not their *occurrence*.[11] More specifically, the presence of an audience increases the

[11] To be clear, animal signals are incredibly varied, serving a wide range of social functions. Sociality *does* predict the occurrence of many animal signals. The research discussed here focused on a narrow range of signals that seem to be primarily expressive.

volume of these vocalizations, yet these vocalizations often occur in a quieter form in the absence of an audience. Marler and Evans (1997, 147) present this consideration as evidence supporting NCV over BEV, yet for the reasons I mentioned in §3, it also supports SAV over NCV.

SAV hypothesizes that emotions trigger facial reflexes and that a separate social cognitive process triggers the amplification of these reflexes, transforming them into facial expressions. Given the experience of an emotion, an EMG should detect patterned changes in facial muscle activation across both solitary and social contexts, although the contractions ought to be greater in the social contexts, assuming that the subject does not attempt suppress the expression. For many emotions, this prediction has borne out (Fridlund et al. 1984; Dimberg 1990; Levinson, Ekman, & Friesen 1990; Partala et al. 2006; Tan et al. 2012; Tan et al. 2016). But for others, it hasn't. In their study of facial expressions of surprise, Reisenzein, Bördgen, & Holtbernd (2006, 310) found that while the solitary experience of surprise sometimes results in facial muscle activations that do not rise to the level of visible contractions—a finding that is consistent with SAV (but not NCV or BEV)—it at other times results in *decreases* in facial muscle activity—a finding that is inconsistent with SAV (and inconsistent NCV, but consistent with BEV). The authors of this study suggest that it is neither the onset of surprise nor the presence of an audience that elicits a facial display of surprise. Rather, it is the need for visual orienting. When subjects knew what caused their surprise, they tended not to raise their brows or widen their eyes, even when they reported feelings of surprise and were aware that they were being watched. My takeaway is that the facial display of surprise may not be an amplification of a facial reflex of surprise. In fact, this display may not really be an "expression" of surprise so much as a useful navigational movement that frequently follows on the heels of surprise. If that's right, then the so-called facial expression of surprise is unlike the facial expressions of other emotions, and so falls outside the scope of SAV. Nevertheless, my contention is that SAV offers a better explanation of most facial expressions than does NCV or BEV. I would consider SAV refuted if it is possible to give alternative accounts of the

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The authors argue that these signals become louder in the presence of an audience, but still occur in quieter form when the animal is alone.

remaining facial expressions of emotion, along the lines of what has been considered in the case of surprise.

6. Other Proposals

I've argued so far that the empirical evidence considered in this paper fits my Social Amplification View (SAV) better than the Neurocultural View (NCV) or the Behavioral Ecology View (BEV). In this final section I will argue that SAV outperforms three previously proposed syntheses of NCV and BEV. To be fair, none of these proposals was developed with the specific goal of predicting both the attribution agreement and the audience effect in mind, and because I am judging these proposals based entirely on how well they predict these two effects, they are at a disadvantage. But the burden is on me to demonstrate that SAV fills a gap filled by no other view of facial expression, so that is what I aim to accomplish in this section.

Mitchell Green (2007, 133-136) proposes a synthesis of NCV and BEV that he calls the *Strategic Readout View* (SRV). SRV accepts NCV's claims (1) that emotions normally trigger facial expressions and (2) that facial expressions signal emotions. SRV also accepts BEV's claims (3) that certain social contexts can also trigger facial expressions and (4) that facial expressions signal social intentions. Whereas advocates of NCV and BEV have historically considered claims 2 and 4 to be in direct tension with one another, Green reconciles them by claiming that "social configurations that display emotion can signal future action precisely because what they display are, inter alia, tendencies to future behavior" (2007, 134). In other words, Green defines emotions partly as tendencies to perform certain actions, and thus he maintains that facial expressions can signal social intentions *by* signaling emotions in social contexts. Like SAV, SRV inherits the strengths of NCV and BEV. Unlike SAV, however, SRV inherits one of NCV's weaknesses. Because SRV accepts NCV's claim that emotions trigger facial expressions independently of sociality, it predicts that facial expressions will occur more frequently in solitary contexts than they in fact do, a prediction that is confounded by the audience effect. SAV outperforms SRV by accepting a modified version of NCV's claim,

according to which emotions trigger facial *reflexes*, but not necessarily facial *expressions*.

Andrea Scarantino (2017) proposes a similar synthesis of NCV and BEV as part of his *Theory of Affective Pragmatics* (TAP). According to TAP, facial expressions do not just communicate one thing, they communicate several things all at once: "we engage in a variety of communicative moves when we produce emotional expressions" (2017, 183):

> For example, an expression of disgust like "Eee!" at finding a black worm in one's oyster is a signal with the "referential function" of representing "an unappealing matter," the "expressive function" of manifesting disgust, and the "appeal function" of demanding that others "closely scrutinize what is on their own plates." (2017, 171, citing Scherer 1988, 83)

Like SRV, TAP attempts to synthesize NCV and BEV by claiming that facial expressions can simultaneous signal emotions *and* social intentions. However, TAP is in the same boat as SRV insofar it posits that these multi-message facial expressions are triggered by the onset of emotion. As such, TAP fails to predict the audience effect. SAV outperforms TAP by positing that multi-message facial expressions are triggered by the interplay of two processes: one emotional, the other social cognitive.

Finally, Paul Griffiths and Andrea Scarantino (2009) propose a synthesis that I'll call the *Social Transactional View* (STV). STV hypothesizes that emotions trigger facial expressions, but only once certain preconditions are met. They write that "emotions are designed to function in a *social context*: an emotion is often an act of relationship reconfiguration brought about by delivering a social signal" (2009, 437). Because some emotions are designed to function in social contexts, they may malfunction in solitary contexts, namely by not triggering the normal facial expression. STV thus predicts the audience effect, and indeed Griffiths and Scarantino cite the literature on the audience effect that I discussed in §2 as support for STV (2009, 438-440). However, Griffiths and Scarantino say almost nothing about the mechanisms that actually give rise to facial expressions. All they say is that "The sensitivity to social context manifested in audience

effects can be implemented by very simple mental mechanisms, as is evident from the prevalence of audience effects in animals" (2009, 439). SAV outperforms STV in two ways. First, SAV specifies in more detail the mechanisms that give rise to the audience effect. Second, SAV can remain neutral in the debate between traditional and situated perspectives on emotion. Griffiths and Scarantino pitch STV as a situationist alternative to traditional, individualist approaches to emotion (2009, 438), but SAV is consistent with both approaches. SAV achieves this independence by tracing the audience effect not to part of the emotional process that gives rise to facial expressions, as STV does, but to an emotion-independent social cognitive process. As such, SAV can be paired with many different views of emotion, whereas STV is wedded to a specific and controversial view of emotion.

In conclusion, SAV has much speaking in its favor. It outperforms NCV, BEV, SRV, and TAP when it comes to predicting both the attribution agreement and the audience effect, which are perhaps the two most important results from decades of empirical research into spontaneous facial expressions. Furthermore, SAV outperforms STV by hypothesizing more specific mechanisms that are consistent with more views of emotion. For these reasons, SAV is the best view currently on offer. I'm not a gambler, but if I were, my money would be on SAV.

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