

# What Makes Groups Emotional?

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## Abstract

When people experience emotions in a group, their emotions tend to have stronger intensity and to last longer. Why is that? This question has occupied thinkers throughout history, and with the use of digital media it is even more pressing today. Historically, attention has mainly focused on processes driven by the way emotions are shared between people via emotional interactions. Although interactions are a major driver of group emotionality, I review empirical findings that suggest that understanding group emotionality requires a broader view that integrates two additional processes: how emotions unfold within the social infrastructure in which they are shared and how these processes are affected by people's cognition about emotions. I propose to summarize the literature using an infrastructure-cognition-interaction framework that contributes to a broader understanding of group emotionality, which should improve our ability to predict group emotionality and to change these emotions when they are undesired.

## Keywords

collective psychology, social networks

One of the oldest insights about human behavior is that when people get together, they become more emotional than they would have been as separated individuals (Canetti, 1962; Durkheim, 1912; Le Bon, 1896). The main premise behind this insight is that emotions naturally tend to quickly calm down over time. However, when people get together in groups, the overall intensity of people's emotions is higher, and the gravitational force of emotion relaxation is reduced, leading groups to express strong emotions for extended periods of time. After being dormant for a few decades, the introduction of digital communications and especially social media has reinvigorated interest in groups' emotionality (Alvarez et al., 2015; Brady et al., 2017; Goldenberg, Garcia, et al., 2020; Goldenberg & Gross, 2020; Páez et al., 2015; Shteynberg et al., 2014). This new interest has also led to increasing attempts to explain and predict group emotionality (Bosse et al., 2014; Fan et al., 2018; Schweitzer & Garcia, 2010). Given this increased interest, it is the perfect moment to be thinking about the social and psychological processes that contribute to group emotionality, which is the goal of the current article.

Before diving into the processes that contribute to group emotionality, however, it is important to consider why this question is even important. I wish to propose two answers. The first is prediction; imagine that we

could look at the unfolding of a collective emotional event and have a better sense of its future in terms of potential spread, size, and length (see, e.g., Cheng et al., 2014). In the same way that social scientists are trying to predict individual emotionality in the form of a psychotic breakdown or the onset of a depressive episode (Benoit et al., 2020; Van De Leemput et al., 2014), we should be striving to predict collective-level emotionality. If we could predict the strength and duration of such emotions, we may be able to act differently to change these emotions when they are destructive or unhelpful. This leads me to the second answer to the question of why understanding what makes groups emotional is important: emotion regulation. Assuming that we want to change group emotions, either to increase or to decrease them, a central question is therefore what processes we should focus on. Although we know quite a lot about how to regulate individual emotions (Gross, 2015), even in group contexts (Goldenberg et al., 2016), there has been very little research thus far on how to regulate groups as a whole (Goldenberg, 2023).

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Reviewing between-individual processes that contribute to group emotionality is a first step in thinking about how emotions of collectives can be changed.

In light of these considerations, the main argument I wish to make in this article is that despite the tremendous increase in interest in what makes groups emotional, the vast majority of attention has been given to emotional interactions between individuals: how emotions are shared and communicated between individuals. This can be seen by the vast literature on emotion contagion and emotional sharing (for recent reviews, see Goldenberg & Gross, 2020; Parkinson, 2020). Although emotional interactions are clearly a central driver of groups' emotionality, I argue that to explain and predict group emotionality, we need to consider two additional types of processes and their interactions. The first is emotion *cognition*, which is how people perceive, evaluate, represent, and simulate others' emotions. I argue that the way emotions of multiple people are evaluated can impact the unfolding of emotions in group contexts. The second is the *infrastructure* in which emotional interactions occur, which is the social network or the physical space in which emotions are expressed. I argue that the network infrastructure in which emotions are shared has an important impact on group emotionality. Therefore, the goal of the article is to extend the understanding of the processes that contribute to the intensity and duration of groups' emotionality by introducing an *interaction-cognition-infrastructure* framework. This simple framework is inspired by insights from other models of collective behavior that suggest that collective behavior is a function of a unique infrastructure and the social interactions that occur within such an infrastructure (Galesic et al., 2021; Vlasceanu et al., 2018).

To fully explore these ideas, in the following sections I open with some definitions of different levels of emotions. After this initial stage, I organize the current literature using the *interaction-perception-infrastructure* framework. Finally, I derive two important questions that follow from this work, which are whether we can predict group emotionality and whether and how we can change it.

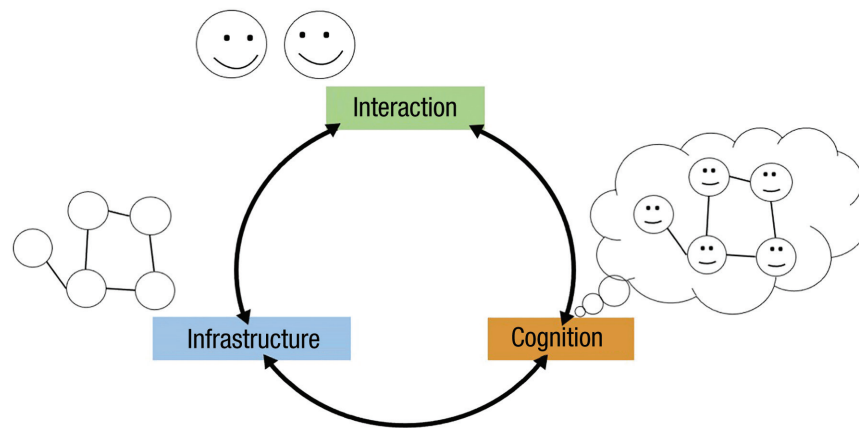
## Defining Emotions

To be able to answer the question of what makes groups emotional, we have to conceptualize emotions at both the micro, individual level and the macro, collective level. Generally speaking, individual emotions (from now on simply called emotions) are defined as flexible response systems (Frijda, 1986) that involve a loosely coordinated set of responses including a physiological response, a brain activation after a cognitive process, and a behavioral attribute (Mauss et al., 2005)

that arise as a result of situations that represent a challenge or an opportunity (Tooby & Cosmides, 1990). Emotions serve different functions, and one especially important function for the current context is to help people communicate their thoughts to others in a quick, relatively clear and efficient way (Barrett, 2012; Buck et al., 1992; Clark et al., 1996; Darwin, 1872; Ekman & Friesen, 1969; Hess & Fischer, 2014; Levenson, 1994; Manstead & Fischer, 2001; Parkinson, 2005; Van Kleef, 2009). This outward-leaning aspect of emotion is reflected in the meaning of the word "emotion," which is derived from the Latin term *emovere*, to "move out" (see Van Kleef, 2010). The communicative role of emotions is especially important to groups' behavior because it helps groups to maintain social structures, norms, and values by expressing emotions about what is good and bad, allowed and prohibited (Eid & Diener, 2001; Smith & Mackie, 2016b; van Kleef & Fischer, 2016). The expression of emotions also helps group members communicate about challenges and opportunities at the collective level, helping group members, for example, to identify risks and motivate efforts to overcome them (Bar-Tal et al., 2007; Halperin, 2016; Olsson & Ochsner, 2008).

Individual emotions are experienced in response to situations that are relevant not only to individuals as separate entities but also to groups, which can be broadly defined as multiple individuals who share a common identity, belief, or goal (Turner, 1982). When emotions are experienced in group contexts, individuals may experience emotions in response to situations that are relevant to their group merely as a result of their perceived group membership (e.g., Americans who are feeling happiness for an American athlete who has just won a gold medal). This subtype of individual emotions is often called group-based emotions (Goldenberg et al., 2016; Mackie et al., 2000; Smith, 1993; Smith & Mackie, 2016a). The strength of group-based emotions seems to be dependent on one's categorization as a member of a certain group and on one's degree of identification with the specific group (Doosje et al., 1998; Halperin, 2014; Hopkins et al., 2016; Yzerbyt et al., 2003).

Group-based emotions are emotions that are experienced at the micro, individual level. When people express emotions together, their emotions often tend to influence each other in nonlinear ways (Garcia & Rimé, 2019; Goldenberg, Garcia, et al., 2020; Schweitzer & Garcia, 2010; Thonhauser, 2022). To examine how these interactions lead to an overall increase in groups' emotions, it is helpful to conceptualize emotions at another level: the collective level. Collective emotions are the emotions of a collective when they are evaluated at the level of multiple people at the same time rather than the individual as a unit of analysis



**Fig. 1.** The infrastructure-perception-interaction framework that is meant to capture the processes that contribute to an increase in the duration and intensity of collective emotions. “Interaction” refers to any situation in which the emotions of one person impact or are being impacted by those of others; “cognition” is meant to include a broad variety of processes in which people perceive, evaluate, or even simulate what others feel; and “infrastructure” refers to the structural, physical, or virtual space in which emotion interactions and cognitions may occur.

(Goldenberg, Garcia, et al., 2020; Huebner, 2011; Páez & Rimé, 2014; Sullivan, 2014; von Scheve & Ismer, 2013). A good analogy for the idea of collective emotion is of a forest fire. When examining a forest fire one can look at the fire within a single tree and examine how it accumulates the trees over time. But a forest fire can also be evaluated at the forest level: how it is impacted by the forest density and terrain, how it spreads as a function of the wind, and whether its overall intensity is increasing or decreasing. In some cases, thinking of the individual tree is important, but it may limit our ability to predict the overall strength of the fire. Just like the size of the fire is determined by the amount of trees that is currently burning, the strength of collective emotions is often measured by the amount of people expressing emotions at a given time and the average intensity of these emotions (Goldenberg, Garcia, et al., 2020). Thinking about collective emotion is especially important when emotions at the individual and collective level show different patterns of behavior over time, and looking merely at one level creates a misleading impression (see, e.g., Goldenberg, Garcia, et al., 2020). Collective emotion is the outcome variable of the question of what makes groups emotional, and therefore from now on I use the term “collective emotion” to describe group emotionality.

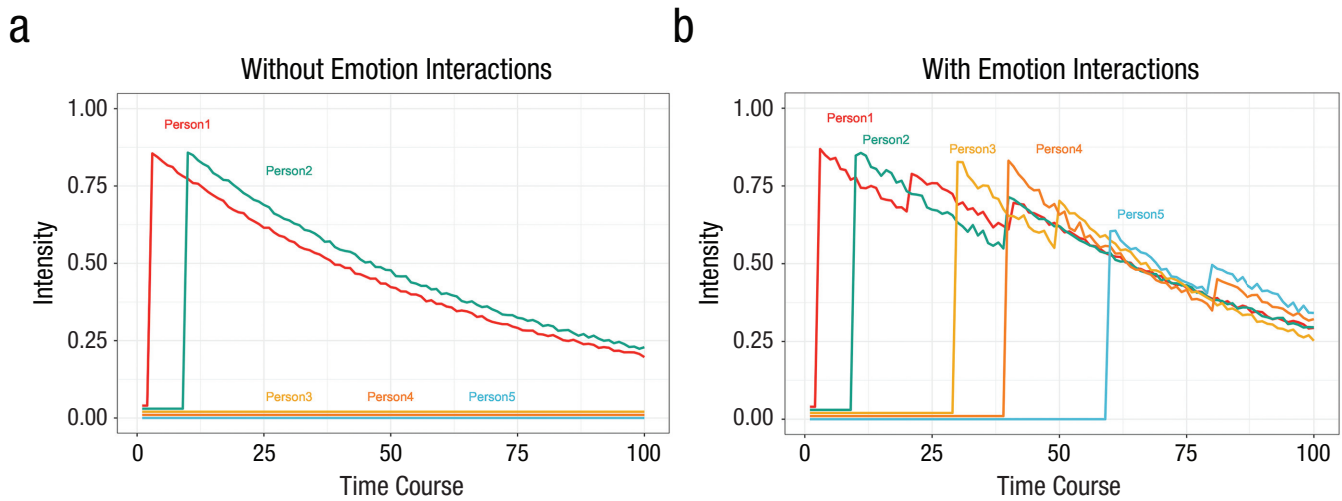
**What Makes Groups Emotional:  
Infrastructure, Perception, and Interaction**

A common insight in complex systems is that collective behavior is the result of a dynamic correspondence

between interactions and infrastructure. Because social behaviors spread differently depending on the network in which they occur, the idea that infrastructure and interactions are interdependent is straightforward and is well explored in complex systems. If we want to understand how ant colonies respond to changes in food resources, we must consider the way colonies are organized, how ants exchange information via interactions, and the influence of such interactions on infrastructure (e.g., Ouellette & Gordon, 2021). A similar approach can be taken when thinking about brain processes by focusing on brain architecture and communication between neurons and its effect on such architecture (Alexander-Bloch et al., 2013).

Things are more complicated, however, when it comes to human interactions because unlike ants or neurons, people’s dynamics are also impacted by how people perceive, represent and understand these dynamics (Galesic et al., 2021; Vlasceanu et al., 2018). People’s perception of the collective emotion is often inaccurate (Brady et al., 2023; Lau et al., 2016), which may impact both how people react themselves to emotional situations and the social ties that they may choose to interact with. Therefore, understanding human collective behavior requires adding an important component in the model: people’s cognition of the collective system.

To think of the unfolding of collective emotions, one must consider a process in which infrastructure, social perception, and social interactions interact (Fig. 1). Although conceptually each component in this framework can be discussed in separate, the reality is that they are never truly separated, and each component



**Fig. 2.** Simulation of the idea of activation with or without emotional interaction. The graphs represent people's emotional intensity over time, either without emotion interactions (a) or with emotion interactions (b). Interactions lead people to be activated (depicted by sharp increases in intensity from 0) or reactivated by the emotions of their peers.

dynamically influences all others. Therefore, to understand how the components of the interaction-cognition-infrastructure framework leads to increased collective emotion, we need to focus on the relationship between these components. In line with this idea, the structure of each of these subsections is the same. First I describe the essence of each of the components and how such components may contribute to amplification. Then I explain how each component impacts the other two. My hope is to provide an overview of the dynamic processes between each of the components to all others.

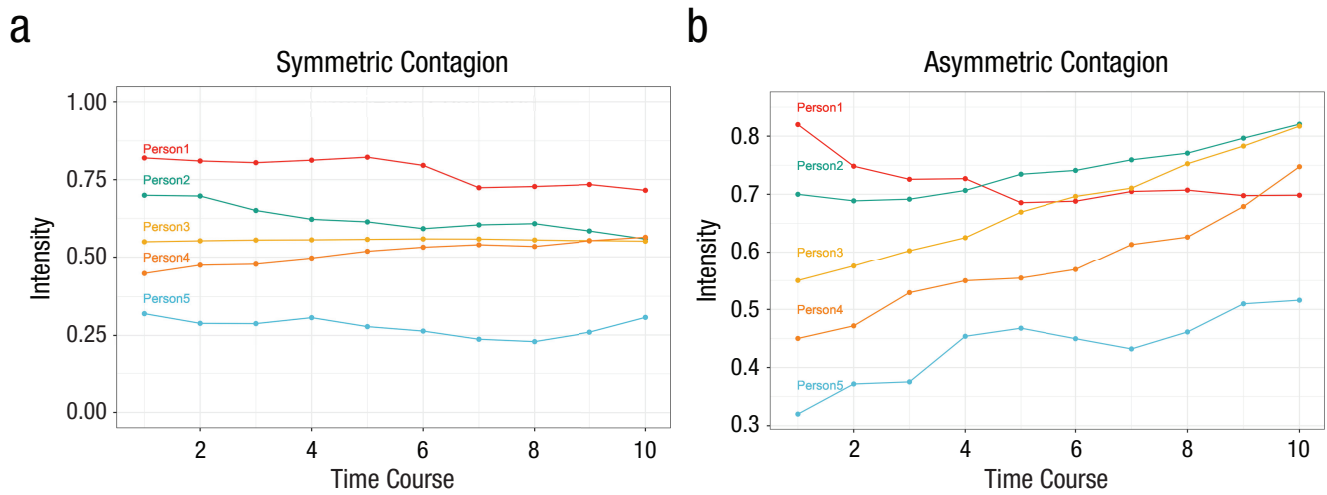
### **Interaction**

The term “emotion interaction” is meant to capture situations in which the emotions of one person impact or are impacted by those of others. Before thinking of contagion or influence—which are the obvious candidates for interactions—group emotionality can be driven by the fact that people tend to express stronger emotions when others are watching (Barrett, 2012; Darwin, 1872; Ekman & Friesen, 1969; Hess & Fischer, 2014; Lazerus et al., 2016; Manstead & Fischer, 2001; Van Kleef, 2009). These expressions may or may not be associated with increased experience (Jakobs et al., 2001; Williams et al., 2021). Amplification in expression is especially likely if it serves some individual or collective goals (for a review, see Porat et al., 2020), and in many group contexts, expressing emotions in the presence of others is congruent with both of these goals. For example, expressing outrage serves reputational goals in that the individual

signals their true group membership to others and is likely to be rewarded (Brady et al., 2020; Jordan & Rand, 2020). But people are also more likely to express outrage in group contexts because they believe that expressing these emotions would help the group achieve its goals in relation to the conflict (Cohen-Chen et al., 2020; Goldenberg et al., 2014; Porat, Halperin, & Tamir, 2016). In such cases, the mere communication of emotions is most likely to lead to an amplification in collective emotion.

An increase in collective emotions can also be caused by the fact that emotions spread from one person to another via social interactions, a process that is often called emotion contagion (Barsade, 2002; Fischer et al., 2003; Goldenberg & Gross, 2020; Hatfield et al., 1994; Páez et al., 2015; Parkinson, 2011; Peters & Kashima, 2015; Rimé, 2007a). There are a few ways in which emotion contagion can contribute to changes in collective emotion. The first and most important is the notion of emotional activation (sometimes referred to as emotional cascades). Activation occurs when someone who has not been emotional—either because they were not aware of the situation or because they calmed down from a previous emotional activation—becomes emotional (again) when exposed to an emotional person or people (Alvarez et al., 2015; Brady et al., 2017; Goldenberg, García, et al., 2020; Jonas et al., 2021). As suggested in Figure 2, activation merely leads to more people becoming emotional and to an increase in collective emotion.

Activation is not the only factor that contributes to the perpetuation of collective emotion. In some cases,



**Fig. 3.** Simulation of a symmetric and asymmetric contagion as affecting emotions over time. In symmetric contagion (a), emotions of multiple people tend to consolidate, but not necessarily to increase in intensity. In asymmetric contagion (b), people with higher intensity are more influential compared with people with lower intensity, which contributes to an increase in collective emotion.

people who are already emotional may modify the intensity of their emotional response as a function of what others around them feel (emotional influence). When it comes to emotional influence, however, for it to lead to an increase in collective emotion there needs to be some factor that may lead people to be more influenced by stronger compared with weaker emotions (Fig. 3a; Bosse et al., 2014), which may not always be the case (see, e.g., L. C. Lin et al., 2018). As suggested, because group-related processes often lead people to be motivated to express stronger emotions in the presence of others, we can assume an asymmetric process in emotional influence in which people who are motivated to express emotions are also more affected by stronger emotional expressions in their group, as demonstrated previously (Goldenberg et al., 2019).

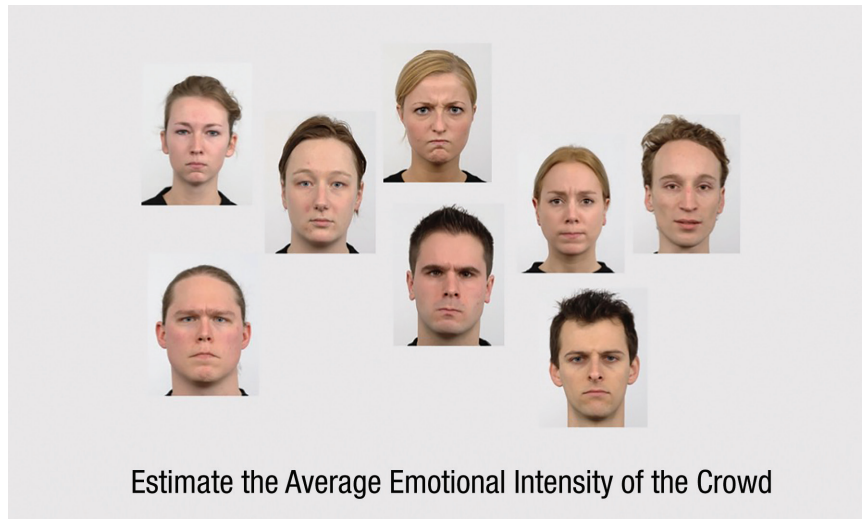
Emotional interactions may not only lead to change in collective emotion as an independent process but also impact the social infrastructure in which they occur in ways that further perpetuates amplification. Emotional content tends to be shared more and therefore spreads further in networks. This means that emotions lead to further engagement between people (Rimé, 2007b; Rimé et al., 1998; Stieglitz & Dang-Xuan, 2013). Given that prior engagement, especially a rewarding one, is a strong predictor of future engagement (Brady et al., 2020; Lindström et al., 2021), emotions seem to be contributing to the strengthening of social interactions, which then leads to an even further stronger activation in future interactions. In other words, repeated stimuli contribute to the fact that networks become more emotionally reactive over time.

Furthermore, people seem to be attracted by others who express strong and extreme emotion and tend to prefer them as social ties, even without previous interaction (Goldenberg et al., 2023). Therefore, when a network becomes emotional, the network infrastructure tends to cluster around emotional people (Romero et al., 2019), and connections to emotional members become stronger, which contributes to further perpetuation of emotions in preceding interactions.

Emotional interactions also impact people’s cognition in important ways that contribute to amplification. As initially suggested by Durkheim and Le Bon (Durkheim, 1912; Le Bon, 1896), when people experience emotions with others, their experience is associated with the understanding that “we are feeling emotions together” (Thonhauser, 2022), which contributes to amplification in their emotions. An empirical study by Páez and colleagues further examined the specific components of such feelings and suggested that social gatherings give rise to perceived synchrony, increased salience of one’s identity and integration in the group, and a sense of empowerment, all of which are associated with an increase in emotional experience (Páez et al., 2015). Emotional interactions therefore impact both infrastructure and cognition.

**Cognition**

The term “cognition” is meant to include a broad variety of processes in which people perceive, evaluate, or even simulate what others feel. The tendency to constantly track and evaluate the attitudes, emotions, and



**Fig. 4.** Example of a crowd-evaluation task in which participants see a crowd expressing different degrees of emotion and are asked to evaluate the mean collective emotion (Goldenberg et al., 2021). Results suggest that people tend to overestimate a crowd's emotions and that this is driven by spending more time attending to more emotional faces.

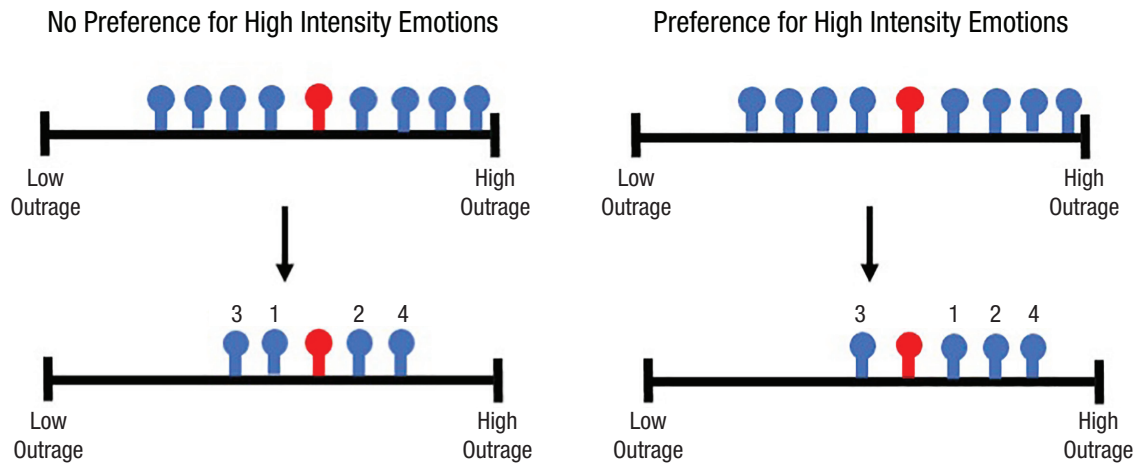
behaviors of one's social environment is an inherent tendency of humans (Krafft et al., 2021; Smith & Mackie, 2016b). Therefore, when evaluating the processes that contribute to increases in collective emotions, it is crucial to consider not only how emotional interactions lead to emotionality but also the ways in which people's representation of what others feel may play a role in changes in collective emotion.

Recent research suggests that when exposed to the emotions of others, people tend to perceive these emotions as stronger than they actually are and to further evaluate collective emotions as more emotional (Brady et al., 2023). This recent work points to amplification as a result of the evaluation of a single emotional expression, but amplification may be even more extreme given people often see multiple emotional expressions in response to any situation. When people evaluate multiple emotions they tend to automatically generate summary statistics, particularly averages, that help them to summarize these emotions and make sense of the world quickly and relatively efficiently (Elias et al., 2017; Haberman & Whitney, 2007, 2010; Whitney et al., 2014; Wolfe et al., 2015). Research on the aggregation of multiple emotions seems to suggest that perceivers are biased toward assuming that groups are more emotional than they actually are (Goldenberg et al., 2021; Goldenberg, Sweeny, et al., 2020; Fig. 4). This amplification in the evaluation of collective emotion seems to occur because of the fact that perceivers tend to spend more time attending to more emotional (compared with more neutral) expressions (Goldenberg et al., 2021). Amplification in evaluating collective

emotions seems to be happening when people are exposed to emotions not only concurrently but also sequentially (Goldenberg et al., 2022). This is driven mainly by the tendency to remember stronger emotional expressions when integrating sequential information.

People's evaluation of the collective emotion could affect their own emotions. If we assume that people are influenced by what they believe to be the collective emotion, and that the perceived collective emotion is higher than the actual collective emotion, then cognition contributes to an upward spiral of influence. Take, for example, a person whose initial emotional intensity is  $x$ . We assume that evaluating the collective emotion as  $x + 5$  would lead to a greater change in the individual emotion compared with evaluating the collective emotion as  $x + 1$ , which then further perpetuates the increase in collective emotion. Although this idea has not yet been examined empirically, a recent agent-based model tried to simulate the amplification caused merely by an amplification in perception, pointing to an increase in collective emotion (Haeringer et al., 2021). Further empirical work is needed to examine the potential consequences of such a process.

Amplification in the evaluation of collective emotion also leads to the formation of social ties that express stronger emotions. Research on the perception of average collective emotions suggest that people tend to overestimate the intensity of fellow group members' positive and negative emotions in response to political issues (Brady et al., 2022; Goldenberg, Abruzzo, et al., 2022; Lau et al., 2016). Furthermore, in a recent study,



**Fig. 5.** Depiction of the results from Goldenberg et al. (2022). A case in which there is no preference toward high-intensity emotions (a) is shown alongside a case in which there is some preference toward high-intensity emotions (b). When participants were given the option to pick peers out of a potential sample, they showed a preference toward peers who expressed higher intensity emotions. Participants are represented by the red dots, and all potential social ties are represented by the blue dots.

Goldenberg et al. (2023) found that the tendency to overestimate the collective emotional response was associated with selecting ties who express more extreme emotions. If people tend to select more emotional ties, they will also end up being influenced by these emotions and become emotional themselves. Therefore, this mere bias in perception is likely to contribute to a change in the network infrastructure and thus an increase in collective emotion.

### Infrastructure

All social interactions, and particularly emotional interactions, occur within a certain social infrastructure. This infrastructure may be dependent on physical space, such as the shape of a building; virtual space, such as one’s social network; as well as psychological space, such as people’s perceptions of who they can reach out to. When thinking of increases in collective emotions as a function of social interactions, it is commonly assumed that the infrastructure under which such interactions occur is fixed. But infrastructure, interactions, and cognition are involved in a dynamic process of influence that further contributes to increases in collective emotion compared with the emotions of separated individuals.

Social infrastructure is affected by two types of decisions regarding one’s network. The first is the decision to join or not to join a certain group, which is often accompanied with the psychological categorization of being a group member (Turner, 1985; Turner et al., 1987; Turner & Reynolds, 2001). The second is the decision of the specific ties one wishes to connect within

a specific group. Looking first at group choice and categorization, it seems clear that there are many situations in certain levels of group emotionality that are likely to lead more members to join. In both a positive and negative context, groups who express a lot of emotions are likely to attract more attention than groups who express less emotion (for work on collective action, e.g., see van Zomeren et al., 2012). People may prefer a certain group not only on the basis of the degree of emotionality it expresses but also the coherence of its emotions, with initial evidence pointing to preference toward low variance in emotion expression (Goldenberg, Sweeny, et al., 2020). Choosing to be a member of coherent groups in terms of their emotionality is likely to lead an individual to be more influenced by this group’s emotions, which should therefore lead to an increased emotionality within specific individuals over time.

But even after people have chosen to enter a specific group, people’s choice of social ties within the group may be as important as choosing to join the group in the first place. This question was recently investigated in a study in which participants were asked to provide emotional responses—both in ratings and in texts—to political situations (Goldenberg et al., 2023). Participants then saw peers’ responses to the same situations and were asked to choose which peers they would like to see in future trials. Participants preferred peers who represented a more extreme emotional response of their political view compared with a moderate emotional response (Fig. 5).

Network infrastructure impacts emotional interactions. At the most basic level, people prefer to share

emotions with closer others (Bourgeois & Hess, 2008; Depow et al., 2021; Jakobs et al., 2001; Lawler & Yoon, 1998; H. Lin et al., 2014; Romero et al., 2019), which should suggest that increasing the strength of ties within groups should increase the frequency and intensity of emotional expressions. Likewise, some empirical evidence suggests that emotions spread further in clustered networks, in which people share many similar connections (Alvarez et al., 2015; Lawler & Yoon, 1998) or are present in the same physical space (Páez et al., 2015; Rennung & Göritz, 2016), with proximity predicting increased synchrony in emotional expressions (Konvalinka et al., 2011). However, research in this space is just in its first steps, and more work is needed to understand the connection between network infrastructure and emotional interactions.

Aside from providing the infrastructure in which emotions become stronger or weaker, network structure interacts with collective emotions in other interesting ways. In some cases, the spread of emotions within specific infrastructure may modify the nature of the emotion. For example, Doré et al. (2015) examined the spread of emotions in response to the Sandy Hook Elementary School shooting in Newton, Connecticut. Their analysis of tweets showed that increasing temporal and spatial distance predicted a shift in emotional tone away from sadness and toward anxiety. In other cases, it is the type of emotion that interacts in interesting ways with network structures. For example, research on the association between network structure and the spread of emotions suggest that negative emotions are more likely to spread within weaker ties compared with positive emotions (Fan et al., 2016; Schöne et al., 2023). These are just initial attempts to examine the interaction between infrastructure and emotional interactions.

In addition to influencing emotional interactions, network infrastructure may influence emotion cognition in ways that may contribute to increases in collective emotion. Generally speaking, people seem to represent knowledge about the collective by bringing to memory more frequent interactions (for review, see Galesic et al., 2018). If indeed people tend to seek others who express emotions, representations of the collective emotion would be higher than it actually is. Therefore, when evaluating the collective emotional response, people may amplify their estimation of the collective, which as discussed above should lead to amplification.

## Discussion and Future Direction

The goal of this article was to explore processes that may contribute to group emotionality. I suggest extending the way we understand group emotionality beyond the

notion of emotional interactions and propose an interaction-cognition-infrastructure framework to examine the processes that underlie groups' emotionality. Having this broader view can allow us to both improve our ability to predict emotional situations and to change them when they are unhelpful or unwanted.

### *Predicting collective emotions*

Efforts to predict collective emotion can be divided to data-driven attempts, in which algorithms are applied to predict collective emotions, and modeling attempts, in which models are built to explain and reveal the ways in which collective emotions unfold. Data-driven approaches to predictions have so far been very limited. One of the reasons is that building the data set that is required for such a predictive model is very challenging and requires having multiple groups responding to multiple situations. However, inspiration for such work can be taken from research on predicting the spread of online cascades (Cheng et al., 2014; Goel et al., 2012; Kupavskii et al., 2012). Given our ability to capture emotions, and given the tools we have to predict emotions, this seems like a natural next step in research on group emotionality.

The most obvious way to predict emotionality is by looking at collective emotions as they are expressed on social media. Good predictive models of collective emotion should be focused on evaluating the three components suggested in the framework proposed herein. First, researchers interested in predicting the progression of collective emotions should try to evaluate both the degree of spreadability of emotions in a certain situation, which could be measured by the number of average shares a content receives. Second, prediction models can also examine network infrastructure such as clustering and the centrality of activated nodes to try to predict contagion. An estimation of cognition, however, is hard to achieve without self-report; however, amplification in the evaluations of collective emotions may be assumed on the basis of the clustering of emotional interactions. If people are exposed to multiple emotional expressions, we should assume that their evaluation of the collective emotions is amplified when adding these perceptions into a bottom-up model.

Although data-driven attempts to predict collective emotions have been relatedly sparse, there are many computational models that attempt to capture collective emotions (Bosse et al., 2014; Fan et al., 2018; Gao & Liu, 2017; Garcia et al., 2011; Haeringer et al., 2021; Hill et al., 2010; Riahi, 2015; Wang et al., 2015; Xiang et al., 2018; Xu et al., 2021). These models were built with the hope that they could provide preliminary signals for changes in collective emotion. Most models,



however, try to explain collective emotion merely as a result of emotion contagion. A first attempt to expand the processes that may contribute to an increase in collective emotion is Bosse and colleagues' ASCRIBE model (Bosse et al., 2014; see also Neto et al., 2015) that captures the insight—that is very much similar to the one captured above—that for groups to become more emotional, simple symmetrical contagion cannot be enough (Bosse et al., 2014; see also Neto et al., 2015). Bosse and colleagues added asymmetry in contagion to their model; however, they did not provide an explanation of the source of such bias. Building on Bosse and colleagues' ASCRIBE model, Haering et al. (2021) not only assumed asymmetry in contagion but also implemented amplification in collective emotion driven by perceiving collective emotion. Haering et al.'s model is the first to specifically address amplification driven by cognition in a way that is similar to what was specified in this article. It therefore introduces an important shift in the way collective emotions are modeled, which is very much congruent with the view of the current article. I suggest that future models should implement a broader view of processes that contribute to emotionality using the suggested framework proposed herein, in line with this positive development.

Improvements in agent-based models should also inform data-driven approaches by pointing to the features that should be captured to predict collective emotion. This approach of providing structural limitations on bottom-up machine learning has been found useful in predicting complex phenomena such as climate (see, e.g., Yuval & O'Gorman, 2020).

### ***Regulating collective emotions***

Collective emotions are a natural part of group behavior, and in many cases their unfolding plays a role in healthy social behavior. Take, for example, positive emotions as a result of a collective celebration (Konvalinka et al., 2011; Páez et al., 2015) or negative emotions such as sadness and anger over the loss of a person of some collective tragedy (Garcia & Rimé, 2019; Porat, Halperin, Mannheim, & Tamir, 2016). However, in some cases, groups' emotions may lead to unproductive or even destructive behaviors. Take, for example, situations of extreme violence or aggression that are driven from anger or hatred (Bar-Tal et al., 2007; Halperin, 2008), or cases of extreme distress and anxiety that could lead to irrational and potentially dangerous behavior (Bartolucci et al., 2021; Başak et al., 2018). In these cases, finding ways to change the collective emotion could have a tremendous benefit to people lives and well-being.

Research on emotion regulation has thus far almost exclusively focused on the regulation of individuals, paying attention to either self-regulation (Gross, 2015)

or the regulation of single others (Niven et al., 2011; Zaki & Williams, 2013). Recently, however, there has been a few initial attempts to conceptualize the regulation of collective emotion (Goldenberg, 2023). I define collective emotion regulation as a process in which a subset of the group engages in behavior that has the intentional goal of affecting the collective emotional response. The most important component of this definition is the fact that regulation is driven by a goal to affect the collective emotion (Gross, 2015). This does not mean that individuals have to be aware of their goal. The notion of a goal is merely a definitional tool designed to differentiate between emotion generation and regulation. Collective emotion can be activated either in a top-down process by a leader of a group who wishes to affect the collective emotional response or emerge as a bottom-up process when an aggregated force of multiple people shares the same goal and is able to execute it by interacting with each other and other group members (see below example). The fact that the target of regulation is more than one person makes collective emotion regulation unique in various ways, as all of the processes that were described as impacting the intensity of collective emotions can also help in its regulation. Therefore, when regulating a collective emotion, one needs to consider both the degree to which such regulation efforts could spread, how they are perceived, and how they are affected by the network infrastructure in which they are implemented.

The current framework, originally designed to examine group emotionality, can also be applied to the notion of emotion regulation. Starting with interactions, just like emotions can spread as a results of emotion contagion so as regulation. One example of a bottom-up process of emotion regulation is regulation that may occur in investment forums. In an attempt to regulate a community of investors after a report of bad quarterly results, group members may try to offer interpretations that may reduce the collective anxiety and the sale of the stock. These interpretations may converge and contribute in the creation of a narrative—which can be evaluated as a form of modification in cognition—that would improve the collective's ability to deal with the results (Schwartzstein & Sunderam, 2021). The spread of regulation and its ability to affect collective emotions obviously are highly dependent on the infrastructure of the network because clustered networks are more likely to support regulation, which is more likely to spread within complex conation. This is just one example of how the framework outlined in this article can be used to examine not only emotion generation but also regulation. There are more open questions than answers in the domain of collective emotion regulation, and I am looking forward to exciting advances in this new domain of research.

## Concluding comments

The current era brings many challenges to human flourishing—from intragroup and intergroup conflicts to environmental challenges that seem to threaten our existence in this world. These challenges lead to strong emotional reactions both at the individual and collective level, which may further perpetuate these destructive cycles and lead to more violence, distress, and despair. It is therefore crucial for us to be thinking about the processes that contribute to these increases in emotions so that we can find way to predict the intensity and duration of these emotions and find ways to change them.

## Transparency


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