Emotional vigilance

Guillaume Dezecache[a] & Hugo Mercier[b]

[a]Université Clermont Auvergne, CNRS, LAPSCO, F-63000 Clermont-Ferrand, France,

guillaume.dezecache@gmail.com

[b] Institut Jean Nicod, Département d'études cognitives, ENS, EHESS, PSL University, CNRS,

hugo.mercier@gmail.com

Abstract

Although emotional displays have long been considered as mere read-outs of the affective state of agents, recent studies and modern evolutionary thinking instead suggest that they should be characterized as proper communicative signals. This implies that emotional displays have evolved to be used strategically, to serve the senders' interests. However, for these signals to be stable, they must also benefit receivers. What guarantees that emotional signals are beneficial for both emitters and observers? In this chapter, we review evidence showing that humans are equipped with mechanisms that evolved to evaluate emotional displays and their sources, so as to minimize the risk of being fooled. We called these mechanisms 'emotional vigilance,' following the 'epistemic vigilance' mechanisms used in ostensive communication. Emotional vigilance, we argue, is part of the human cognitive make-up, and we outline empirical avenues to best elucidate its features.

Keywords.

Emotional displays; signaling; emotional vigilance; communication; epistemic vigilance.

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Introduction

Far from being incidental to human communication, emotional displays (which can be tentatively defined as bodily movements that seem to be associated with our momentary affective states) are ubiquitous in human affairs. The production of emotional displays radically alters the meaning of verbal utterances in conversation. For example, specific facial configurations may convey irony (Attardo et al., 2003), uncertainty (Bitti et al., 2014), or boredom (Bevilacqua et al., 2018). They can also be used to indicate commitment (Reed et al., 2014; Reed & DeScioli, 2017). Emotional displays may also, on their own, express joy, anger or fear (among others) (Ekman, 1999). In fact, the absence of emotional displays may be detrimental to the success of many social activities, as suggested by the social disruption suffered by people experiencing impairment in the use of body musculature, as in facial paralysis (Bogart et al., 2012; Bogart & Matsumoto, 2010). The invention and use of emoticons is another sign of the centrality of emotional displays in human communication (Cherbonnier & Michinov, 2021).

Because of their tight link with affective experience (they appear to co-occur with affective experience, hence their name), so-called emotional displays are assumed to be causally linked to corresponding affective states. It has been proposed that the production of, for instance, fear displays necessarily accompanies the experience of fear. As such, emotional displays are considered read-outs of emotional experience (Ekman, 1999, 2007). This view entails that people cannot easily fake emotional displays (e.g., making a full-blown and likely authentic so-called fear display in the complete absence of the affective experience of fear); this also entails that people cannot completely inhibit emotional displays when experiencing a given affect. The

major assumption that there exists a tight, causal link between emotional displays and affective experience pervades the scientific literature on emotions (Ekman, 2007).

A second traditional assumption in the emotion literature is that the perception of emotional displays automatically leads to a corresponding and similar affective experience in perceivers. This corresponds to the phenomenon of 'emotional contagion,' or the automatic and unconscious mimicry of muscular configuration momentarily observed in others, which in turn leads to convergence in emotional experience in observers via afferent muscular feedback (Hatfield et al., 1992, 1993, 2014).

We believe that these two traditional assumptions are not tenable anymore. After a brief introduction to the many types of emotional displays, we review existing criticism of these assumptions, before proposing an alternative paradigm, grounded in the theory of the evolution of communication.

The many facets of emotional displays

Emotional displays can take a great variety of forms in humans. For obvious reasons of visual accessibility in close-range social interactions, the facial musculature has received a great deal of attention in the literature (Ekman, 2007). Much academic research has been dedicated to the identification of discrete facial configurations linked with the experience of specific affects, with highly-debated findings of associations between basic sets of configurations of facial muscular activity and affective experience (Barrett, 2006; Barrett et al., 2019; Crivelli & Fridlund, 2018, 2019; Ekman, 2007; Fridlund, 2014; Jack et al., 2014; Jack & Schyns, 2015).

Besides the facial musculature itself, the voice and its quality (such as prosodic alterations of speech) also are recognized as a major source of emotional displays in humans

(Sauter, Eisner, Ekman, et al., 2010). As in the case of facial configurations, there have been debates on whether there are vocal displays specific to particular affective experiences (Anderson et al., 2018; Sauter, Eisner, Calder, et al., 2010; Sauter, Eisner, Ekman, et al., 2010; Simon-Thomas et al., 2009).

Work by De Gelder, Grèzes and colleagues also suggests that bodily postures can play an important role in emotional perception (De Gelder, 2006; De Gelder et al., 2015; Grèzes et al., 2007, 2007; Pichon et al., 2008), with discussions about potential associations between particular bodily muscular configurations (here: the face being excluded) and the experience of certain affects (Atkinson et al., 2004; Veld et al., 2014; Watson & de Gelder, 2020).

Because it has been the focus of most research, and because of its centrality in close-range social interactions, facial displays of emotion will remain the major focus in this chapter, although we believe our conclusions would hold for all emotional displays.

Emotional displays or emotional signals?

As mentioned earlier, one assumption regarding emotional displays is that they are reliable read-outs of the displayers' internal states. In fact, and according to the Basic Emotions Theory (Ekman, 1999, 2007; Keltner et al., 2019), facial displays (or at least, a subset of them) would have been evolutionarily preserved thanks to their status as reliable indicators of the affective state of the agent displaying them. As such, there would be a correspondence between internal affective states and specific muscular configurations (a set of 'facial affect programs'), the former causing the latter in an automatic fashion. This theory makes the following two predictions: (a) There is uniformity in production, and universality in recognition, revealing a

one-to-one mapping between basic affective experience and basic emotional facial displays in all cultures; (b) People cannot fake facial emotional displays.

Regarding (a), pioneering cross-cultural work with populations of the United States, Brazil, Japan, New Guinea, and Borneo showed that populations across sites are capable (above-chance level) of matching some facial displays with corresponding affective states, strongly suggesting that facial displays of emotion are universally recognized, and likely universally produced (Ekman, 1973; Ekman et al., 1969).

Regarding (b), it was found that one particular variant of smiling behavior (the so-called 'Duchenne' smile, Ekman et al., 1990; Gunnery et al., 2013; Gunnery & Ruben, 2016) could only be produced under the genuine experience of joy and recognized as genuine. This variant would contrast with the polite smile, associated with non-genuine happiness. Furthermore, it has been argued that, in general, we experience difficulties producing facial displays at will.

More recent research has cast doubt on these two claims:

With respect to (a), a number of methodological problems have been identified that threaten the claim that emotional facial displays are universally produced and recognized (Gendron et al., 2018; Jack et al., 2009; Nelson & Russell, 2013; Russell, 1994). For example, Crivelli and colleagues (Crivelli et al., 2016) showed that gasping facial displays (recognized as 'fear' in the Western world) were identified as expressing anger and threatening intent by the Trobrianders of Papua New Guinea. This study (and many others, see Gendron et al., 2018, for a recent review) suggest that facial displays do not possess a distinct meaning in all cultures.

With respect to (b), Gosselin and colleagues (2010) examined the capacity of adults to control volitionally 20 facial action units linked with so-called basic emotions. Most action units (18/20) could be activated voluntarily (Gosselin et al., 2010). This suggests that, in principle, the

bulk of facial configurations can actually be produced at will, and that humans could potentially 'fake' them.

In fact, in natural situations, facial emotional displays (even those hard to voluntarily produce) are only loosely related to emotional experience. It is for instance known that smiles (including Duchenne smiles) are loosely related to one's internal state (e.g., success at a bowling alley: Kraut & Johnston, 1979; success at a judo competition: Crivelli et al., 2015). Discrepancies between the actual use of facial emotional displays and the theory of basic emotions led to the birth of the so-called 'Behavioral Ecology View' of facial displays (Crivelli & Fridlund, 2018, 2019; Fridlund, 2014). This view argues that facial displays (including so-called facial emotional displays) are tools for social influence rather than read-outs of one's internal states. In fact (and we will explain below in greater detail), Fridlund noted that evolution cannot select for behaviors that are detrimental to their bearers (Fridlund, 2014). For example, the automatic expression of, say, fear in situations requiring a neutral look would be selected against. Facial display works in the best interests of the displayer rather than in the interests of their inner uncontrollable states: there should be context-dependent inhibition of facial displays, to meet the best interests of signalers (Al-Shawaf et al., 2015; Al-Shawaf & Lewis, 2017).

The Behavioral Ecology View of facial displays has contributed to a renewed theory of the proximate mechanisms at the basis of facial emotional displays. First, facial displays do not 'express' anything. They are signals of one's behavioral intention. Our facial displays are not about people, or what is inside them; rather, they are about what one is about to do, or how one is trying to influence others. In other words, facial emotional displays serve as tools to impact and influence others, behaviors that are produced to make others do what one wants them to do (Crivelli & Fridlund, 2018; Krebs & Dawkins, 1984).

Emotional contagion or emotional communication?

As outlined above, another common conception in the emotion literature is that the perception of emotional facial displays causes mimicry and convergence in the emotional states of observers (Hatfield et al., 1993). This is in line with the classical framework of 'primitive emotional contagion' (Hatfield et al., 1992). This framework states that the perception of muscular movements in others cause automatic mimicry in ourselves, which in turn momentarily affects our own affective state through muscular feedback. In their very influential book dedicated to emotional contagion, Hatfield, Rapson and Cacioppo (1994) provide evidence for the existence of the two steps mentioned above: first, that we tend to converge in musculature with others, notably their facial movements, through a process called 'facial mimicry' (Dimberg et al., 2000; Hatfield et al., 1994); second, that the adoption of a given facial configuration tends to make agents converge in their emotional states—a smile makes them happy, as the sender was (Larsen et al., 1992; Soussignan, 2002; Strack et al., 1988).

Although popular, this framework suffers from a number of limitations. Mechanistically, there is no evidence of a causal link between the two steps, and the seminal protocol used to demonstrate the facial feedback hypothesis (adopting part of the facial configuration of a smile using a pen in the mouth positively affect funniness rating of cartoons) has not been successfully replicated (Wagenmakers et al., 2016). Another serious problem for this theory is that facial mimicry is in fact far from being an automatic process: as we will see below, studies have shown that facial mimicry is heavily influenced by contextual features, such as one's attitudes towards the emitter. Besides mimicry, we do not automatically and spontaneously share the emotions we see others exhibit. For example, Zillman and Cantor (1977) studied affective responses to

emotions seen in an actor. The actor was malevolent, benevolent, or neutral, and they expressed either euphoria or dysphoria at the end of the video clips. Emotional contagion (convergence of affect between the actor and viewer) only occurred when the actor was either benevolent or neutral. When the actor was malevolent, there was a discordance in emotions between actor and viewer.

Another relevant study found that competition (that is, a conflict in the interests of the agents involved) causes 'counter-contagion' in participants (Lanzetta & Englis, 1989). As such, our attitudes to others shape the way we respond to their emotional displays.

The idea that emotions are contagious is popular but incorrect. Conceptually, the process of contagion by pathogens does not apply to emotional convergence between agents, and the mechanisms behind the two are vastly different (Dezecache et al., 2015, 2016; Warren & Power, 2015). In fact, 'emotional contagion' may be best conceptualized as instances of accidental match between the emotions of two or more persons. No emotion is 'transferred' from one individual to another individual. Instead, we react to others' emotional signals, in a way which may or may not be somewhat congruent (and which will never be perfectly congruent) with them (Dezecache et al., 2015, 2016).

An evolutionary approach to communication

From an evolutionary perspective, the two traditional assumptions that emotions are a read-out of affective states, and that they provoke mandatory reactions in observers, are not tenable. Rejecting these assumptions paints a picture of emotional displays that is much better aligned with the theory of the evolution of communication, for the following reasons (Maynard Smith & Harper, 2004). For emotional displays to be a stable form of communication, they

should, on average, benefit both displayers and observers (Scott-Phillips, 2008; Maynard Smith & Harper, 2004, for the case of emotional displays, see Dezecache et al., 2013). Against the first traditional assumption, emotional displays cannot be mere read-outs of emotional experience. If they were, they would often betray affective states that the displayer would be better off hiding (Fridlund, 2014). They would thus often be detrimental to their displayer, and selected against. Eventually, displayers would stop displaying.

Against the second traditional assumption, emotional displays cannot mandatorily cause emotional convergence (or, indeed, any emotional reaction) in observers. If they did, they would often cause reactions that are not in the interest of the observers, leading them to stop attending to emotional displays, making such displays useless (Dezecache et al., 2013). Evolutionarily, there should exist context-dependence in the way we produce facial displays, so as to make sure they serve our best interests, on average (Al-Shawaf et al., 2015).

A radical shift in our thinking about emotional displays, inspired by modern evolutionary treatment of communicative systems, means we should revise our understanding of what emotional displays are, what their perception causes in observers, and what keeps the production and reception of emotional displays evolutionarily stable. This endeavor has been pursued by ourselves (Dezecache et al., 2013; Mercier et al., 2017) and others (e.g., (Al-Shawaf et al., 2015; Al-Shawaf & Lewis, 2017)). In this chapter, we focus on the latter point: how an evolutionary perspective can cast a new light on the reception of emotional displays. We will argue that mechanisms of *emotional vigilance* determine how emotional displays influence us. Before delving into these mechanisms, we introduce the analogous concept of *epistemic vigilance*, which will illustrate the functioning of these mechanisms.

Epistemic vigilance

The general logic of the evolution of communication doesn't apply only to emotional displays: for any form of communication to be evolutionarily stable, it has to benefit, on average, both senders and receivers. Unless their interests are almost perfectly aligned (e.g. cells in a body), senders often have incentives to send signals that would be beneficial to them but harmful to the receivers, turning the signals into manipulation and deception. For communication to persist, there must be mechanisms that stop senders from abusing receivers (again, on average). Some signals might be produced in such a way that only individuals with certain traits can emit them (indices). For instance, Thomson's gazelles stot when they see some predators, jumping in place in a way that doesn't help them escape at all. This behavior is thought to display the gazelle's physical fitness, such that only very fit gazelles can stot convincingly, sending an honest signal to the predator that chasing them would be futile (Al-Shawaf & Lewis, 2018; Caro, 1986).

Clearly, human ostensive communication is not an index of anything (with rare exceptions such as saying "I am not a mute"). Instead, it has been argued that human ostensive communication remains stable thanks to cognitive mechanisms of epistemic vigilance (Mercier, 2020; Sperber et al., 2010). These mechanisms allow receivers to reject most harmful messages, while accepting beneficial messages. They do so by putting different weights on messages as a function of a variety of cues related to the content of the message (Is it plausible? Is it supported by good arguments?) and to its source (Are they competent? Do they have our interests at heart?).

There is a wealth of data showing that mechanisms of epistemic vigilance function efficiently, and that they start developing very early in childhood (some can be observed in

infants) (for reviews, see Harris et al., 2018; Mercier, 2020). This evidence comes not only from laboratory experiments, but also from studies on the limited persuasive power of advertising, propaganda, political campaigns, and other mass persuasion attempts (Mercier, 2020).

In the rest of the chapter, we outline the evolutionary logic justifying the need for mechanisms of emotional vigilance, before reviewing laboratory and observational evidence that demonstrate its workings.

Why we need emotional vigilance

Epistemic vigilance is important because ostensive communication appears to be 'cheap talk': with a few exceptions, there is nothing intrinsic in an ostensive signal (e.g. saying "I love you") that guarantees its veracity. It has been argued, however, that emotional displays do not suffer from the same potential weakness, and that this is precisely what makes them such a useful communicative device (Frank, 1988). This argument rests on the first traditional assumption, that emotional displays are honest read-outs of affective states (i.e. only someone who is genuinely angry could convincingly display anger). As we have seen, however, this traditional assumption has been largely debunked (Al-Shawaf et al., 2015; Crivelli et al., 2016; Crivelli & Fridlund, 2018). Emotional signals are not indices. Evolution cannot make an unfit gazelle stot convincingly, but nothing stops evolution from making individuals send emotional displays decoupled from their underlying affective states—or from affecting the underlying affective states themselves, so that they are felt when displaying the emotion would be strategically useful. As it stands, emotional displays are routinely used manipulatively and exploitatively (Al-Shawaf et al., 2015).

Since emotional signals are not intrinsically honest, there must exist some other mechanism that keeps them (mostly) honest. By analogy with epistemic vigilance, we suggest that mechanisms of emotional vigilance serve this function (for a related proposal on empathy more specifically, see Weisz & Cikara, 2021).

Emotional vigilance

Emotional displays are signals, that is, means that others use to influence us. A display of fear encourages us to prepare for swift defensive actions. A display of happiness encourages us to approach, and to preserve the positive interaction. Unlike in spoken communication, our reaction to the emotional displays we perceive may come so fast (a few hundreds of milliseconds) that one may be tempted to say they are 'automatic' or at least outside of our control. In fact, they may just not be under our *conscious* control. This does not mean that we lack evolved structures that could control our reactions, or at least adjust them so that, on average, they serve our best interests. Like epistemic vigilance mechanisms (see, e.g. Mercier, 2020), emotional vigilance mechanisms may help put different weights on emotional signals as a function of different contextual cues, in particular the benevolence of the emitters (i.e., whether their fitness interests are aligned with ours) and their competence (i.e., whether their displays are appropriate given background information).

Assessment of benevolence

There is much evidence showing that we react to others' emotional displays based on whether we perceive their interests to be aligned with ours (benevolence). As discussed above, Zillman and Cantor (1977) as well as Lanzetta and Englis (1989) have shown that emotional

convergence with the emotions seen in others is modulated by whether the others were observed acting in malevolent, benevolent, or neutral ways, as well as whether the observers have a competitive or cooperative relationship with the actors. More recently, Likowski and colleagues (2008) have examined the impact of attitudes towards emitters on the facial responses of observers. They found that emitters perceived positively were mimicked more than those perceived negatively when they displayed either happy or sad faces. Using group membership (which provides a crude but important cue of alignment of interests), van der Schalk and colleagues (2011) examined the mimicry of fear and anger seen in emitters. They found that mimicry was higher when exposed to ingroup as opposed to outgroup emitters. When members of the outgoup exhibited anger, this evoked fear in participants, and whereas outgroup displays of fear evoked aversion in participants. Relatedly, Paulus and Wentura (2015) found that reactions to displays of fear and happiness were a function of the group of the emitter, with ingroup emitters eliciting 'concordant' behavior (avoidance for fear and approach for happiness) and outgroup emitters activating the reverse pattern. Rauchbauer and colleagues (2016) found that anger was mimicked more when displayed by angry outgroup members as compared to angry ingroup members—showing that, ironically, a reaction closer to mimicry is elicited by outgroups than by ingroups, but only when it is appropriate. Finally, Paulus and colleagues (2016) used a reverse-correlation technique to study the representation of smiles of ingroup vs. outgroup individuals, demonstrating that ingroup smiles are represented with more benevolence than those of outgroups.

Further evidence comes from more explicit situations of misaligned interests, such as those created in Lanzetta and Englis (1989). Participants in the study of Likowski and colleagues (2011) played dice with an avatar with whom they were either engaged in a cooperative,

competitive or neutral interaction. Upon receiving the results of the dice game, avatars produced happy, sad, angry, or neutral displays. In competitive situations, participants reacted with less congruence to happy, sad, and angry avatars (see Seibt et al., 2015; Weyers et al., 2009, for further evidence).

Much of the research covered above is related to the phenomenon of so-called facial mimicry, that is the adoption of a muscular configuration that bears correspondence (or at least similarity) to the facial muscular configuration seen in others. Less has been done with respect to affective responses to others' *bodily* configuration as function of their perceived benevolence and overlap in fitness interests (or lack thereof). Future research looking at mechanisms of emotional vigilance could profitably attend to this gap.

Assessment of competence

Besides the benevolence of the emitter (i.e., overlap in fitness interests between emitter and receiver), emotional vigilance is also attuned to their competence, that is, whether their emotional displays appear apt, given the context in which they are expressed. For example, in a very recent study, Kastendieck and colleagues (2021) revealed a top-down influence of judgment of appropriateness on our responses to perceived facial displays, such that smiles in an inappropriate context (funerals) were only mimicked when there was closeness between observers and emitters.

Modulation of reactions according to perceived competence seems to develop early in ontogeny. In a 2012 study, Hepach and colleagues (2012) showed that, when provided with contextual information, 3-year-olds reacted to the distress seen in adults as a function of how warranted the distress was, showing more concern when the distress was justified as opposed to

when it was a clear overreaction. Chiarella and Poulin-Dubois (2013) examined 15- and 18-month old infants' reactions to actors experiencing a positive or a negative emotion, after a justified or an unjustified event. When exposed to unjustified emotional displays, eighteen-month old infants looked for more information, presumably in an attempt to make sense of the situation. They also showed less concern for the emitters when the sad displays were unjustified. These results are consistent with a later study by Walle and Campos (2014) that examined 16- and 19-month old infants' sensitivity to inauthentic emotions, i.e., emotion displays that were exaggerated, inappropriate or unclear. Nineteen-month-old infants reacted in ways suggesting they were able to identify the non-authentic displays.

Beyond dyadic emotional communication: the role and impact of emotional vigilance

So far, we have relied on laboratory experiments to show that reactions to emotional displays are modulated in sensible ways by the perceived benevolence and competence of the emitter of the displays, taking these results as evidence that humans possess well-functioning mechanisms of emotional vigilance. However, this conclusion might seem to be belied by real-world phenomena, from panicking crowds to 'mass psychogenic illness,' when a strong emotion appears to spread uncontrollably in a population. In fact, we briefly argue here that accurate descriptions of both phenomena make them fit well with the current framework (see Mercier, 2020).

Regarding crowds, it is now well-established that the naïve view of crowds as being uniform, prone to irrational behavior, and easily influenced by leaders, is misguided. Crowds are heterogeneous: they are comprised of individuals having different goals and behaving in different ways—they do not blindly imitate the emotions or the behaviors of other crowd

members or of leaders (Schweingruber & Wohlstein, 2005). If crowd members influence each other, it is within small groups of people who know each other, who have joined the crowd together, and who thus likely meet the benevolence and competence conditions that characterize emotional vigilance (Aveni, 1977; Drury, 2018; Drury et al., 2020; Johnson et al., 1994; McPhail & Wohlstein, 1983; Stott et al., 2018; Templeton et al., 2018). Instead of crowds being subject to irrational panic or bloodlust, we consistently observe that (i) if anything, people do not panic enough (Dezecache, 2015), (ii) even under terrible circumstances, people often engage in pro-social behavior instead of panicking (Dezecache, 2015; Dezecache et al., 2020; Drury, 2018; Drury et al., 2009a, 2009b; Johnson, 1987; Mawson, 2005, 2017), (iii) violent crowds tend to be quite discerning in how they exert violence, in a way that fits with the prior goals of at least some crowd members (e.g., Barrows, 1981; Rudé, 1967) . Although much remains to be understood about the behavior of crowds, what we know of them is consistent with the idea that humans are endowed with mechanisms of emotional vigilance, mechanisms which preclude the "contagious transports, irresistible currents of passion, epidemics of credulity" feared by nineteenth century crowd psychologists (Taine, 1876, p. 241).

What of 'mass psychogenic illness,' such as the 'epidemic of laughter' that affected schoolchildren in Tanganyika (what would become Tanzania) (Rankin, 1963). Children started laughing uncontrollably, and this behavior appeared to spread to hundreds of their schoolmates. Even though we are certainly faced with an extreme behavior, we still observe broad patterns that fit with the current framework. First, and most strikingly, these strong emotions are never passed on to outgroup members. In this example, none of the parents, schoolteachers, or other observers were ever affected, with the transmission being restricted to children who knew each other well. In other words, the benevolence condition of emotional vigilance was met: responsive

parties (i.e., those showing 'contagious' laughter) showed aligned interests with the signalers. Second, the people affected typically find themselves in a particularly stressful situation, and their bizarre behavior allows them at least a temporary reprieve (e.g. they do not have to go to school anymore). Their reaction might thus be less maladaptive than it first seems. As in the case of crowds, mass psychogenic illnesses thus do not directly contradict the current framework, on the contrary, they fit within it—although, admittedly, they remain poorly understood and not very well documented (and potentially largely anecdotal) .

Emotional vigilance: a research agenda

As discussed above, evidence suggests that we react to emotional displays based on the emitter's benevolence and competence (or at least the aptness if the display). That said, not all emotional displays are created equal. The costs of reacting when one shouldn't have, and failing to react when one should have, vary as a function of the affect being displayed. *Reacting* to a fake display of pain by feeling pain oneself and potentially helping the emitter might be costlier than failing to feel that pain (which doesn't preclude helping, but makes it non-mandatory); *failing to react* with fear to the fear of others might be costlier than reacting with fear—an unpleasant but not particularly costly feeling that can be extinguished promptly if we ascertain there was no real need for it. In this respect, the 'better safe than sorry' principle in ecology and animal behavior states that a mis-calibrated response to any sign of danger is possibly less detrimental than failure to react to actual danger (Haftorn, 2000) (see for similar discussion in the evolutionary psychology literature more specifically (Haselton & Buss, 2000; Nesse, 2005)). One should map the diversity of emotions and the costs involved if recipients wrong react or do not react to them in a manner consistent with what is expected by the emitter. Moreover, people

might learn to adjust their emotional reactions to changing costs and benefits. For example, throughout their curriculum, medical students adjust their reactions to the pain observed in their patients (Smith, Norman and Decety, 2017).

The distribution of emotional vigilance mechanisms in phylogeny is another promising avenue for research. For instance, in some primate species, alarm calls are not innate in form and/or function (Dezecache et al., 2019; Seyfarth & Cheney, 1980) and it is possible that immature individuals call in non-specific or unreliable ways (Ramakrishnan & Coss, 2000; Seyfarth & Cheney, 1980). In other mammals, the signals (notably: alarm calls) of unreliable individuals may be discounted (Blumstein et al., 2004; Hare & Atkins, 2001). Exciting research avenues lie in examining the extent to which animal receivers transfer reliability across contextual domains (e.g., unreliable alarm callers may also be unreliable food callers), and/or whether they respond to callers in a way that reflect not only assessment of competence but also assessment of benevolence.

Other promising avenues in human research more specifically are individual differences in emotional vigilance, and the question of how emotional vigilance develops in ontogeny, and whether some emotional vigilance mechanisms could emerge earlier than others, based on when they are needed (based on when, on average, relevant adaptive problems are encountered). In cultural contexts where infants are surrounded by mature individuals (rather than peers), benevolence might appear as a more urgent issue than competence, for instance.

Finally, the evolutionary history of emotional vigilance with respect to epistemic vigilance is a question worthy of further investigation. Our thought is that emotional vigilance might have evolved prior to epistemic vigilance, for the type of signals it deals with (emotional

displays) are more widely distributed than the ostensive signals typically dealt with by epistemic vigilance.

Conclusion

Although emotional displays have been studied within an evolutionary framework since Darwin (Darwin, 1872), we have argued that the traditional understanding of emotional displays in psychology is largely at odds with an evolutionary perspective. An evolutionary approach to communication shows that for communication to be stable, it has to benefit both senders and receivers (in the case of emotional displays, emitters and observers). This means that (i) emotional displays would likely be maladaptive if they mandatorily followed some affect, given that we are often better off not revealing our affects to others; (ii) that the reactions to emotional displays would likely be maladaptive if they were mandatory, given that emitters could then influence observers into feeling whatever emotion best serve their own ends, instead of the ends of observers.

Here, we have focused on point (ii), suggesting that instead of reactions to emotional displays being mandatory, they are modulated by mechanisms of emotional vigilance. These mechanisms serve the interests of the observer by using cues of benevolence (is the emitter likely to have my interests at heart?), and competence (is the display appropriate in the context?) to adjust the observer's reaction to the displays. This way, the observer resists being purposely or inadvertently duped into experiencing an emotion that would not serve their interests. Much remains to be studied about these defense mechanisms, and the adaptiveness of our reactions to emotional displays more generally. We believe that the current framework may constitute a fertile ground for new hypotheses and research.

References

Al-Shawaf, L., Conroy-Beam, D., Asao, K., & Buss, D. (2015). Human Emotions: An Evolutionary Psychological Perspective. *Emotion Review*. https://doi.org/10.1177/1754073914565518

Al-Shawaf, L., & Lewis, D. (2018). The Handicap Principle. In *Encyclopedia of Evolutionary Psychological Science* (T.K. Shackelford, V.A. Weekes-Shackelford (eds.)). Springer International Publishing AG. https://doi.org/10.1007/978-3-319-16999-6_2100-1

Al-Shawaf, L., & Lewis, D. M. (2017). Evolutionary Psychology and the Emotions. In *Encyclopedia of Personality and Individual Differences* (V. Zeigler-Hill, T.K. Shackelford (eds.)). Springer International Publishing.

Anderson, C. L., Monroy, M., & Keltner, D. (2018). Emotion in the wilds of nature: The coherence and contagion of fear during threatening group-based outdoors experiences. *Emotion*, *18*(3), 355–368. https://doi.org/10.1037/emo0000378

Atkinson, A. P., Dittrich, W. H., Gemmell, A. J., & Young, A. W. (2004). Emotion perception from dynamic and static body expressions in point-light and full-light displays. *Perception*, *33*(6), 717–746. https://doi.org/10.1068/p5096

Attardo, S., Eisterhold, J., Hay, J., & Poggi, I. (2003). Multimodal markers of irony and sarcasm. *Humor*, *16*(2), 243–260.

Aveni, A. F. (1977). The not-so-lonely crowd: Friendship groups in collective behavior. *Sociometry*, 96–99.

Barrett, L. F. (2006). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review*, *10*(1), 20–46.

Barrett, L. F., Adolphs, R., Marsella, S., Martinez, A. M., & Pollak, S. D. (2019). Emotional Expressions Reconsidered: Challenges to Inferring Emotion From Human Facial Movements. *Psychological Science in the Public Interest: A Journal of the American Psychological Society*, *20*(1), 1–68. https://doi.org/10.1177/1529100619832930

Barrows, S. (1981). *Distorting Mirrors: Visions of the Crowd in Late Nineteenth-century France*. Yale University Press.

Bevilacqua, F., Engström, H., & Backlund, P. (2018). Changes in heart rate and facial actions during a gaming session with provoked boredom and stress. *Entertainment Computing*, *24*, 10–20.

Bitti, P. E. R., Bonfiglioli, L., Melani, P., Caterina, R., & Garotti, P. (2014). Expression and communication of doubt/uncertainty through facial expression. *Ricerche Di Pedagogia e Didattica. Journal of Theories and Research in Education*, *9*(1), 159–177.

Blumstein, D. T., Verneyre, L., & Daniel, J. C. (2004). Reliability and the adaptive utility of discrimination among alarm callers. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, *271*(1550), 1851–1857.

Bogart, K., & Matsumoto, D. (2010). Living with Moebius Syndrome: Adjustment, Social Competence, and Satisfaction with Life. *The Cleft Palate-Craniofacial Journal*, *47*(2), 134–142. https://doi.org/10.1597/08-257_1

Bogart, K., Tickle-Degnen, L., & Joffe, M. S. (2012). Social interaction experiences of adults with Moebius Syndrome: A focus group. *Journal of Health Psychology*, *17*(8), 1212–1222. https://doi.org/10.1177/1359105311432491

Caro, T. M. (1986). The functions of stotting: A review of the hypotheses. *Animal Behaviour*, *34*(3), 649–662.

Cherbonnier, A., & Michinov, N. (2021). The recognition of emotions beyond facial expressions: Comparing emoticons specifically designed to convey basic emotions with other modes of expression. *Computers in Human Behavior*, *118*, 106689. https://doi.org/10.1016/j.chb.2021.106689

Chiarella, S. S., & Poulin-Dubois, D. (2013). Cry babies and pollyannas: Infants can detect unjustified emotional reactions. *Infancy : The Official Journal of the International Society on Infant Studies*, *18*(Suppl 1), E81–E96. https://doi.org/10.1111/infa.12028

Crivelli, C., Carrera, P., & Fernández-Dols, J.-M. (2015). Are smiles a sign of happiness? Spontaneous expressions of judo winners. *Evolution and Human Behavior*, *36*(1), 52–58. https://doi.org/10.1016/j.evolhumbehav.2014.08.009

Crivelli, C., & Fridlund, A. J. (2018). Facial Displays Are Tools for Social Influence. *Trends in Cognitive Sciences*, *22*(5), 388–399. https://doi.org/10.1016/j.tics.2018.02.006

Crivelli, C., & Fridlund, A. J. (2019). Inside-Out: From Basic Emotions Theory to the Behavioral Ecology View. *Journal of Nonverbal Behavior*, *43*(2), 161–194. https://doi.org/10.1007/s10919-019-00294-2

Crivelli, C., Russell, J. A., Jarillo, S., & Fernández-Dols, J.-M. (2016). The fear gasping face as a threat display in a Melanesian society. *Proceedings of the National Academy of Sciences*, *113*(44), 12403–12407.

Darwin, C. (1872). *The Expression of the Emotions in Man and Animals* (John Murray.).

De Gelder, B. (2006). Towards the neurobiology of emotional body language. *Nature Reviews Neuroscience*, *7*(3), 242–249.

Gelder, B. de, Borst, A. W. de, & Watson, R. (2015). The perception of emotion in body expressions. *WIREs Cognitive Science*, *6*(2), 149–158. https://doi.org/10.1002/wcs.1335

Dezecache, G. (2015). Human collective reactions to threat. *WIREs Cognitive Science*, *6*(3), 209–219. https://doi.org/10.1002/wcs.1344

Dezecache, G., Crockford, C., & Zuberbühler, K. (2019). The development of communication in alarm contexts in wild chimpanzees. *Behavioral Ecology and Sociobiology*, *73*(8), 104. https://doi.org/10.1007/s00265-019-2716-6

Dezecache, G., Eskenazi, T., & Grèzes, J. (2016). Emotional convergence: A case of contagion? In *Shared representations: Sensorimotor foundations of social life* (pp. 417–436). Cambridge University Press. https://doi.org/10.1017/CBO9781107279353.021

Dezecache, G., Jacob, P., & Grezes, J. (2015). Emotional contagion: Its scope and limits. *Trends in Cognitive Sciences*, *19*(6), 297–299.

Dezecache, G., Martin, J.-R., Tessier, C., Safra, L., Pitron, V., Nuss, P., & Grèzes, J. (2020). *Nature and determinants of social actions during a mass shooting*.

Dezecache, G., Mercier, H., & Scott-Phillips, T. C. (2013). An evolutionary approach to emotional communication. *Journal of Pragmatics*, *59*, 221–233.

Dimberg, U., Thunberg, M., & Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychological Science*, *11*(1), 86–89.

Drury, J. (2018). The role of social identity processes in mass emergency behaviour: An integrative review. *European Review of Social Psychology*, *29*(1), 38–81.

Drury, J., Cocking, C., & Reicher, S. (2009a). Everyone for themselves? A comparative study of crowd solidarity among emergency survivors. *British Journal of Social Psychology*, *48*(3), 487–506.

Drury, J., Cocking, C., & Reicher, S. (2009b). The nature of collective resilience: Survivor reactions to the 2005 London bombings. *International Journal of Mass Emergencies and Disasters*, *27*(1), 66–95.

Drury, J., Stott, C., Ball, R., Reicher, S., Neville, F., Bell, L., Biddlestone, M., Choudhury, S., Lovell, M., & Ryan, C. (2020). A social identity model of riot diffusion: From injustice to empowerment in the 2011 London riots. *European Journal of Social Psychology*, *n/a*(n/a). https://doi.org/10.1002/ejsp.2650

Ekman, P. (1973). Cross-cultural studies of facial expression. *Darwin and Facial Expression: A Century of Research in Review*, *169222*(1).

Ekman, P. (1999). Basic emotions. *Handbook of Cognition and Emotion*, *98*(45–60), 16.

Ekman, P. (2007). *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life* (Reprint édition). Holt McDougal.

Ekman, P., Davidson, R. J., & Friesen, W. V. (1990). The Duchenne smile: Emotional expression and brain physiology: II. *Journal of Personality and Social Psychology*, *58*(2), 342.

Ekman, P., Sorenson, E. R., & Friesen, W. V. (1969). Pan-cultural elements in facial displays of emotion. *Science*, *164*(3875), 86–88.

Frank, R. H. (1988). *Passions Within Reason: The Strategic Role of Emotions*. Norton.

Fridlund, A. J. (2014). *Human facial expression: An evolutionary view*. Academic Press.

Gendron, M., Crivelli, C., & Barrett, L. F. (2018). Universality Reconsidered: Diversity in Making Meaning of Facial Expressions. *Current Directions in Psychological Science*, *27*(4), 211–219. https://doi.org/10.1177/0963721417746794

Gosselin, P., Perron, M., & Beaupré, M. (2010). The voluntary control of facial action units in adults. *Emotion*, *10*(2), 266–271. https://doi.org/10.1037/a0017748

Grèzes, J., Pichon, S., & De Gelder, B. (2007). Perceiving fear in dynamic body expressions. *Neuroimage*, *35*(2), 959–967.

Gunnery, S. D., Hall, J. A., & Ruben, M. A. (2013). The Deliberate Duchenne Smile: Individual Differences in Expressive Control. *Journal of Nonverbal Behavior*, *37*(1), 29–41. https://doi.org/10.1007/s10919-012-0139-4

Gunnery, S. D., & Ruben, M. A. (2016). Perceptions of Duchenne and non-Duchenne smiles: A meta-analysis. *Cognition and Emotion*, *30*(3), 501–515. https://doi.org/10.1080/02699931.2015.1018817

Haftorn, S. (2000). CONTEXTS AND POSSIBLE FUNCTIONS OF ALARM CALLING IN THE WILLOW TIT, PARUS MONTANUS; THE PRINCIPLE OF 'BETTER SAFE THAN SORRY'. *Behaviour*, *137*(4), 437–449. https://doi.org/10.1163/156853900502169

Hare, J. F., & Atkins, B. A. (2001). The squirrel that cried wolf: Reliability detection by juvenile Richardson's ground squirrels (Spermophilus richardsonii). *Behavioral Ecology and Sociobiology*, *51*(1), 108–112.

Harris, P. L., Koenig, M. A., Corriveau, K. H., & Jaswal, V. K. (2018). Cognitive Foundations of Learning from Testimony. *Annual Review of Psychology*, *69*, 251–273. https://doi.org/10.1146/annurev-psych-122216-011710

Haselton, M. G., & Buss, D. M. (2000). Error management theory: A new perspective on biases in cross-sex mind reading. *Journal of Personality and Social Psychology*, *78*(1), 81.

Hatfield, E., Bensman, L., Thornton, P. D., & Rapson, R. L. (2014). *New Perspectives on Emotional Contagion: A Review of Classic and Recent Research on Facial Mimicry and Contagion*. https://doi.org/10.23668/psycharchives.2195

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1992). Primitive emotional contagion. *Review of Personality and Social Psychology*, *14*, 151–177.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1993). Emotional contagion. *Current Directions in Psychological Science*, *2*(3), 96–100.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional Contagion*. Cambridge University Press.

Hepach, R., Vaish, A., & Tomasello, M. (2012). Young children sympathize less in response to unjustified emotional distress. *Developmental Psychology*, *49*(6), 1132–1138. https://doi.org/10.1037/a0029501

Jack, R. E., Blais, C., Scheepers, C., Schyns, P. G., & Caldara, R. (2009). Cultural confusions show that facial expressions are not universal. *Current Biology*, *19*(18), 1543–1548.

Jack, R. E., Garrod, O. G. B., & Schyns, P. G. (2014). Dynamic Facial Expressions of Emotion Transmit an Evolving Hierarchy of Signals over Time. *Current Biology*, *24*(2), 187–192. https://doi.org/10.1016/j.cub.2013.11.064

Jack, R. E., & Schyns, P. G. (2015). The Human Face as a Dynamic Tool for Social Communication. *Current Biology*, *25*(14), R621–R634. https://doi.org/10.1016/j.cub.2015.05.052

Johnson, N. R., Feinberg, W. E., & Johnston, D. M. (1994). Microstructure and panic: The impact of social bonds on individual action in collective flight from the Beverly Hills Supper Club fire. *Disasters, Collective Behavior and Social Organizations*, 168–189.

Johnson, R. N. (1987). Panic and the breakdown of social order: Popular myth, social theory, empirical evidence. *Sociological Focus*, *20*(3), 171–183.

Kastendieck, T., Mauersberger, H., Blaison, C., Ghalib, J., & Hess, U. (2021). Laughing at funerals and frowning at weddings: Top-down influences of context-driven social judgments on emotional mimicry. *Acta Psychologica*, *212*, 103195. https://doi.org/10.1016/j.actpsy.2020.103195

Keltner, D., Sauter, D., Tracy, J., & Cowen, A. (2019). Emotional Expression: Advances in Basic Emotion Theory. *Journal of Nonverbal Behavior*, *43*(2), 133–160. https://doi.org/10.1007/s10919-019-00293-3

Kraut, R. E., & Johnston, R. E. (1979). Social and emotional messages of smiling: An ethological approach. *Journal of Personality and Social Psychology*, *37*(9), 1539–1553. https://doi.org/10.1037/0022-3514.37.9.1539

Krebs, J. R., & Dawkins, R. (1984). Animal signals: Mind-reading and manipulation. In *Behavioural Ecology: An Evolutionary Approach* (pp. 380–402). Blackwell Scientific Publication.

Lanzetta, J. T., & Englis, B. G. (1989). Expectations of cooperation and competition and their effects on observers' vicarious emotional responses. *Journal of Personality and Social Psychology*, *56*(4), 543.

Larsen, R. J., Kasimatis, M., & Frey, K. (1992). Facilitating the Furrowed Brow: An Unobtrusive Test of the Facial Feedback Hypothesis Applied to Unpleasant Affect. *Cognition and Emotion*, *6*(5), 321–338. https://doi.org/10.1080/02699939208409689

Likowski, K. U., Mühlberger, A., Seibt, B., Pauli, P., & Weyers, P. (2008). Modulation of facial mimicry by attitudes. *Journal of Experimental Social Psychology*, *44*(4), 1065–1072. https://doi.org/10.1016/j.jesp.2007.10.007

Likowski, K. U., Mühlberger, A., Seibt, B., Pauli, P., & Weyers, P. (2011). Processes underlying congruent and incongruent facial reactions to emotional facial expressions. *Emotion (Washington, D.C.)*, *11*(3), 457–467. https://doi.org/10.1037/a0023162

Mawson, A. R. (2005). Understanding mass panic and other collective responses to threat and disaster. *Psychiatry: Interpersonal and Biological Processes*, *68*(2), 95–113.

Mawson, A. R. (2017). *Mass panic and social attachment: The dynamics of human behavior*. Routledge.

McPhail, C., & Wohlstein, R. T. (1983). Individual and collective behaviors within gatherings, demonstrations, and riots. *Annual Review of Sociology*, *9*(1), 579–600.

Mercier, H. (2020). *Not born yesterday: The science of who we trust and what we believe*. Princeton University Press.

Mercier, H., Dezecache, G., & Scott-Phillips, T. (2017). Strategically Communicating Minds. *Current Directions in Psychological Science*, *26*(5), 411–416.

Nelson, N. L., & Russell, J. A. (2013). Universality revisited. *Emotion Review*, *5*(1), 8–15.

Nesse, R. M. (2005). Natural selection and the regulation of defenses: A signal detection analysis of the smoke detector principle. *Evolution and Human Behavior*, *26*(1), 88–105. https://doi.org/10.1016/j.evolhumbehav.2004.08.002

Paulus, A, & Wentura, D. (2015). It depends: Approach and avoidance reactions to emotional expressions are influenced by the contrast emotions presented in the task. *Journal of Experimental Psychology. Human Perception and Performance*, *42*(2), 197–212. https://doi.org/10.1037/xhp0000130

Paulus, Andrea, Rohr, M., Dotsch, R., & Wentura, D. (2016). Positive Feeling, Negative Meaning: Visualizing the Mental Representations of In-Group and Out-Group Smiles. *PLOS ONE*, *11*(3), e0151230. https://doi.org/10.1371/journal.pone.0151230

Pichon, S., De Gelder, B., & Grezes, J. (2008). Emotional modulation of visual and motor areas by dynamic body expressions of anger. *Social Neuroscience*, *3*(3–4), 199–212.

Ramakrishnan, U., & Coss, R. G. (2000). Age Differences in the Responses to Adult and Juvenile Alarm Calls by Bonnet Macaques (Macaca radiata). *Ethology*, *106*(2), 131–144. https://doi.org/10.1046/j.1439-0310.2000.00501.x

Rankin, P. J. (1963). An epidemic of laughing in the Bukoba district of Tanganyika. *Central African Journal of Medicine*, *9*(5), 167–170.

Rauchbauer, B., Majdandžić, J., Stieger, S., & Lamm, C. (2016). The Modulation of Mimicry by Ethnic Group-Membership and Emotional Expressions. *PloS One*, *11*(8), e0161064. https://doi.org/10.1371/journal.pone.0161064

Reed, L. I., & DeScioli, P. (2017). Watch out! How a fearful face adds credibility to warnings of danger. *Evolution and Human Behavior*, *38*(4), 490–495. https://doi.org/10.1016/j.evolhumbehav.2017.03.003

Reed, L. I., DeScioli, P., & Pinker, S. A. (2014). The commitment function of angry facial expressions. *Psychological Science*, *25*(8), 1511–1517.

Rudé, G. F. E. (1967). *The Crowd in the French Revolution*. Oxford University Press.

Russell, J. A. (1994). Is there universal recognition of emotion from facial expression? A review of the cross-cultural studies. *Psychological Bulletin*, *115*(1), 102.

Sauter, D. A., Eisner, F., Calder, A. J., & Scott, S. K. (2010). Perceptual cues in nonverbal vocal expressions of emotion. *Quarterly Journal of Experimental Psychology*, *63*(11), 2251–2272.

Sauter, D. A., Eisner, F., Ekman, P., & Scott, S. K. (2010). Cross-cultural recognition of basic emotions through nonverbal emotional vocalizations. *Proceedings of the National Academy of Sciences*, *107*(6), 2408–2412. https://doi.org/10.1073/pnas.0908239106

Schweingruber, D., & Wohlstein, R. T. (2005). The Madding Crowd Goes to School: Myths about Crowds in Introductory Sociology Textbooks. *Teaching Sociology*, *33*(2), 136–153. https://doi.org/10.1177/0092055X0503300202

Scott-Phillips, T. C. (2008). Defining biological communication. *Journal of Evolutionary Biology*, *21*(2), 387–395.

Seibt, B., Mühlberger, A., Likowski, K. U., & Weyers, P. (2015). Facial mimicry in its social setting. *Frontiers in Psychology*, *6*, 1122. https://doi.org/10.3389/fpsyg.2015.01122

Seyfarth, R. M., & Cheney, D. L. (1980). The ontogeny of vervet monkey alarm calling behavior: A preliminary report. *Zeitschrift Für Tierpsychologie*, *54*(1), 37–56.

Simon-Thomas, E. R., Keltner, D. J., Sauter, D., Sinicropi-Yao, L., & Abramson, A. (2009). The voice conveys specific emotions: Evidence from vocal burst displays. *Emotion*, *9*(6), 838.

Smith, J. M., & Harper, D. (2004). *Animal Signals*. OUP Oxford.

Soussignan, R. (2002). Duchenne smile, emotional experience, and autonomic reactivity: A test of the facial feedback hypothesis. *Emotion*, *2*(1), 52–74. https://doi.org/10.1037/1528-3542.2.1.52

Sperber, D., Clément, F., Heintz, C., Mascaro, O., Mercier, H., Origgi, G., & Wilson, D. (2010). Epistemic vigilance. *Mind & Language*, *25*(4), 359–393.

Stott, C., Ball, R., Drury, J., Neville, F., Reicher, S., Boardman, A., & Choudhury, S. (2018). The evolving normative dimensions of 'riot': Towards an elaborated social identity explanation. *European Journal of Social Psychology*, *48*(6), 834–849.

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*(5), 768–777. https://doi.org/10.1037//0022-3514.54.5.768

Taine, H. (1876). *The origins of contemporary France* (Vol. 1). New York: H. Holt, 1890-[v. 1.

Templeton, A., Drury, J., & Philippides, A. (2018). Walking together: Behavioural signatures of psychological crowds. *Royal Society Open Science*, *5*(7), 180172.

van der Schalk, J., Fischer, A., Doosje, B., Wigboldus, D., Hawk, S., Rotteveel, M., & Hess, U. (2011). Convergent and divergent responses to emotional displays of ingroup and outgroup. *Emotion*, *11*(2), 286–298. https://doi.org/10.1037/a0022582

Veld, E. M. J. H. in 't, Boxtel, G. J. M. V., & De Gelder, B. (2014). The Body Action Coding System I: Muscle activations during the perception and expression of emotion. *Social Neuroscience*, *9*(3), 249–264. https://doi.org/10.1080/17470919.2014.890668

Wagenmakers, E.-J., Beek, T., Dijkhoff, L., Gronau, Q. F., Acosta, A., Adams Jr, R. B., Albohn, D. N., Allard, E. S., Benning, S. D., & Blouin-Hudon, E.-M. (2016). Registered replication report: Strack, martin, & stepper (1988). *Perspectives on Psychological Science*, *11*(6), 917–928.

Walle, E. A., & Campos, J. J. (2014). The Development of Infant Detection of Inauthentic Emotion. *Emotion (Washington, D.C.)*, *14*(3), 488–503. https://doi.org/10.1037/a0035305

Warren, Z. J., & Power, S. A. (2015). It's contagious: Rethinking a metaphor dialogically. *Culture & Psychology*, *21*(3), 359–379.

Watson, R., & De Gelder, B. (2020). The representation and plasticity of body emotion expression. *Psychological Research*, *84*(5), 1400–1406. https://doi.org/10.1007/s00426-018-1133-1

Weisz, E., & Cikara, M. (2021). Strategic Regulation of Empathy. *Trends in Cognitive Sciences*, *25*(3), 213–227. https://doi.org/10.1016/j.tics.2020.12.002

Weyers, P., Mühlberger, A., Kund, A., Hess, U., & Pauli, P. (2009). Modulation of facial reactions to avatar emotional faces by nonconscious competition priming. *Psychophysiology*, *46*(2), 328–335. https://doi.org/10.1111/j.1469-8986.2008.00771.x

Zillman, D., & Cantor, J. R. (1977). Affective responses to the emotions of a protagonist. *Journal of Experimental Social Psychology*, *13*(2), 155–165. https://doi.org/10.1016/S0022-1031(77)80008-5