Making Sense of Emotional Contagion

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ABSTRACT

Emotional contagion is a phenomenon that has attracted much interest in recent times. However, the main theory, mimicry theory, fails to properly address its many facets. In particular, we will focus on two shortcomings: the elicitation of emotional contagion is not context-independent, and there can be cases of emotional contagion without motor mimicry. We contend that a general theory of emotion elicitation (such as Scherer's Component Process Model of Emotion) is better suited to account for these features, because of its multi-level appraisal component. From this standpoint, emotional contagion is viewed as a particular kind of emotional response that involves the same components and processes of emotional responses in general.

1. Introduction

Emotions appear to be contagious (Dezecache, Eskenazi, & Grèzes, 2016; Doherty, 1997). Examples abound: there is the phenomenon of laugher contagion (Provine, 2012); mothers share the distress of their children (Manini et al., 2013); friends tend to converge on their feelings (McIntosh, 2006); 2- or 4-day-old newborns cry when they hear the cry of another newborn, but not when they hear another noise (Simner, 1971). Clinical psychologists are likely to catch their patients' feelings, especially in cases of depression where expressions of sadness might be especially salient (Hatfield, Cacioppo, & Rapson, 1993). Different terms have been used to describe this phenomenon in which one person catches up the emotion of another, such as "emotional propagation", "emotional replication" (Dezecache, Jacob, & Grèzes, 2015), or

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"spread of emotions" (Dezecache et al., 2016). Yet it is best known as "emotional contagion".

Emotional contagion is not only an interesting psychological phenomenon in its own, but also because it has been related to many other phenomena. It is viewed as a kind of "primitive", "basic", "unconscious", "rudimentary" or "affective" empathy (Chartrand & Bargh, 1999; Darwall, 1998; de Vignemont & Singer, 2006; De Waal, 2008; de Waal, 2012; Hatfield, Cacioppo, & Rapson, 1992; Hatfield et al., 1993; Jackson, Meltzoff, & Decety, 2005; Manera, Grandi, & Colle, 2013; Prochazkova & Kret, 2017; Singer et al., 2004). Furthermore, it has been related to the evolution of morality because sharing another's feelings may foster prosocial behaviors (de Waal, 2012). It has also been related to musical expression (Davies, 2011), and to team performance (Barsade, 2002; Totterdell, 2000). In this latter case, it is supposed to promote affiliation (Chartrand & Bargh, 1999; Lakin, Jefferis, Cheng, & Chartrand, 2003), affective bonding (Hatfield et al., 1993; Lakin et al., 2003), and improved social interactions (Hatfield et al., 1992, 1993; Hatfield, Rapson, & Le, 2009; Wild, Erb, & Bartels, 2001). Finally, emotional contagion has also been conceived of as facilitating joint attention (Maye, Isern-Mas, Barone, & Michael, 2017; Seeman, 2011).

From an evolutionary perspective, emotional contagion seems to be a primitive adaptation, as it is found in many social mammals. Its function may have been to promote good relationships within the group and consequently to contribute to its adaptive stability (De Waal, 2008; Dezecache et al., 2016; Effron, Niedenthal, Gil, & Droit-Volet, 2006; Hatfield et al., 2009; Jackson et al., 2005; Manini et al., 2013; Paukner, Suomi, Visalberghi, & Ferrari, 2009; for a review see Pérez-Manrique & Gomila, 2017). Emotional contagion is viewed as the basic form of empathy, that would have developed into more sophisticated ones, such as sympathetic concern and empathic perspective taking as further cognitive capabilities became available (De Waal, 2008; de Waal, 2012; J. Decety & Chaminade, 2003; Jackson et al., 2005; Singer et al., 2004).

Despite the importance of emotional contagion, we still lack a satisfactory account of how it works. The principal theory is mimicry theory (Hatfield et al., 1992, 1993, 2009). According to mimicry theory, emotional contagion is mediated by an automatic process of mimicry of the expressive movements perceived which induces the same emotional state in the viewer. Yet emotional contagion is not always a context-independent response, and it is not

always mediated by motor mimicry. In this paper, we will summarize the relevant evidence in these respects, and propose an integrative model which can better explain the multifaceted character of the phenomenon. We will contend that emotional contagion should be understood as a particular kind of emotional response, instead of one served by a specialized mechanism. In order to substantiate our claim, in section 2 we begin with a thorough characterization of emotional contagion. In section 3, we introduce mimicry theory and we show how it explains emotional contagion. In section 4, we specify the factors known to modulate emotional contagion, to call into question the assumptions of mimicry theory that emotional contagion is stimulus-driven, and context-independent. Besides, we add some challenging cases for mimicry theory, such as cases where an emotional expression has different meanings because of cultural differences. In section 5 we discuss the relation between mimicry and emotional contagion, and argue that emotional contagion is possible without mimicry, and mimicry is possible without emotional contagion. Finally, in section 6, we argue for an integrative account of emotional contagion, grounded in a dynamical model of emotion elicitation in general (such as Scherer's), to better account for the context-dependence of emotional contagion and its connection with motor mimicry.

2. The Characterization of Emotional Contagion

In general, "emotional contagion" refers to the tendency to "catch" others' emotions (Hatfield et al., 1992), or the emotional ambience of our environment (Davies, 2011). Scheler (1973) calls it "psychic contagion" (*gefühlansteckung*), and provides the example of someone who walks into a bar and immediately catches the joyous atmosphere. As Scheler explains, this is an involuntary experience which happens despite our will, and without our awareness.

Emotional contagion can take place through different processes, which Doherty (1997) distinguishes as: (1) occult imaginary processes (projection, fantasy), and learning; (2) inferential processes based on self-perception; and (3) the emotional response to a perceived expressive display. This latter process is called "primitive emotional contagion" (Hatfield et al., 2009), and it is supposed to be subtle, automatic, uncontrollable, unintentional, hardly accessible to consciousness, and ubiquitous (Hatfield et al., 1992, 1993). This is the sort of emotional contagion this paper focuses on.

This kind of emotional contagion occurs when the following three requirements are satisfied. First, primitive emotional contagion occurs directly,

without any mediating projective imaginative activity (Darwall, 1998). Unlike Smith's (1790) sympathy, which requires imagination, and projection; emotional contagion is closer to Hume's (1739) sympathy, in which people catch others' emotions. In this case, the automatic affective matching is due to the perception of emotional signals in others, which somehow causes the unintentional and involuntary adoption of congruent emotional states in the observer (Dezecache et al., 2016). Consequently, the individual's emotional reaction is not appropriate to their actual situation as an observer but to that of the other person, the model: it is as if the observer was feeling another person's emotions (Bavelas, Black, Lemery, & Mullett, 1986), but not from their point of view, responding to their situation, as we imagine they see it; but rather more directly, as if the observer simply mirrors the expressive behavior of the model. Second, primitive emotional contagion does not require either the understanding of the model's intentions, or the awareness of oneself as distinct self (Darwall, 1998; de Vignemont & Singer, 2006; De Waal, 2008). The same happens in mimicry (Carpenter & Call, 2009). Other empathic phenomena, such as sympathetic concern and empathic perspective taking do require the self-other distinction and involve some sort of intentional attribution, imagination, or projection (Darwall, 1998). This would be the case of Smith's (1790) sympathy, in which the subject imagines himself in the other's circumstance.

Third, affective matching is a necessary condition for emotional contagion. Emotional contagion requires mirroring or "copying others' feelings" (Darwall, 1998), so that the perceiver's emotional response has to be similar to the perceived one[1]. For instance, someone laughs because they see their sister laughing. Some authors consider that emotional contagion could also involve cases in which the emotional reaction is either congruent or complementary (Doherty, 1997), such as cases where someone shows concern for a friend's distress. Yet it has been argued that these are better seen as examples of

[1] There are some disagreements regarding this condition. For instance, Lahvis (2017) focuses on behavior, and sees emotional contagion as a case of mimicry. According to this view, emotional contagion is a "reflexive behavioural change within the context of a motivationally salient event in which an individual spontaneously expresses a behavior that resembles the behavior expressed by another individual" (p.138). However, we consider that affective matching is a necessary condition for emotional contagion; cases where the matching is just in the behavioral dimension are better explained as cases of mimicry, or "emotional mimicry".

sympathetic concern (Darwall, 1998; De Waal, 2008), sympathy (Darwall, 1998) or emotional communication (Dezecache et al., 2015).
In summary, primitive emotional contagion is characterized by a perception-driven process of emotional matching. The mimicry theory agrees on this way of characterizing the phenomenon. Now we turn to how mimicry theory explains emotional contagion.

3. The Mimicry Theory of Emotional Contagion

Mimicry theory relates emotional contagion to motor mimicry. Motor mimicry consists in unwittingly adopting the movements, gestures, or behavior of another individual (Chartrand & Bargh, 1999; Wagenmakers et al., 2016). The theory thus claims that emotional contagion occurs because, and when, the observer unconsciously mimics the movements involved in the expression of the observed emotion, and by doing so, they induce the same emotion in themselves. This view of emotional contagion as a mimicry-related phenomenon was already present in the very formulation of the notion of empathy (Lipps, 1903's "Einfühlung")[2], but has been mostly elaborated by Hatfield (Hatfield et al., 1992, 1993, 2009). This view has become commonplace (Darwall, 1998; de Waal, 2012; Doherty, 1997; McIntosh, 2006; Prochazkova & Kret, 2017), possibly because it is grounded in the mirror neuron system in our brains, which works as a perception-motor link. Hence, the mirror neuron system becomes the common mechanism mediating both phenomena, i.e. mimicry and emotional contagion (Blakemore & Frith, 2005; De Waal, 2008; Rizzolatti, 2005). This approach sometimes even defines emotional contagion by appeal to motor mimicry, thus linking both phenomena by definition. Therefore, emotional contagion is said to consist of "the tendency to automatically

[2] As Stueber (2014) describes, the concept of "empathy" appeared in discussions on aesthetics to explain subjects' affective participation of an external reality. It was used to describe how we project emotions to objects. Lipps' took the term from that context and applied it in epistemology, to address the problem of other minds. According to Lipps (1903), the perception of an emotional display in another individual automatically activates the same emotion in the perceiver; and this is how we perceive other persons as minded creatures. After that, it was also defended in human sciences as a method to interpret a text. Finally, when empathy became a topic of scientific exploration, it was merged to sympathy, which had been introduced in moral philosophy and psychology by Hume and Smith to explain how humans could know, think and feel about others (Wispé, 1986). Due to its history, empathy means nowadays both: taking the perspective of another, and reacting emotional to another. Thanks to an anonymous reviewer for bringing this issue to our attention.

synchronize and mimic expressions, vocalizations, postures and movements with those of another person, and consequently, to converge emotionally" (Hatfield et al., 1993, p.5). At some other times, motor mimicry is viewed as an instance of emotional contagion (McIntosh, 2006).

The basic idea of the theory is that both emotional contagion and motor mimicry are stimulus-driven, bottom-up processes, which do not require any cognitive processing. According to Hatfield et al. (1993), they are connected in that primitive emotional contagion initiates in a sequence that begins with mimicry, commanded by the central nervous system. It is followed by proprioceptive feedback from the mimicked facial, postural and verbal expression elicited. This feedback induces the corresponding affective state, and this gives rise, as a result, to emotional convergence.

Therefore, emotional contagion and mimicry are intimately related. Emotional contagion is viewed as an interpersonal process, initially analogous to the phenomenon of motor mimicry: one moves in a way appropriate to the context of the agent that one perceives, as when we withdraw a hand upon seeing another person hammer theirs (Bavelas et al., 1986). In emotional contagion this process continues to the emotional matching part, because the bodily movements involved in motor mimicry in the case of emotional contagion elicit the corresponding emotional state. In the next subsections, we consider each of the phases that lead to emotional contagion, according to mimicry theory.

Mimicry of the Perceived Expression

In social interaction, people are capable of unconsciously and unintentionally mimicking and synchronizing, at times almost instantaneously, with their partners' faces, vocal productions, gestures, postures, and movements (Bourgeois & Hess, 2008; Hatfield et al., 1993; McIntosh, 2006; Paukner et al., 2009; van Baaren, Holland, Kawakami, & van Knippenberg, 2004), with no understanding of the demonstrator's intention (Carpenter & Call, 2009). This non-conscious tendency for imitation was called "the chameleon effect" by Chartrand & Bargh (1999). They defined it as the "non-conscious mimicry of postures, mannerisms, facial expressions and others' behaviors of one's interaction partners, such that one's behavior passively and unintentionally changes to match that of others in one's current social environment" (p. 893). This mimicry facilitates behavioral coordination, shared feelings of affiliation, smoother interactions, affinity, and even greater liking between interactive partners (Bourgeois & Hess, 2008; Chartrand & Bargh, 1999; Lakin et al.,

2003; McIntosh, 2006). In fact, the person whose emotions are mimicked is more likely to display prosocial behaviors such as helping others, leaving more generous tips, or donating money to charity (Paukner et al., 2009; van Baaren et al., 2004). Thus, from an evolutionary perspective, mimicry seems an adaptation to facilitate social cooperation through interpersonal bonding (Chartrand & Bargh, 1999; Lakin et al., 2003; van Baaren, Decety, Dijksterhuis, van der Leij, & van Leeuwen, 2009), coordination (Bourgeois & Hess, 2008), and nonverbal communication (Bavelas et al., 1986; McIntosh, 2006). Several studies support the notion that motor mimicry may decrease racial bias (Inzlicht, Gutsell, & Legault, 2012), reduce victim blaming (Stel, van den Bos, & Bal, 2012), and increase affective responses to seeing another individual in pain (De Coster, Verschuere, Goubert, Tsakiris, & Brass, 2013). The "chameleon effect" is explained by a pre-conscious perception-behavior link, through which the mere perception of another's movement automatically increases the likelihood of displaying those same movements oneself (Chartrand & Bargh, 1999). At the neural level, this link can be understood in terms of a common coding neural mechanism: the visual input is codified by motor neurons involved in performing those same behaviors one is seeing. Several proposals resort to this common coding perception-action system (Bourgeois & Hess, 2008; De Waal, 2008; J. Decety & Chaminade, 2003; Hatfield et al., 2009; Heyes, Bird, Johnson, & Haggard, 2005; Jackson et al., 2005; McIntosh, 2006), which is located in the mirror neuron system (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; de Gelder, Snyder, Greve, Gerard, & Hadjikhani, 2004; de Waal, 2012). Given this neural mechanism, the perception of a behavior is supposed to increase the tendency of the perceiver to behave in a similar way (De Waal, 2008).

Propioceptive Feedback

According to mimicry theory, when the mimicked movements express an emotion, propioceptive feedback activates the qualitative feelings that generally accompany that emotion[3]. As long as the expressive movements of each emotion

[3] As will be seen in section 6, an emotion is compound by five elements: physiological arousal, motor expression, subjective feeling, behavior preparation, and cognitive processes (Scherer 2001). According to mimicry theory, propioceptive feedback allows us to go from the motor expression component, i.e. the expression of the emotion, to the subjective feelings component, i.e. the internal sensations or *qualia*. For instance, proprioceptive feedback allows to go from the expression of sadness to the subjective feeling of sadness; i.e. from looking sad, to *feeling* sad.

are distinct enough, the imitation of another's expression induces the same emotion in the observer through this activation of the corresponding feelings (Niedenthal, 2007). It is through this complex internal process that mimicry elicits an emotional response that matches the perceived one, thus giving rise to emotional contagion (De Coster et al., 2013; Doherty, 1997; James D. Laird et al., 1994; Sato, Fujimura, Kochiyama, & Suzuki, 2013).

This peripheral feedback mediation theory finds its inspiration in James' original theory of emotional feeling (James, 1890; J. D. Laird & Lacasse, 2013). James contended that the feeling of emotion does not arise from cortical activity, but from the peripheral feedback from the facial expression of emotion. Due to this proprioceptive feedback, the facial configuration adopted through mimicry generates in the subject the emotion associated with that configuration because of the corresponding feeling it induces. In other words, when a subject faithfully reproduces a facial expression of emotion, they come to feel the corresponding emotion (J. D. Laird & Lacasse, 2013; Strack, Martin, & Stepper, 1988).

Thus, this idea is supported by the findings that motor expression might produce specific feelings, which increase or decrease the intensity of the subjective experience (J. D. Laird & Lacasse, 2013; Scherer, 2001; Strack et al., 1988). For instance, when people produced facial expressions of fear, anger, sadness or disgust, they were more likely to feel the emotion associated with those specific expressions rather than just any unpleasant emotion (Adelmann & Zajonc, 1989; Ekman, Levenson, & Friesen, 1983). So the idea is that facial expression itself can induce, enhance (or suppress) an emotion and its physiological arousal (Effron et al., 2006). In emotional contagion, this process is triggered by the perception of another's expression, and it is the induced movements that matter for the emotion felt by the observer.

This effect goes beyond facial stimuli. Adoption of postural or vocal movements have also been observed to induce the corresponding emotions (Hatfield et al., 1993; J. D. Laird & Lacasse, 2013; Niedenthal, 2007). All sorts of expressive behaviors have been shown to have a powerful influence on feelings (J. D. Laird & Lacasse, 2013). Consequently, in emotional contagion the emotional experience is supposed to be shaped moment-to-moment by the activation and the feedback from facial, vocal, postural, and kinetic mimicry (Hatfield et al., 1992, 1993, 2009).

In summary, the perception of somebody smiling triggers the facial configuration associated with this expression; this mimicry induces its

corresponding proprioceptive feedback, which in its turn gives rise to the feeling of happiness associated with this expression (Manera et al., 2013). Thus, mimicry of expressions and feedback from the corresponding movements end up inducing their associated emotions.

Many positive aspects of this account explain its influence and appeal. It affords a concrete, explicit, and systematic explanation to the phenomenon of vicarious emotional experience (Doherty, 1997); and it offers an elegant account of human social responses to another's expressive actions, that is grounded in neuroanatomical mechanisms, such as the notorious ″mirror system″ in the premotor cortex (Dezecache et al., 2015). It also suggests how emotional contagion may contribute to understanding others (Neal & Chartrand, 2011). However, doubts have been raised on this theory, both about whether mimicry is always involved in emotional contagion, as the theory claims, and about how mimicry elicits emotional contagion, when it does. As a matter of fact, some studies have failed to find evidence of the link between mimicry and emotional contagion (Hess & Blairy, 2001; McIntosh, 2006), And mimicry is a very ubiquitous phenomenon, one that extends beyond emotional contagion (Bourgeois & Hess, 2008). In what follows, we offer two general arguments to cast further doubt on the theory: first, that emotional contagion is a context-dependent process in a way that mimicry theory is unable to capture. Second, that mimicry is a phenomenon often not associated with emotional contagion. In the last section, we propose an alternative account of emotional contagion in terms of a general theory of emotional responses.

4. Emotional Contagion is Context-dependent

Our first objection to mimicry theory is that it does not properly account for the context-dependency of emotional contagion. Emotional contagion, as we will describe shortly, is sensitive to a broad set of contextual variables in a way that mimicry is not. The theory takes mimicry to work as a context-independent reflex, both in the sense of an automatic response and as a reflection of what it is seen. But automatic processes, i.e. fast, effort-less, and out of the subject's awareness, are frequently context dependent: color perception is a well-known example. Emotional contagion is another. Yet, by turning all cases of emotional contagion into cases of mimicry, the theory lacks the resources to account for this context-dependence.

We develop this first objection in two strands. First, we review the many factors that have been shown to modulate emotional contagion. Secondly, we argue that the mimicry theory fails to account for such context-dependency.

4.1 Modulating Factors

Interactive Social Context

Emotional contagion takes place in interactive contexts and is affected by many contextual and social cues (Bourgeois & Hess, 2008). It may even happen through digital social networks, without face to face interaction (Kramer, Guillory, & Hancock, 2014). Mimicry, on the contrary, requires co-presence, but does not require interaction (McIntosh, 2006). However, one of the consequences of mimicry, i.e. affinity, only appears if interaction takes place (Chartrand & Bargh, 1999). An account of emotional contagion has to account for these features.

Scope: Previous Relationship between Subjects

The relationship between the observer and the model also modulates the phenomenon (Bourgeois & Hess, 2008; Dezecache et al., 2016; McIntosh, 2006): people are more likely to acquire the emotional expression of similar and socially close individuals (De Waal, 2008); individuals that they like or love (Lakin et al., 2003; McIntosh, 2006); and also, in-group individuals, or individuals with whom there is an expectation to cooperate (Bourgeois & Hess, 2008). The empirical evidence for this is double. First, Manini et al. (2013) registered different autonomic responses (recorded by means of facial thermal images) of mothers observing their respective distressed child, compared to those of other women observing an unknown child involved in an ecological, distressful condition. The first group showed much more emotional contagion than the second. Secondly, Singer (2006) observed participants experienced greater activation in pain related areas when the subject feeling pain had been a fair player during a previous game.

Along with these positive results, there is also a negative one. In McIntosh's (2006) second study the relationship between model and observer marginally affected mimicry, but not emotional contagion. Participants were friends but this relationship did not give rise to higher emotional contagion. In section 4 we will further discuss this finding, because it calls into question the link between emotional contagion and motor mimicry.

Hence, as predicted by Hatfield et al. (1992), who expected to find more emotional contagion among couples, friends, and mother-baby dyads, emotional contagion depends on previous experience among the individuals involved, either by a maternal (or kin) bond, by a learned preference related to fairness in a previous social interaction, by group membership, and in general by the relationship between the participants.

Individual Differences

Besides the relationship between the interacting subjects, some people are more prone than others to catching others' emotions, some people are more effective in infecting others, and some people are less sensitive to emotional contagion at all (Hatfield et al., 2009).

Hatfield et al. (1992) described the features that make someone more susceptible to contagion: attention focused on others (due to love, respect, or responsibility), self-description in terms of interrelatedness to others, ability to interpret others' emotional expressions, tendency to mimic expressions, awareness of their own emotional responses, and strong emotional reactivity. These characteristics might be found more in women, particularly mothers (especially towards their infants, as just mentioned), and certain social roles, such as psychotherapists, teachers and caretakers, and, in general, people who are more aware of their own feelings and particularly good at decoding others' expressions (Hatfield et al., 1992).

The evidence that supports these conclusions comes from studies using the Emotional Contagion Scale (Doherty, 1997), which assesses the susceptibility to contagion, or the frequency with which emotional stimuli elicit a congruent emotional expression in a person. Using this scale, Doherty (1997) found that reactivity, sensitivity to others and social functioning correlate positively with emotional contagion, self-esteem and emotional modes of empathy. And, in line with the predictions of Hatfield et al. (1992), susceptibility to emotional contagion was negatively related to self-assertiveness, alienation and emotional stability (Doherty, 1997). However, the prediction regarding women's susceptibility to emotional contagion was only partially confirmed by Doherty (1997) and disconfirmed by Wild et al. (2001), whose results showed that while women had greater expressiveness, their ability to catch another's emotion was not different from that of men.

If there are people more likely to catch others' emotions, by emotional contagion, then there should also be people with a greater ability to shape others'

emotions. According to Hatfield et al. (2009) there is a set of conditions that powerful "contagiers" possess: they must feel (or appear to feel) strong emotions, they must be able to express these emotions and they should be relatively insensitive to the feelings of those who are experiencing emotions incompatible with their own. In line with these predictions, Wild et al. (2001) found that participants generally experienced more emotions when looking at female faces than when looking at male faces, due to the stronger expressions of the former ones.

The Type of Emotion

Emotional contagion does not work equally for all emotions, but depends upon the emotion expressed. First, Manera et al. (2013) found that individual differences in smile authenticity detection were explained by differences in the susceptibility to emotional contagion for positive and negative emotions, a result which suggests that different neural systems might be involved. Secondly, and most relevant, Wild et al. (2001) observed a greater effect of happy expressions. Last but not least, Bourgeois & Hess (2008) showed that negative emotions were mimicked only when shown by an in-group member, whereas happiness displays were always mimicked.

These results, taken together, suggest that emotional contagion works differently depending on the type of emotional expression involved. Not all emotional expressions are equally mimicked. According to Bourgeois & Hess (2008), emotional contagion of an expression depends upon how much that expression signals affiliation, which requires happiness expressions. In addition, their study also showed that the social value of the expression interacts with the relationship factor, so that the "decision" to match or not the perceived expression depends both on the type of emotion as well as on the level of intimacy among model and perceiver.

Kind of Stimulus

Not only does the emotion seem to matter for emotional contagion to take place, but the channel through which the emotion is expressed and then caught also does. Emotional contagion may occur through all sort of expressive behaviors: faces, postures, verbal expressions, gestures, chemosensory signals, and even emoticons (Dezecache et al., 2016). The more that bodily cues are involved in the design, such as in studies involving video stimuli, the more powerful contagion effects were observed (Bourgeois & Hess, 2008; J. Decety &

Chaminade, 2003; Doherty, 1997; Hsee, Hatfield, Carlson, & Chemtob, 1991; Niedenthal, Brauer, Halberstadt, & Innes-Ker, 2001). Again, this suggests that emotional contagion is sensitive to the complexity of the expression, beyond the mere mimicry of the bodily movements perceived.

The Emotional State of the Perceiver

Emotional contagion has also been shown to be sensitive to the emotional state of the perceiver before contagion. Being in some emotional states facilitates contagion. To study this question, two hypotheses have been proposed: the Addition Hypothesis and the Interaction Hypothesis (Hsee et al., 1991). According to the Addition Hypothesis, subjects more likely catch up those emotions which are congruent with their current mood. According to the Interaction Hypothesis, happier subjects will more likely catch up others' emotions, regardless of the type of emotion expressed.

Empirical evidence is scarce and not conclusive yet. Whereas Niedenthal et al. (2001) found support for the Addition Hypothesis, the experiment by Hsee et al. (1991) supported the Interaction Hypothesis. Hsee et al. (1991) found that subjects who had received a previous happiness induction paid more attention to the stories and experienced greater contagion, regardless of the emotional content the video. In any case, it seems clear enough that previous state modulates somehow emotional contagion.

Attention

As Hatfield et al. (1992) and Davies (2011) pointed out, attention also plays a role in susceptibility to contagion. The more attention participants directed to perceived emotions, the more likely they were to catch up the emotional state of others (Hatfield et al., 1993). Besides, attention facilitated the synchronization of movements: the more attentive participants were to another, the more likely they were to mimic their movements (Hatfield et al., 1993). Hence, attentive participants would be more open to emotional convergence (Davies, 2011).

In summary, emotional contagion is modulated by the prior relationship between subjects, by the expressed emotions, by the specific stimuli involved, by individual differences in sensitivity to it, by the prior emotional state of the subject involved, and by the degree of attention paid to the emotional display. The mimicry theory has a difficult time to account for these many contextual influences on emotional contagion, as it understands motor mimicry as a process that operates in a stimulus-driven way (Hatfield et al., 1992,

1993, 2009), with no understanding of the context, or of the other's intentions being necessary (Carpenter & Call, 2009). Mimicry is "triggered" by the perception of an emotional expression, in a bottom-up and context-independent way (Bavelas et al., 1986; Bourgeois & Hess, 2008; Davies, 2011; De Waal, 2008; Lakin et al., 2003). Therefore, mimicry theory cannot account for the set of contextual factors known to modulate emotional contagion, as they clearly indicate that emotional contagion is not a purely bottom up process, as mimicry theory contends.

To put it differently, if emotional contagion were as reflex-like and context-independent as the theory assumes, it would occur in situations in which it does not actually take place. We submit three cases that fail to comply with the predictions of the theory: (1) culturally unrecognized or incongruent expressions, (2) non-imitable configurations, and (3) cases in which no contagion takes place.

Culturally unrecognized or incongruent expressions

Culture influences nonverbal behavior. For instance, smiles are perceived differently according to the cultural context within which they take place (Krys et al., 2016; Martin, Rychlowska, Wood, & Niedenthal, 2017). As a consequence, emotional contagion may require that both partners in the interaction share the same culture, i.e. the same way to express their emotions. Yet mimicry theory does not account for this cultural mediation. Neither does it account for incongruent expressions. If the model's bodily movements made no sense in the context for the perceiver, emotional contagion would not take place, even if mimicry would.

To consider this point in greater depth, imagine an expression which may be associated with different emotions for different groups, and an interactive situation between a member of each group. This is a plausible situation as the relationship between emotions and facial displays in adult humans is controversial and anyway not univocal (Martin et al., 2017). According to mimicry theory, the observer should mimic the bodily movements of the agent they are interacting with. Yet this mimicry would not give rise to emotional contagion, as the observer associates another emotion to those movements.

The same applies in cases in which a similar emotional state is expressed through dissimilar emotional expressions. For instance, my expression of sadness might be different from the expression of sadness of my

Russian cousins. According to mimicry theory, no contagion should follow in my interaction with them. Yet it seems that interacting with them, and implicitly knowing how they express their emotions, I might catch their sadness.

Therefore, mimicry theory can explain cases of contagion when the emotional expressions involved have similar expressive patterns, and similar meanings. Yet it cannot explain cases of similar expressions with different meaning; neither cases of different expressions with similar meaning.

Non-imitable Configurations

Neuroscientific evidence suggests that emotional displays have to be in one's motor repertoire for emotional contagion to proceed. First, brain areas related to emotional and cognitive conflict processing are activated when subjects face inappropriate and unfamiliar social behaviors (J. Decety & Chaminade, 2003). This activation somehow buffers mimicry, since it involves a previous assessment of what is perceived. Second, experience plays a role. The common coding mechanism that allows the matching of perceived and performed movements needs to be configured through experience, according to the Associative Sequence Learning hypothesis (Heyes et al., 2005).

Cases of No Contagion

The perception of another's emotional display does not always elicit the same emotion in the interacting partner (Dezecache et al., 2015). In other words, emotional contagion is just an option; other responses may be more appropriate, depending on the context. This is so because certain social contexts might not favor sharing emotional experiences (Dezecache et al., 2016). For instance, the perception of an enemy's anger is likely to trigger fear and submission, not anger (Dezecache et al., 2015); similarly, a competitor's joy is unlikely to get matched (Dezecache et al., 2016); and, the disgrace of another might cause laughter (Dasborough & Harvey, 2016). Furthermore, some phenomena, such as counter-empathy (Dezecache et al., 2016; Lanzetta & Englis, 1989) or sympathy (Darwall, 1998), typically elicit complementary expressions, instead of the same one. Thus, emotional propagation is unlikely to happen in all cases (Dezecache et al., 2015). Mimicry theory does not account for this possibility.

To account for the many factors that modulate emotional contagion, the theory could attempt to refurbish its notion of mimicry. Thus, it could be claimed that mimicry is also context-dependent in the several ways documented. Yet mimicry theory cannot really offer that argument, as it would deprive the

notion of mimicry of its distinctive content to turn it into a synonymous of imitation. The central cases of motor mimicry, such as contagious yawning (Campbell & de Waal, 2011) and rapid facial mimicry (Mancini, Ferrari, & Palagi, 2013), are clearly low-level, bottom up, processes.

In summary, both sets of considerations drive us to conclude that emotional contagion is a context-dependent phenomenon in a way that the mimicry theory is not able to account for. Both the many factors that mediate the elicitation of emotional contagion, and its contextual constraints suggest that a proper account of emotional contagion needs to go beyond a simple perception-motor matching process. We will go back to this issue in the sixth section.

5. The Relation between Mimicry and Emotional Contagion

Our second objection addresses the necessity and sufficiency of mimicry for emotional contagion. If mimicry were both necessary and sufficient for emotional contagion, as mimicry theory implies, mimicry would always give rise to emotional contagion, and conversely, no emotional contagion would happen without motor mimicry. However, it seems that emotional contagion can happen without mimicry, and that mimicry does not necessarily lead to emotional contagion.

On the one hand, mimicry may not be necessary for emotional contagion. It is possible that we can come to feel another's emotion, not by means of mimicking their expression (I may remain inexpressive), but as an emotional reaction to their expression through some other route. If this is correct, we can expect to find some kind of contagion without mimicry. Möbius Syndrome is an extreme instance of this scenario. It is a form of congenital bilateral facial paralysis which blocks facial expression (Krueger & Michael, 2012). These patients actually perceive, and even recognize facial expressions (Calder, Keane, Cole, Campbell, & Young, 2000), but they are not able to mimic them (Michael et al., 2015). Cases of emotional contagion between dogs and their owners (Sümegi, Oláh, & Topál, 2014) also illustrate this possibility. Emotional contagion takes place without unconscious mimicry (which would be too difficult or even physically impossible for individuals of different species), but from a more sophisticated perception of the social context and the expressive cues.

Mimicry theory supporters might reply to this criticism by excluding these cases from emotional contagion. They might say that since they are not mimicry-based they are not cases of primitive emotional contagion, but instances

of more sophisticated emotional processes such as projective empathy, or sympathy. However, the defining feature of emotional contagion is not mimicry, which is just one of its posited mechanisms. Furthermore, even excluding mimicry from the definition of emotional contagion, the three criteria we proposed in section 2 can still be satisfied. First, emotional contagion can still occur without any projective imaginative activity. As we will propose in section 6, emotional contagion might be the result of several cognitive processes, but these do not need to be any kind of projection into the other's situation. Second, emotional contagion without mimicry can still happen without explicit understanding of the model's intentions, or the awareness of oneself as distinct self. As we will propose, cognitive processes are involved in emotional contagion but they do not need to be explicit. Therefore, emotional contagion can happen without the subject's awareness. Finally, affective matching is still a necessary condition for emotional contagion, even though it might happen without mimicry. Thus, emotional contagion does not need to include mimicry in its definition, and hence cases of emotional convergence which are not caused by mimicry can still count as emotional contagion.

On the other hand, it seems clear enough that not all the expressions that we mimic lead to the feeling of the emotion associated with that expression. As a matter of fact, there are cases of mimicry, such as the "chameleon effect" (Chartrand & Bargh, 1999), yawn contagion (Norscia & Palagi, 2011; Platek, Mohamed, & Gallup Jr, 2005), or early imitation in babies (Simner, 1971), which are clearly not cases of emotional contagion. Moreover, in McIntosh's (2006) second study, mimicry and emotional contagion were differently affected by the previous relationship factor. The relationship between the model and the observer had different effects: when friends were involved, increased mimicry did not result in increased emotional contagion. Thus, this finding suggests that mimicry may take place without contagion.

In other words, instead of viewing mimicry as the key to emotional contagion, it could be rather said that both mimicry and emotional contagion are processes that may share a basic perception-motor matching mechanism, but which have their respective aetiologies. In fact, the mirror neuron system is known to be involved in many other processes, from motor control to language (Pulvermüller & Fadiga, 2010).

6. A Dynamical Alternative

In our view, a broader perspective is required to account for an intersubjective process such as emotional contagion. A theory that takes into account both the

many factors known to influence it, and the dynamics of emotion elicitation in general. So, we propose to explain emotional contagion in terms of an emotion theory, as an instance of any emotional process. To this extent, we resort to Scherer's influential dynamic view of emotion, as a relevant framework. This theory accounts for the context-dependency of emotion elicitation, and for the cognitive factors that modulate the resulting state.

Scherer's Dynamical Model

The multiple factors involved in emotional contagion can be accommodated within the framework of a dynamical theory of emotional processing. In particular, Scherer's multilevel sequential appraisals model, also known as the Component Process Model of Emotion (Scherer, 2009), offers the elements needed to account for emotional contagion, and the many factors which modulate it.

According to Scherer (2009) an emotion involves temporal dynamics of interrelations between dimensions, components and constant, non-linear, processes. Rather than a homogeneous state, an emotion is a dynamic process of changes involving five components that interact and, hence, influence each other at different time scales (Scherer, 2001). The five components of emotion the theory distinguishes are: physiological arousal (changes in temperature, cardiovascular rate, muscle tension, etc.), motor expression (facial, vocal, gestural, and postural changes with a relevant communicative function), subjective feeling (internal sensations or *qualia* that reflect changes in other components during emotional episodes), behavior preparation (action tendencies with a motivational function), and cognitive processes (involved in the different levels of appraisal of the stimulus in context).

These components are driven jointly by a set of common determinants and interact during emotion processing in a recursive fashion, resulting in a high degree of coherence and synchronization (Scherer, 2013). Evidence for the involvement of the various components and the subsequent reappraisals comes from the variety of multi-modal emotional expressions that emotions may involve (Scherer, 2013). Thus, a perceived stimulus may give rise to a fast appraisal that induces the corresponding physiological changes, expressive movements, and behavioral predisposition. Yet further cognitive processing of the context may modify this initial appraisal and modify this initial emotional response, and so forth.

Emotional Contagion in Light of Scherer's Model

By definition, for an emotional phenomenon to be emotional contagion, it needs to happen without any projective activity, with no explicit awareness of the

subject, and resulting in affective matching. Regarding the outcome, in emotional contagion both agents need to feel the same emotion, namely the subjective feeling component. In other words, emotional contagion occurs when an individual comes to feel the same as another one with whom they are interacting (rather than just having a similar arousal, motor expression, etc). How this convergence takes place depends on the other components as they develop in time.

In particular, two main components are relevant to account for the factors that modulate emotional contagion: the expressive component, responsible for the perceiver's imitation of the expresser's motor expression; and the cognitive component, responsible for the perceiver's appraisal of the expresser's emotion in context. Both components might influence each other and lead to emotional contagion; i.e. the fact of both the expresser and the perceiver experiencing the same emotion. From this point of view, one can predict that the greater the number of similarly activated components, the greater the contagion will be. Laird & Lacasse (2013) agree with this prediction and provided evidence in favor of this additive effect.

This multiple determination of components in emotional contagion has already been suggested by different authors. For instance, Doherty (1997) described emotional contagion as being multiply determined by a set of psychological, cognitive, behavioral, and social phenomena; McIntosh (2006) claimed that different processes might account for emotional contagion; Hatfield et al. (2009) theorized that emotional contagion may have different causes, including innate features (unconditioned emotional responses through primitive associative processes or unconscious imitation), acquired responses (learned conditioned emotional response), and mental simulations (complex cognitive processes); and, finally, Bavelas et al. (1986) proposed a "parallel process theory" through which both interpersonal and intrapersonal psychological processes can be elicited by the same stimuli but thereafter proceed independently.

However, these different proposals failed to emphasize the dynamical character of the emotional response, as Scherer's theory does. Thus, when considering which of the components (cognitive, behavioral or somatovisceral) is the first to occur, Hatfield et al. (1993) responded that they would take place almost simultaneously and that, if not, the order would depend on the person and the situation. On another occasion, Hatfield recognized that either motor imitation or neural activation might generate a similar observable behavior in the

observer (Hatfield et al., 2009). Conversely, Bavelas et al. (1986) contended that witnessing an emotional event may give rise both to personal feelings and to motor mimicry; and insisted that we cannot infer a causal direction between both processes. Scherer's theory solves these doubts about temporal order by making the process a non-linear one.

The Dynamical Model's Plausibility

This dynamical theory of emotion can better account for the context-dependence of emotional contagion. Interestingly, it also clarifies its relation to motor mimicry. Scherer's theory accounts for the factors known to modulate emotional contagion: context, relationship between subjects, individual differences, type of emotion, kind of stimulus, and emotional state of the subject before contagion. All these modulating effects depend upon the cognitive component of the emotional process, i.e. the multi-level appraisal (Scherer, 2009). The cognitive component assesses the whole situation, influences the other components, and receives influence from all of them. Context-dependency requires some form of cognitive processing, which can become automatic, without being stimulus-driven. Emotional processing is automatic, i.e. fast, effortless and unconscious, but not bottom up. This understanding of automaticity helps to include the role of the cognitive component discriminating, assessing, and recognizing the stimulus involved; and then eliciting the most appropriate response (Scherer, 2013). Consequently, we can account for the absence of emotional contagion when we have unrecognized or incongruent emotions, lack of expressive movements in our repertoire, and contextual inappropriateness. Whether this appraisal allows, promotes, or causes the emotional response is a question that needs further investigation. Yet it has already been shown that the appraisal shapes the elicitation of the emotional response (Bourgeois & Hess, 2008; Lazarus, 1991; Moody, Mcintosh, Mann, & Weisser, 2007).

Scherer's model also clarifies the relationship between mimicry and contagion. The inclusion of the cognitive component weakens the necessary relation between emotional contagion and mimicry endorsed by mimicry theory. Consequently, both mimicry without contagion (McIntosh, 2006) and contagion without mimicry (Bavelas et al., 1986; Manini et al., 2013; Sümegi et al., 2014) can be accounted for, and they can be explained in terms of the different appraisal processes involved. Appraisal takes place while perceiving and can promote or suppress mimicry; as well as contagion. Secondly, appraisal

also affects the necessary relation between proprioceptive feedback and contagion, making it possible to mimic an expression and not feeling that same emotion (Mcintosh, 1996). Finally, the subject is viewed now not as a passive agent whose states are triggered from the outside, but as an active agent that perceives and mimics, but also discriminates between stimuli, interprets them in a context, and selects either a complementary or a congruent response, even if at a sub-personal level. Consequently, emotional contagion is never the result of a lineal chain that goes from a perception-action mechanism to contagion, through mimicry and proprioceptive feedback, but a more complex dynamic of interrelated processes and components. In this dynamical account, we can account for the flexibility of emotional contagion.

7. Limitation of the Dynamical Model

The main limitation of the dynamical model is its generality. Since it explains emotional contagion as another emotional reaction, it cannot give a specific and detailed account of it as a particular phenomenon. Yet our view of emotional contagion still keeps the phenomenon's distinctiveness.

First, as we have shown in section 5, our description of emotional contagion still satisfies the three criteria that we have proposed in section 2: it still happens without any projective activity, with no explicit awareness of the subject, and it results in affective matching.

Second, our notion of emotional contagion cannot be reduced to mimicry because, as we have shown in section 5, both phenomena work differently: emotional contagion can happen without mimicry, and mimicry does not necessarily lead to emotional contagion. As we said, mimicry and emotional contagion may share a basic perception-motor matching mechanism, but have their respective aetiologies. In particular, whereas mimicry is triggered by different movements such as emotional expressions, or body postures (Bavelas, Black, Lemery, & Mullett, 1987); emotional contagion is more specific. Unlike mimicry, emotional contagion might need some kind of emotional sensitivity to detect and react to others' emotional movements. Furthermore, both phenomena might have different adaptive value. Emotional contagion might be especially useful in situations of uncertainty. In these cases, it is more adaptive to copy others' emotions, i.e. emotional contagion, than others' behaviour, i.e. mimicry (Nakahashi & Ohtsuki, 2015).

Finally, our notion of emotional contagion is still not so sophisticated as empathic perspective taking, or sympathy because, as we have already said,

emotional contagion does not include projection into the other's situation. Other cognitive processes might be involved in emotional contagion, but they are not explicit: they happen in a sub-personal level, and involuntarily. This fact distinguishes emotional contagion from other more demanding forms of empathy such as sympathy, or perspective taking, where the subject intends to project himself into the other's situation. Furthermore, these other forms of empathy do not need to result in affective matching. For instance, through sympathy I might feel pity for someone who laughs at another's disgrace; or through perspective taking, I might feel anger against the bullies who are annoying a victim at school, although the victim does not feel it. Unlike these other forms of empathy, emotional contagion requires implicitly cognitive processes, and affective matching.

The explanatory power of our account is enhanced only in comparison with mimicry-based accounts, which becomes insufficient once the complexity of emotional contagion is taken into account. The dynamical model better captures the complexity of emotional contagion, at the expense of losing specificity. Further development of this proposal is required to improve on the specificity of the explanation.

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