Beyond Emotional Similarity: The Role of Situation-Specific Motives

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Abstract

It is well established that people often express emotions that are similar to those of other group members. However, people do not *always* express emotions that are similar to other group members, and the factors that determine when similarity occurs are not yet clear. In the current project, we examined whether certain situations activate specific emotional motives that influence the tendency to show emotional similarity. To test this possibility, we considered emotional responses to political situations that either called for weak (Studies 1 and 3) or strong (Study 2 and 4) negative emotions. Findings revealed that the motivation to feel weak emotions led people to be more influenced by weaker emotions than their own, whereas the motivation to feel strong emotions led people to be more influenced by stronger emotions than their own. Intriguingly, these motivations led people to change their emotions even after discovering that others' emotions were similar to their initial emotional response. These findings are observed both in a lab task (Studies 1-3) and in real-life online interactions on Twitter (Study 4). Our findings enhance our ability to understand and predict emotional influence processes in different contexts and may therefore help explain how these processes unfold in group behavior.

Key words: Emotions, Emotion Contagion, Emotional Influence, Motivation, Group Dynamics

People often respond emotionally to socio-political events, even when these events do not touch them personally, but only relate to their group as a whole (Smith, 1993; Smith & Mackie, 2015; Wohl, Branscombe, & Klar, 2006). These emotions are almost never experienced in isolation from the emotions of other group members. On the contrary, group members' emotions often influence other group members' emotions, making emotional responding a truly social process (Le Bon, 1895; Rimé, Finkenauer, Luminet, Zech, & Philippot, 1998). The social dimension of emotions, particularly in response to socio-political events, is becoming increasingly important with the use of social media and people's constant exposure to the emotions of others in online platforms. Recent social movements and political shifts such as the Arab Spring, Black Lives Matter, and online interactions before and after the recent US elections reveal how the spread of emotions can contribute to important changes in our society.

It is clear that people are influenced by other's emotions, but do we truly understand the nature of that influence? In mapping the type of influence group members have on each other's emotions, prior work has focused on emotional similarity, defined as responding to other group members' emotions with similar emotions (for reviews see Barsade, 2002; Fischer, Manstead, & Zaalberg, 2003; Hatfield, Cacioppo, & Rapson, 1994; Parkinson, 2011; Peters & Kashima, 2015). Emotional similarity is a well-established psychological process, driven by the visceral and immediate nature of emotions which makes them highly sensitive to the context in which they are experienced (Parkinson, 2011). When people experience emotions in social contexts, they rely heavily on others' emotions in developing their own responses, which often lead them to feel similar to others (Manstead & Fischer, 2001).

But emotional similarity should not be inevitable, and the dynamics of the social influence of emotions are probably more nuanced than only similarity. People's emotional

motivation to resist or enhance the experience of certain emotions should play a role in the degree to which they are influenced by the emotions of their social environment. Previous research suggests that in some situations, people appear to have emotional motivations that shape the strength of their emotional responses (Tamir, 2015; Zaki, 2014). In the same way that these motivations influence people's emotions when they are on their own, these motivations may also play a role in enhancing or reducing the degree to which people are influenced by others' emotions.

Changes in the degree of intragroup emotional influence can be very important to overall group behavior, especially when we are thinking of emotional interactions that occur on social media regarding different political situations. For example, take a situation in which multiple group members are motivated to experience strong negative emotions such as outrage. In such a situation, these emotional motivations may not only affect individual emotional responses but also how contagious these emotions are within the group, and how much they contribute to overall group emotional response, both in terms of group's collective action and in terms of support for certain policies (Brady, Wills, Jost, Tucker, & Van Bavel, 2017; Goldenberg, Garcia, Suri, Halperin, & Gross, 2017). Yet, despite their importance, very little work has been done to examine processes beyond emotional similarity.

The goal of the present research was to examine whether and to what extent situations that activate specific emotional motives interact with the tendency to show emotional similarity. Specifically, we examined situations in which we thought people would be motivated to experience certain emotions at either weak or strong intensities. In these situations, we asked: are people as likely to be influenced by those who express stronger emotions as by those who express weaker emotions? And if people feel the same level of emotion as other group members,

does this mean they have no impact on each other, or might social influences still be operative? We answer these questions by integrating both laboratory experiments and an analysis of interactions on Twitter.

Emotional Similarity

Compared to attitudes and beliefs, emotions are especially prone to social influence due to their immediate nature, and the fact that they are mostly activated by other people. These emotional influence processes often lead people's emotions to resemble others' emotions (Barsade, 2002; Fischer et al., 2003; Hatfield et al., 1994; Páez, Rimé, Basabe, Wlodarczyk, & Zumeta, 2015; Parkinson, 2011; Peters & Kashima, 2015; Rimé, 2007). This well-established phenomenon of emotional similarity occurs in all facets of life, from interpersonal relationships (Beckes & Coan, 2011; Feldman & Klein, 2003) to large collectives (Durkheim, 1912; Konvalinka et al., 2011; Páez et al., 2015). Emotional similarity occurs in many modes of communication: from face to face interactions in real life (Hess & Fischer, 2014; Konvalinka et al., 2011), to text based interactions on social media (Garcia, Kappas, Küster, & Schweitzer, 2016; Kramer, Guillory, & Hancock, 2014), and even in cases in which people are not exposed to actual emotional expressions of others, but merely receive information about these emotions (Lin, Qu, & Telzer, 2018; Smith & Mackie, 2016; Willroth, Koban, & Hilimire, 2017).

For emotional similarity to occur, people have to be exposed to the emotions of others. One domain in which such exposure is common is social media. Social media are driven by an attention economy, in which users are competing for other users' attention. Expressing emotions is a very good way to attract attention and expand exposure (Tufekci, 2013). Furthermore, social media companies are motivated to maximize emotions to maintain users' engagement and are therefore motivated to promote emotional content (Crockett, 2017). The occurrence of strong

emotions on social media is accompanied by processes of emotion similarity (Del Vicario et al., 2016; Kramer et al., 2014). Especially in social and political contexts, emotional similarity plays a central role in a variety of collective behaviors such as prosociality (Garcia & Rimé, 2019; van der Linden, 2017), collective action (Alvarez, Garcia, Moreno, & Schweitzer, 2015; Brady et al., 2017), and polarization and conflicts (Del Vicario et al., 2016).

Emotional influence processes that lead to similarity can occur as a result of different mechanisms. One mechanism is "emotion contagion," which involves immediate changes to one's emotions as a result of direct exposure to others' emotional expressions (Hatfield et al., 1994). Processes of contagion were originally thought to be "automatic" and uninfluenced by social motivations (Hatfield et al., 1994). However, recent work shows that even these fleeting processes are modified by motivational influences which may increase or decrease their strength (Bourgeois & Hess, 2008).

A second mechanism for emotional influence process that leads to similarity is social appraisals (for reviews, see Parkinson, 2011; Peters & Kashima, 2015). According to *Social Appraisal Theory* (SAT, Manstead & Fischer, 2001), individuals use others' emotions as appraisals that help them to construct their own emotional experiences. Social appraisal processes are influenced by situational and motivational considerations. Thus, people's basic motivations to belong to their group (Baumeister & Leary, 1995) or to see their group in a positive light (Hogg & Reid, 2006; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) can influence how they interpret others' emotions and how they choose to relate to them (van Kleef, 2009). Such motivations often lead group members to feel similar emotions to others.

Beyond Emotional Similarity

Compelling as the findings regarding emotional similarity may be, there is reason to believe that emotional similarity may not be inevitable (for example, see Delvaux, Meeussen, & Mesquita, 2016). In particular, previous work suggests that situation-specific emotional motives can and do influence people's emotional responses. Recent studies show that individuals are more likely to experience strong negative emotions in situations in which expressing such emotions is perceived to be helpful, and are more likely to reduce negative emotions in situations in which such emotions are perceived to be unhelpful (Ford & Tamir, 2012; Porat, Halperin, & Tamir, 2016; Tamir, Mitchell, & Gross, 2008). For example, when people believe that feeling increased anger would serve their group's ideological goals in an intergroup context, they may choose to expose themselves to information that will make them angrier (Porat, Halperin, & Tamir, 2016). If situation-specific motives can influence people's emotions, it seems reasonable that these motives might influence the degree to which emotional similarity is observed.

One indication that situation-specific motives were operative in a given context would be a lack of symmetry in the way people are influenced by weaker or stronger emotions in others. A simple account of emotional similarity suggests that people should be influenced by others' emotions in the same way whether these emotions are stronger or weaker than their own emotions. However, this assumption may not hold when people have a clear emotional motive to feel either strong or weak emotions. To our knowledge, this idea has not been directly tested. Much of the work on emotional similarity has only examined the influence of emotions that are stronger than one's own emotions (Hatfield et al., 1994; Konvalinka et al., 2011; Kramer et al., 2014). Even in the few experiments in which participants received either stronger or weaker group emotional feedback (for example, Koban & Wager, 2016; Willroth, Koban, & Hilimire, 2017), it is impossible to tell from these findings whether the process of similarity is

symmetrical. Our assumption in this project is that people may be more influenced by stronger or weaker emotions, depending on the emotional motives elicited by specific situations.

A second indication that situation-specific motives were operative in a given context would be a change in people's emotional responses even when their initial responses were similar to other group members. To our knowledge, this idea also has not been directly tested. This is because prior work has focused on what happens when individuals are exposed to emotions that differ from their own. Our assumption is that in situations that call for strong or weak emotions, there is no reason to believe that the motivation to increase or decrease these emotions will cease once similarity is achieved. In fact, if group members have a motive to be "better than average" (i.e. to be more responsive to a personally valued situation-specific motive than other members of their group), they may be motivated to change their emotions when learning that others feel similar emotions. This assumption is supported by recent work that shows that in some cases, group members may be motivated to feel emotions that are either greater or lesser than others in their group (Goldenberg, Saguy, & Halperin, 2014; Ong, Goodman, & Zaki, 2017). However, these studies have not examined whether such motivation predicts changes in people's emotions when they learn what other people feel, leaving this an open question.

Emotional Influence as a Driver of Emotional Escalation and Polarization

Emotional influence processes, if aggregated, may lead to important changes in overall group emotion and behavior. For example, a motivational bias that leads people to be more influenced by stronger, compared to weaker group emotions, might contribute to quicker contagion and thus an increase in overall group emotion. Group members' tendency to increase their emotional responses even when learning that others feel similar emotions to them might

further exacerbate these intragroup dynamics. These types of processes are similar to those documented in social psychology research on escalation and polarization (Iyengar, Lelkes, Levendusky, Malhotra, & Westwood, 2018; Myers & Lamm, 1976; Ross, 2012). Indeed, alongside increasing concerns regarding the occurrence of polarization, there is an increased realization of the central role that emotions have in contributing to its occurrence and amplification (Crockett, 2017; Iyengar et al., 2018; Tucker et al., 2018).

The idea that groups may polarize merely as a result of intragroup processes has been a source of interest (and contention) in social psychology for almost 60 years, since James Stoner, an M.A. student at MIT, revealed the existence of a risky shift (Stoner, 1961). Stoner's dissertation ignited tremendous interest in polarization (Cartwright, 1973; Dion, Baron, & Miller, 1970; Lord, Ross, & Lepper, 1979; Moscovici & Zavalloni, 1969; Myers & Bishop, 1970), but also skepticism and rigorous attempts to outline its limitations and boundary conditions (Myers & Lamm, 1976; Westfall, Judd, & Kenny, 2015). Following these efforts, the primary focus in polarization research has shifted from establishing its existence to clarifying the specific processes or situations that lead some groups to polarize more than others (Westfall et al., 2015).

Previous research has pointed to three main mechanisms for polarization. First, polarization can be caused merely as a result of conformity processes operating on a skewed distribution of attitudes within a group (Myers & Lamm, 1976). Second, polarization can be caused as a result of exposure to outgroup views which may challenge one's ideology or belief system (Lord et al., 1979; Ross, 2012). Finally, and most relevant to the current project, is polarization that occurs as a result of social comparison processes (Abrams, Marques, Bown, & Dougill, 2002; Hornsey & Jetten, 2004; Jetten & Hornsey, 2014; Packer, 2008; Skinner & Stephenson, 1981). The main argument for the social comparison approach is that people may

have certain goals or ideals for their desired position in relation to others in their group. This leads group members to aspire to express views that are more extreme than other group members, thus further contributing to escalation and polarization.

Social comparison is a primary focus as a mechanism for this project. In cases in which participants learn that other group members feel similar emotions to them, social comparison may be operative in motivating participants to change their emotions to reflect their difference from the group. In cases in which participants learn that group emotion is different from their own emotion, social comparison is more likely to motivate group members to change their emotions when they learn that they are actually "worse than average" in terms of their desired emotional responses. Furthermore, we believe that emotions play a unique role in these social comparison processes. The primary reason for this assumption is that by their nature, emotions are immediate responses to events rather than well-established beliefs. They therefore are much more likely to change as a result of relational motivations, and their change can be quick and impactful. These emotional changes are usually what is responsible for more permanent changes in attitudes that further contribute to polarization (for a similar argument, see Iyengar, Lelkes, Levendusky, Malhotra, & Westwood, 2018). Yet, despite their central role in perpetuating processes of polarization, very little work has examined the unfolding of these intragroup emotional processes.

The Present Research

The goal of the current project was to examine whether and to what extent certain situations activate emotional motives that influence emotional similarity. We used three lab studies (with pre-tests for the first two studies) and a Twitter analysis in order to examine this issue (all data are available at https://osf.io/7tja9/).

In Study 1, we examined a situation in which we expected group members would be motivated to express weak negative emotions. To achieve this goal, we conducted a laboratory study using a relatively liberal college student population (American citizens at Stanford University). We examined how participants' emotions were influenced by other Americans' emotions in response to pictures of outgroup threat (such as people burning the American flag). Our choice of these pictures was motivated by our expectation (which was confirmed by our pre-test) that participants would be motivated to experience weak negative emotions in response to such situations and that such motivation would bias the way participants are influenced by others' emotions. We had two hypotheses. Our first hypothesis was that in this context, participants would be more influenced by weaker emotions compared to stronger emotions. Our second hypothesis was that when learning that others' emotions were similar to their own emotions, participants would change their emotions to be weaker than their initial response.

In Study 2, we examined a situation in which we expected group members would be motivated to express strong negative emotions. Specifically, we examined emotional responses in a liberal college to cases in which American soldiers behaved immorally towards outgroup members (such as in the Abu Ghraib prisoner abuse). This choice was motivated by our expectation (which was confirmed in our pre-test) that participants would be motivated to express strong negative emotions to such situations and that this motivation would bias the way participants are influenced by others' emotions. In this context, we expected participants would be more influenced by stronger (compared to weaker) emotions of other group members, and that participants would change their emotions to be stronger than their initial response.

Study 3 was designed to extend the findings of Studies 1 and 2. In this study, we added a control condition in which participants were not exposed to any group emotion, with the

intention of showing that in this condition there would be no change in participants' emotional ratings. In addition, we directly tested participants' emotional motivations in relation to their group and looked at whether these motivations moderated the results. As the pictures used in Study 3 were similar to those of Study 1, our hypotheses were also similar to those of Study 1, with the added hypothesis that participants' motivation would moderate the results.

Finally, Study 4 was designed to replicate the findings of Study 2 in a real-life context. We looked at changes in emotions expressed in tweets related to civil unrest following the police shooting of Michael Brown in Ferguson, Missouri on August 9th, 2014, a context that we expected would lead users who tweeted about the Ferguson unrest to be motivated to express strong negative emotions. For this reason, our hypotheses for Study 4 paralleled those of Study 2.

Study 1:

Emotional Influence in Response to Outgroup Threat in the Laboratory

The goal of Study 1 was to examine processes of emotional influence in a situation in which participants have a clear preference to have weaker negative emotions, both in an absolute sense and in relation to other group members. To achieve this goal, we conducted a laboratory study using pictures of outgroup threat in a relatively liberal college student population (American citizens at Stanford University). We expected – and validated in a set of pilot studies – that these participants would be motivated to express weak negative emotions in comparison to other Americans, in response to situations of outgroup threat. This expectation was based on previous work on political affiliation and emotional preferences which suggested that liberals not only tend to experience less anger in response to outgroup threat, but are also motivated to experience less anger in response to such cases (Porat, Halperin, & Tamir, 2016). We therefore expected this motivation to modify the way in which participants were influenced by the

emotions of other group members. Our first hypothesis was that in this context, participants would be more influenced by weaker emotions compared to stronger emotions. Our second hypothesis was that when learning that others' emotions were similar to their own emotions, participants would change their emotions to be weaker than their initial response.

Method

Participants. Previous studies that used a similar task to the one used in the current project have found very strong effects of emotional influence using 20 participants and 200 stimuli (Klucharev, Hytönen, Rijpkema, Smidts, & Fernández, 2009) or 30 participants and a 150 stimuli (Willroth et al., 2017). Since our stimulus set included 100 emotional pictures, we decided to aim for 40 participants in order to reach a similar number of trials as previous studies. Forty Stanford students were recruited in exchange for credit; all were Americans. We omitted 2 participants from the analyses (one participant was removed for misunderstanding the instructions and another for participating in a similar study and recognizing the manipulation) resulting in a sample of 38 participants (23 males, 15 females; age: M = 19.33, SD = 1.12).

Pre-tests. We conducted two pre-tests before running the actual study. The first pre-test was designed to confirm that our stimuli would elicit the desired negative emotions. Analysis of these pre-test pictures suggested that our stimulus set indeed elicited negative emotions, predominantly anger (see supplementary materials). The second pre-test was designed to test our expectation that liberal Americans would be motivated to experience weak negative emotions in response to such pictures. This question was evaluated during a pre-test and not in the actual experiment in order to avoid a situation in which answering this question would affect participants' performance in the task (and vice versa). As expected, we found that participants not only wanted to feel weak negative emotions in the context of outgroup threat, but also

wanted to feel weaker negative emotions than others, which supports the idea that this emotional motive may involve social comparison processes (for details, see supplementary materials).

Stimulus Set. Our final stimulus set included a total of 150 pictures, 100 depicting cases of outgroup threat and 50 neutral pictures. Our outgroup threat pictures were of outgroup members conducting either threatening gestures such as burning the US flag or pictures of actual terror attacks in the US such as the September 11 attacks. Our neutral pictures were pictures of either crowds or cities and were taken from similar studies in which participants' ratings indicated that the pictures indeed elicited very little emotional response. The purpose of the neutral pictures was to buffer the negative effect of the negative pictures.

Procedure. Along with all subsequent studies described here, Study 1 received research ethics committee approval prior to the collection of data. Participants were told that they were taking part in a study with the goal of validating emotional ratings of pictures. According to the instructions, each picture would have to be rated twice for reliability purposes. The study included two phases.

In phase one, participants saw 150 pictures for three seconds each. A hundred of those pictures were of situations eliciting outgroup threat and 50 were neutral pictures (either pictures of urban areas or of crowds, similar to the pilot study). Participants were asked to rate the intensity of their emotions in response to the pictures on a 1 to 8 scale which appeared at the bottom of the screen, 1 indicating not intense, and 8 very intense (see Figure 1 for the trial structure). We chose to use a unipolar scale (weak to strong negative intensity) in order to simplify the task as much as possible. We used a 1-8 scale so that participants would be able to use both hands for the rating while looking at the screen at all times. The participant's rating on each trial was highlighted by a red box.

In phase two, participants were asked to rate the intensity of their emotions in response to the same pictures again. They were told that before each rating they would be shown an average rating of approximately 250 other American participants who completed the study. Participants were not told the exact identity of these 250 participants, however post study interviews suggested that they estimated that these were 250 people like them (Stanford students) who completed the study in exchange for course credits. The ostensible rationale for showing the group ratings was that previous work indicated that this process was helpful in maintaining participants' interest (participants were later asked to estimate the goal of the study to make sure that indeed they were not consciously trying to be aligned with the group).

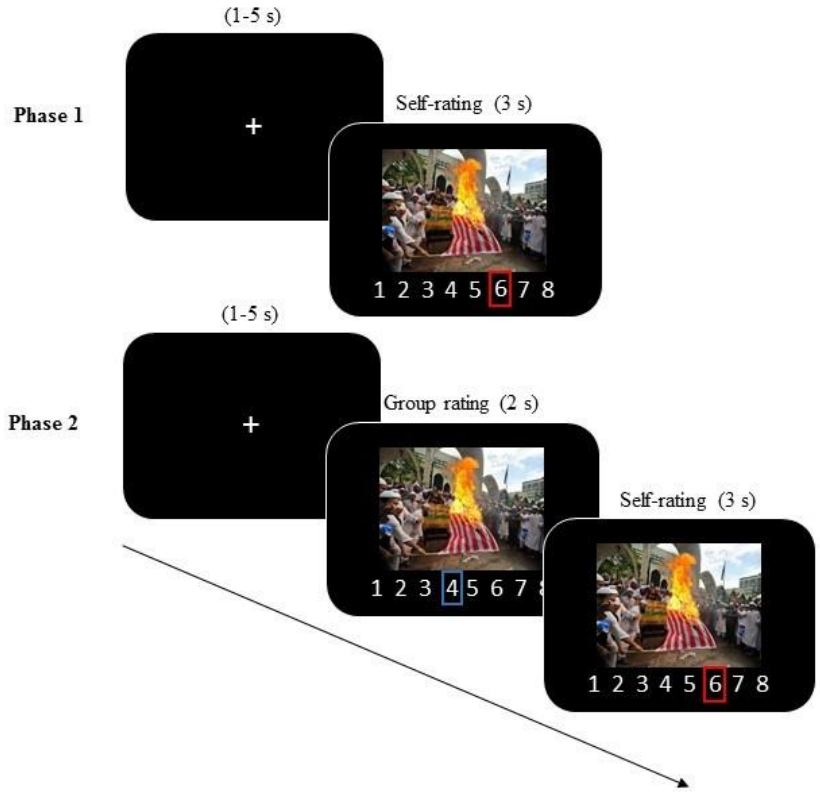

Figure 1. Trial structure for the two phases of the task in Study 1. During the first phase, participants were asked to rate the intensity of their emotional responses to the picture on an 8-

point Likert Scale. During the second phase, participants first saw an average group rating and were then asked to re-rate the intensity of their emotional responses to the picture.

Although participants believed that the group ratings were the average ratings of 250 Americans (validated by a post session interview), the ratings were actually generated by a pseudorandom algorithm that resulted in three trial types. On a third of the trials, the average group emotion was chosen from uniform distribution of 1-3 points weaker than the participant's own rating (weaker group emotion condition). On a third of the trials, the average group emotion was chosen from a uniform distribution of 1-3 points stronger than the participant's own rating (stronger group emotion condition). On a third of the trials, the average group emotion was exactly the same as participants' own rating (same group emotion condition). Comparing the difference between participants' rating in the first phase and the second phase allowed us to see whether different group emotional ratings would lead to changes in participants' own ratings.

Note that the group emotion algorithm was constrained such that a trial could be assigned to the weaker group emotion condition only when the initial rating was stronger than 1, and a trial could be assigned to the stronger group emotion condition only when the initial rating was weaker than 8. We therefore removed these cases (ratings 1 and 8) from our analysis (9.57% of all outgroup threat picture ratings). Removing these ratings also assisted in reducing the possibility of regression to the mean in line with recommendations by Yu and Chen (2015). It did not, however, change the significance of the effects.

Results and Discussion

We analyzed the data from our task using two complementary methods. The first was a mixed model analysis. The second was a linear computational model that we adapted from the

social influence and reinforcement learning literatures. We used these two approaches in tandem because each one allowed us to answer different questions regarding our dataset. Our mixed model analysis provided evidence for changes in participants' emotions as a result of our manipulation. Our computational modeling analysis allowed us to examine whether adding motivation to a similarity only model would improve model fit. Furthermore, it allowed us to separate participants' tendency to show similarity from their tendency to show situation-specific motives and examine the correlation between the two (similarity and motivation). In addition to these two primary analyses, in secondary analyses we explored the connection between these processes and political affiliation and group identification (see supplementary materials).

Mixed Model Analysis. We used only the ratings of the non-neutral pictures in our analysis. To analyze these ratings, we first created a by-participant difference score for each picture, reflecting the change in participants' rating between the first and second phase of the task (before and after receiving the group feedback). A positive difference score for a certain picture indicated that participants' second rating was stronger than their initial rating, and the opposite for a negative difference score. We then conducted a mixed-model analysis in which the group emotion was the independent fixed variable (group emotions were stronger than the participant's emotion, weaker, or the same). We made sure that the intercept of the model was zero in order to compare participants' difference score in each of the conditions to zero. In addition, based on findings that pointed to participants' habituation to the task (see supplementary materials), we controlled for trial number. Finally, we used by-participant and by-picture random intercepts. Results suggested that the difference score in the weaker group emotion condition was significantly weaker than zero (b = -.60 [-.73, -.47], SE = .07, $t(401)$ = -

9.21, $p < .001$, $d = -.91$[1]) and that the difference score in the stronger group emotion condition was also significantly stronger than zero in absolute value (b =.21 [.08, .34], SE = .07, $t(415)$ = 3.24, p = .01, d = .31). These findings suggested that emotional similarity was operative.

In order to test our expectation that the difference score in the weaker condition would be significantly greater than the difference score in the stronger condition, we created a by-participants coefficient of the difference score in each condition. A positive difference coefficient meant that participants' emotional intensity increased between the first and second rating in that specific condition, whereas a negative difference coefficient meant that participants' emotional intensity decreased between the first and second rating in that specific condition. To compare the size of participants' difference coefficients in the strong versus weak conditions, we reversed participants' coefficients in the weak group condition (multiplying these coefficients by -1) and compared them to participants' coefficients in the stronger group emotion condition using a mixed-model analysis (with a by-participant random variable). In line with our first hypothesis, results showed that the difference in participants' ratings between the first and second phase ratings in the weak condition was greater than in the stronger group emotion condition (b =*.33* [.12, .54], SE = .10, t (74) = 3.15, p = .002, d = .72). These findings support our first hypothesis.

We tested our second hypothesis by comparing the difference between participants' first and second rating in the same group emotion condition to zero. This comparison revealed that participants' difference score was lower than zero (b =-.19 [-.32, -.06], SE = .05, $t(408)$ = -2.91, p = .01, d = -.28). These results supported our second hypothesis, suggesting that when participants were exposed to emotions that were similar to their initial ratings, they changed their

[1] Effect sizes were calculated based on recommendations by Westfall et al. (Westfall, Kenny, & Judd, 2014). Also see (Brysbaert & Stevens, 2018).

emotional responses to be weaker than the group's emotions (see Figure 2). See Table 1 for mean averages.

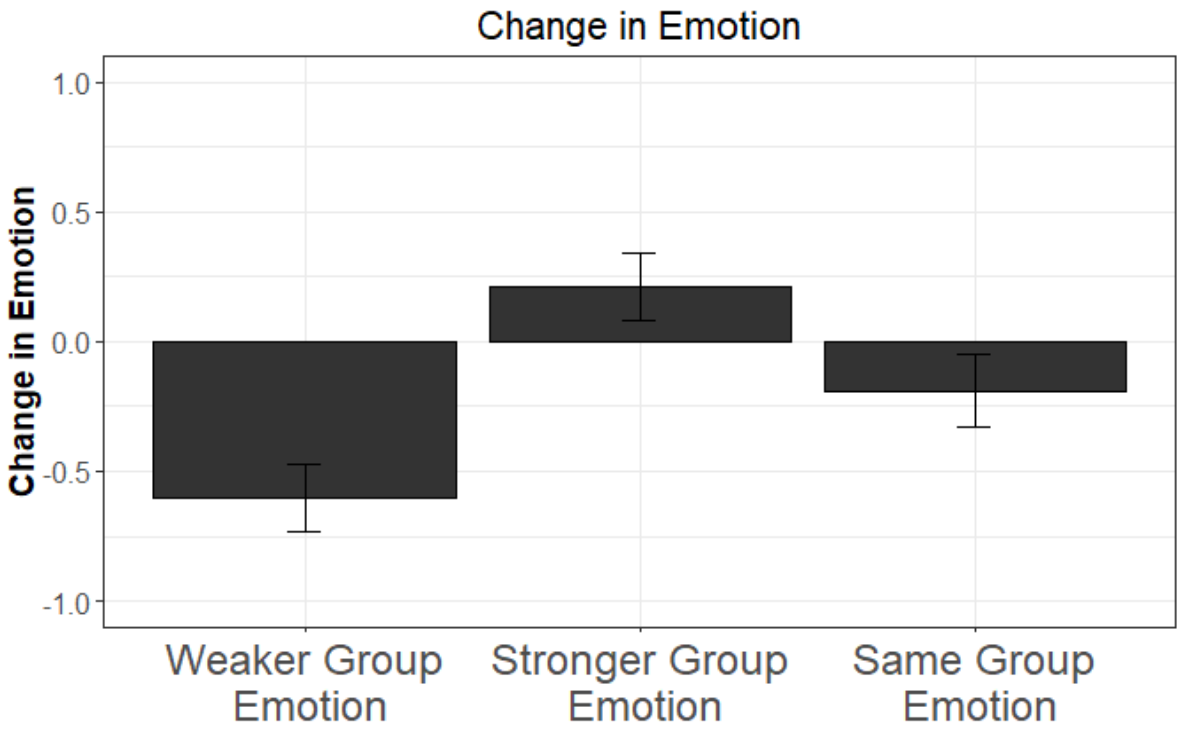

Figure 2. Change in emotional responses based on the perceived group emotion for each of the three conditions in Study 1. When the group emotions were weaker than participants' own emotions, participants' second emotional response was weaker than their initial response. This difference score was significantly larger compared to participants' increase in emotions in the stronger group emotion trials. Finally, when participants learnt that the group's emotions were similar to their own emotions, they changed their emotions to be weaker than their initial ratings.

Table 1. *Group means and standard deviations for the three conditions in each phase in Study 1.*

	Weaker Group Emotion	Stronger Group Emotion	Same Group Emotion
Phase 1	5.50 (1.54)	5.48 (1.51)	5.48 (1.52)
Phase 2	4.90 (1.62)	5.69 (1.57)	5.29 (1.62)

Linear Computational Model. Our starting point was social influence models that have been used in a variety of contexts to explain adjustments in behavior, based on feedback received from others (Kerckhove et al., 2015; Mavrodiev, Tessone, & Schweitzer, 2013). These models are similar in principle to reinforcement learning models (Sutton & Barto, 1998), which are based on the general notion that people adjust their output (in this case their emotional responses) in response to feedback they receive from the environment regarding prior actions (in this case the mean group emotion). We began with what we refer to as a similarity only model:

$$Rating\_2_{i,t} = Rating_{i,t-1} + s_i\ (\overline{Group}_{i,t-1} - Rating\_1_{i,t-1}) + h_i \qquad (1)$$

Where $Rating\_2_{i,t}$ is participants' ratings at time phase 2 and $Rating\_1_{i,t-1}$ is participants' ratings at Phase 1. s_i is an individual-level parameter indicating the degree of similarity for each participant and it is multiplied by the difference between the group rating ($\overline{Group}_{i,t-1}$) and the individual rating ($Rating\_1_{i,t-1}$) in Phase 1. In addition, we added the term h_i to indicate the habituation participants may experience as a result of watching the stimuli for the second time. This h_i coefficient is estimated by looking at order effects that may affect the results (similar to controlling for order in the analysis). Including a habituation term in the model strengthened the results. However, the same results hold without the addition of a habituation term.

Two theoretical assumptions are incorporated in this similarity only model. First, the model assumes that emotional influence is a symmetrical process and that people are influenced to similar degrees by the group's emotion, whether the group emotion is stronger or weaker than their own emotion. Second, the model makes the assumption that in cases in which the group's emotion is similar to the individual's initial rating ($\overline{Group}_{i,t-1} - Rating\_1_{i,t-1} = 0$), participants will not update their emotion ratings from Phase 1 to Phase 2 ($Rating\_2_{i,t} = Rating\ 1_{i,t-1}$).

For an emotional influence model that includes similarity and motivation (titled similarity + motivation model), we adjust model 1 to include a parameter that captures participants' motivation:

$$Rating\ 2_{i,t} = Rating\ 1_{i,t-1} + s_i\ (\overline{Group}_{i,t-1} - Rating\ 1_{i,t-1}) + h_i + m_i \qquad (2)$$

Our similarity + motivation model is similar to the similarity only model, with the addition of a motivation parameter (m_i). A participant's motivation parameter represents a context-specific increase or decrease to the degree participants were influenced by other group members' emotions. This weight adds directionality to the way group members are influenced by others' emotion (depending on whether the parameter is positive or negative).

This simple addition changes the two basic assumptions of the similarity only model (corresponding to hypotheses 1 and 2). First, the adjusted model assumes that similarity is not a symmetrical process. In cases in which the group emotion is different than the individual's initial emotion, the motivation parameter, if it is indeed negative, leads to a boost in similarity towards weaker group emotions and reduces the degree of influence of stronger group emotions. Second, our model makes the assumption that in cases in which the group's emotion is similar to the

individual's initial rating ($\overline{Group}_{i,t-1} - Rating\ 1_{i,t-1} = 0$), participants will adjust down their emotion rating to account for their motivation ($Rating\ 2_{i,t} = Rating\ 1_{i,t-1} + m_i$). We were therefore interested in comparing the similarity only and the similarity+ motivation models in predicting the data from Study 1.

We first adjusted both models to permit easy comparison. This enabled us to treat the similarity only model as a linear model with only a slope s_i, compared to the similarity + motivation model with a slope s_i and an intercept m_i :

$$Rating\_2_{i,t} - Rating\_1_{i,t-1} = s_i\ (\overline{Group}_{i,t-1} - Rating\ 1_{i,t-1}) + h_i \quad (3)$$

$$Rating\_2_{i,t} - Rating\_1_{i,t-1} = s_i\ (\overline{Group}_{i,t-1} - Rating\_1_{i,t-1}) + h_i + m_i \quad (4)$$

We conducted a linear regression using the similarity + motivation model in order to predict the data of Study 1. Results indicated that the intercept of the model (m_i) was negative and significantly different than zero (*M* =-.20 [-.29, -.10], *SE* = .05, *t*(3283) =-4.05, *p* < .001) suggesting that participants' motivation was to experience weak emotions. We then compared the similarity + motivation model to the similarity model, using a likelihood ratio test for nested models (penalizing the motivate model for an additional parameter). Results indicated that the similarity + motivation model was significantly better compared to the similarity model ($\chi^2(1)$ = 16.43, p < .001).

Given that the similarity + motivation model was more successful than the similarity only model at predicting the results of Study 1, we were interested in learning more about the relationship of participants' motivation (m_i) and similarity (s_i). We estimated the parameters for each participant (see Figure 3 for the distribution of these parameters). Overall, it seemed that the

mean of the distribution of the similarity parameter was positive but that the mean of the motivation parameter was negative (marked by the dotted line). We then correlated the similarity and motivation parameters. Results indicated that the two parameters were uncorrelated with each other ($r(37) = .22$ [-.10, .50], $p = .17$). We interpret this lack of correlation between the similarity and motivation parameters as indicating that the extent to which an individual tends to generally conform to other group members' emotions is unrelated to the degree to which that individual is motivated to have low levels of emotion in that particular context.

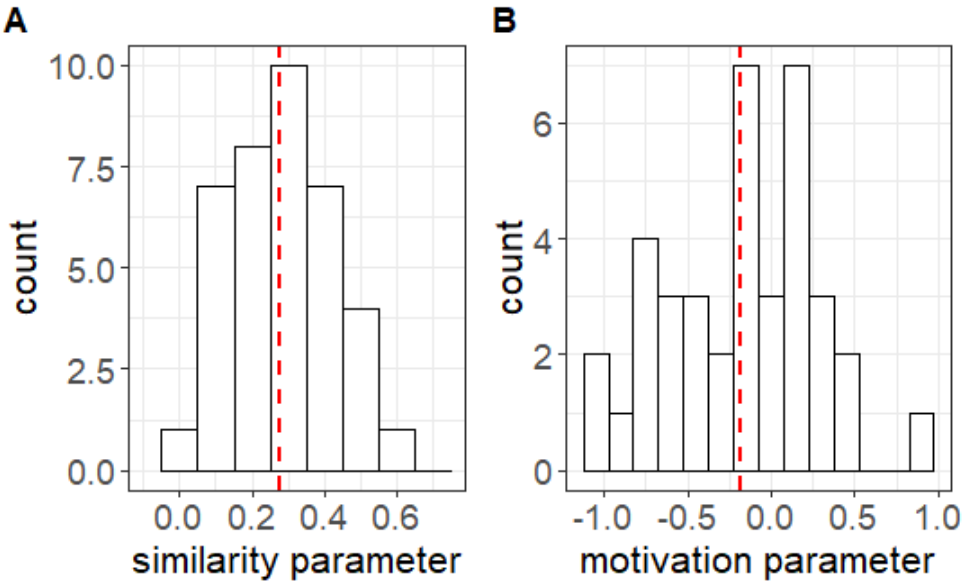

Figure 3. The distribution of the similarity and motivation parameters in Study 1. The mean of the similarity parameter was higher than zero (reflected by the dotted line) while the mean of the motivation parameter was lower than zero. The two parameters were uncorrelated with each other.

Overall, results of Study 1 point to a bias in the way participants were influenced by other group members' emotions in this particular context such that participants were more influenced by weaker group emotions compared to stronger group emotions. We interpret this finding as

suggesting that the emotional motives operative in this situation (that were measured in the pre-test) influenced the degree to which participants were influenced by the group's emotions. In addition, when learning that the other group members' emotions were similar to their own emotions, participants adjusted their emotional responses to be weaker than they were initially. We interpret this finding as suggesting that motivational forces may lead individuals to adjust their emotional responses even when similarity pressures are absent. Our computational modeling approach suggested that our similarity + motivation model was better in predicting participants' emotional responses than a similarity only model, even when applying a penalty for the additional parameter. Finally, results suggested that participants' emotional similarity did not correlate with participants' strength of emotional motivation, as captured by the model.

Although results of Study 1 provide initial support for our hypotheses, one important question is whether our findings were influenced by participants' habituation to the pictures over time. Although we statistically controlled for habituation, it is nonetheless possible that the reduction in emotional ratings from the first to the second phase was caused by habituation to the pictures. In order address this concern, we sought to examine the role of situation-specific emotional motives in a context that we believed would activate a motive to feel strong (rather than weak) emotions. Our expectation was that the situation-specific motives in this situation would lead to results that were a mirror image of those obtained in Study 1.

Study 2:

Emotional Influence in Response to Ingroup Immoral Behavior in the Laboratory

The goal of Study 2 was to examine processes of emotional influence in a situation in which participants have a clear preference to have strong negative emotions, both in an absolute

sense and in relation to other group members. To achieve this goal, we conducted a laboratory study using pictures of ingroup immoral behavior in a relatively liberal college student population (American citizens at Stanford University). We expected – and validated in a set of pilot studies – that these participants would be motivated to express strong negative emotions in comparison to other Americans, in response to situations of ingroup immoral behavior. Our expectation that this type of stimuli would elicit a strong motivation for high negative emotions is based both on findings that show that such stimuli indeed elicit stronger emotions in a liberal sample (Pliskin, Halperin, Bar-Tal, & Sheppes, 2018), as well as on evidence that liberals are more affected by moral intuitions relating to harm to others (Graham, Haidt, & Nosek, 2009; Haidt & Graham, 2007; Schein & Gray, 2015). Based on the assumption that our sample would be motivated to experience strong negative emotions in response to these stimuli, we had two hypotheses. Our first hypothesis was that in this context, participants would be more influenced by stronger emotions compared to weaker emotions. Our second hypothesis was that when learning that others' emotions were similar to their own emotions, participants would change their emotions to be stronger than their initial response.

Method

Participants. As in Study 1**,** we recruited 40 Stanford students in exchange for credit; all were Americans. We removed one participant who personally knew people that appeared in the Abu Ghraib pictures and asked to stop the experiment, resulting in 39 participants (12 males, 27 females; age: M = 18.89, SD = 1.68).

Pre-tests. We conducted two pre-tests before running the actual study. The first pre-test was designed to confirm that our stimuli would elicit the desired negative emotions. Analysis of these pre-test pictures suggested that our stimulus set indeed elicited negative emotions,

predominantly anger and guilt (see supplementary materials). The second pre-test was designed to test our expectation that liberal Americans would be motivated to experience strong negative emotions in response to such pictures. This question was evaluated during a pre-test and not in the actual experiment in order to avoid a situation in which answering this question would affect participants' performance in the task (and vice versa). As expected, we found that participants not only were motivated to feel strong negative emotions in the context of ingroup immoral behavior, but also were motivated to feel stronger negative emotions than others, which supports the idea that this emotional motive may involve social comparison processes (for details, see supplementary materials).

Stimulus Set. Our final stimulus set included a total of 100 pictures, 50 depicting cases of ingroup immoral behavior and 50 neutral pictures. Our ingroup immoral behavior pictures were of American soldiers behaving immorally towards outgroup members (e.g., the Abu Ghraib incident in which American army personnel abused prisoners of war; or American soldiers threatening children and women in combat zones). Our neutral pictures were similar to those in Study 1. We used fewer pictures than in Study 1 because during our pre-tests, we learnt from participants that observing the pictures was emotionally taxing. In order to get an indication of whether reducing the number of pictures would yield to the appropriate effects, we conducted a power analysis of the findings in Study 1. Our analysis suggested that 50 pictures would produce power above 80% (see supplementary materials).

Procedure. The instructions and procedure were identical to Study 1. As in Study 1, the group emotion algorithm was constrained such that a trial could be considered as a weaker group emotion condition only when the initial rating was stronger than 1, and a trial could be assigned to the stronger group emotion condition only when the initial rating was weaker than 8. We

therefore removed these cases (ratings 1 and 8) from our analysis (26% of all ingroup immoral behavior picture ratings). Removing these ratings also assisted in reducing the possibility of regression to the mean in line with recommendations by Yu and Chen (2015). Not removing these non-randomized trials from the analysis did not change the significance of the findings in the weak and strong group emotion conditions, but it did weaken the results of the same group emotion condition to become marginally significant.

Results and Discussion

We analyzed our task using two complementary methods as in Study 1.

Mixed Model Analysis. As in Study 1, we created by-participant, by-picture difference scores. We first compared the difference score to zero for both the weaker and stronger group mean conditions. Results indicated that when learning that the group emotions were weaker than their own ratings, the difference between participants' first and second emotional ratings was only marginally different than zero (b = -.*16* [-.32, .01], SE = .08, $t(370) = -1.90$, $p = .06$, d = -.16). However, as predicted, when learning that the group emotions were stronger than their own ratings, participants' second ratings were stronger and significantly different than zero (b =.46 [.28, .60], SE = .08, $t(369) = 5.37$, $p < .001$, d = .48). In order to test whether the difference score in the stronger condition was significantly greater than the difference score in the weaker condition, we created a by-participants coefficient of the difference score in each condition. We then compared the size of participants' difference coefficients in the strong versus weak conditions. This was done by reversing participants' coefficients in the weak group condition (multiplying these coefficients by -1) and comparing them to participants' coefficients in the strong condition using a mixed-model analysis (with a by-participant random variable). In line with our first hypothesis, results showed that the difference in participants ratings between the

first and second phase ratings in the strong condition was significantly stronger compared to the weak condition in absolute values (b =-.37 [-.65, -.08], SE = .14, $t(76)$ = -2.57, p = .01, d = -.58, Figure 4). To test hypothesis 2, we compared the difference score in the same group emotion condition to zero, showing that participants' second emotional response was significantly stronger than zero (b =.19 [.02, .35], SE = .08, $t(381)$ = 2.28, p = .02, d = .20). These results supported our second hypothesis, suggesting that participants changed their emotional responses to be stronger than the group's emotions (see Figure 4). See Table 2 for mean averages.

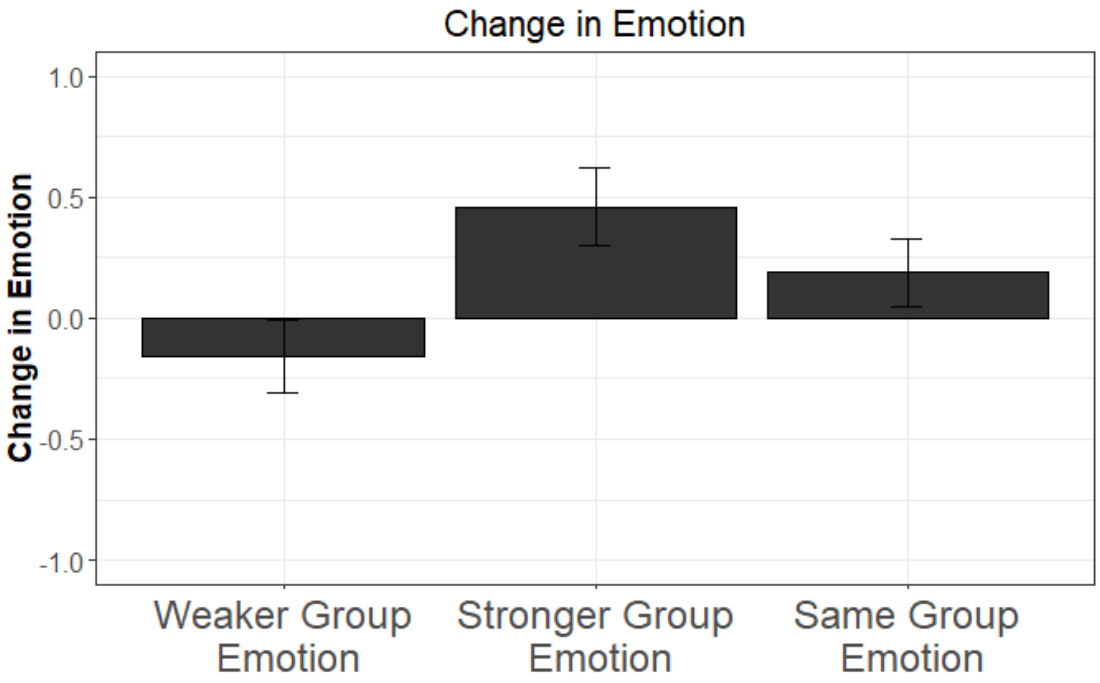

Figure 4. Change in emotional responses based on the perceived group emotion for each of the three conditions in Study 2. When the group emotions were weaker than participants' own emotions, participants' second emotional response was weaker than their initial response. This difference score was significantly smaller compared to participants' increase in emotions in the stronger group emotion trials. Finally, when participants learnt that the group's emotions were

similar to their own emotions, they changed their emotions to be stronger than their initial ratings.

Table 2. Group means and standard deviations for the three conditions in each phase in Study 2.

	Weaker Group Emotion	Stronger Group Emotion	Same Group Emotion
Phase 1	6.23 (1.16)	6.21 (1.19)	6.13 (1.18)
Phase 2	6.08 (1.28)	6.75 (1.31)	6.32 (1.35)

Linear Computational Model. As in Study 1, we used equations 3 and 4 (above) to compare the similarity only model, a linear model with a slope s_i, to the similarity + motivation model, a linear model with a slope s_i and an intercept m_i. Results indicated that the intercept of the similarity + motivation model was positive and significantly different than zero (M =.24 [.11, .37], SE = .06, $t(1353)$ =3.77, $p < .001$) suggesting that participants' overall motivation was indeed to feel strong emotions in this context. We then compared the similarity + motivation model to the similarity model, using a likelihood ratio test for nested models. Results indicated that the similarity + motivation model was significantly better compared to the similarity model ($\chi^2(1) = 14.2$, $p < .001$).

Based on the fact that the similarity + motivation model was more successful than the similarity only model at predicting the results of Study 2, we were interested in learning more about the relationship of participants' motivation (m_i) and similarity (s_i). We estimated the parameters for each participant (see Figure 5 for the distribution of these parameters). Overall, it seemed that both the mean of the distribution of the similarity parameter and the mean of the motivation parameter were positive (marked by the dotted line). We then correlated the similarity

and motivation parameters. Results indicated that the two parameters were uncorrelated ($r(37)$ = -.03 [-.34, .28], p = .85). These findings suggest that participants' tendency for similarity and motivation were separate drivers of participants' behavior.

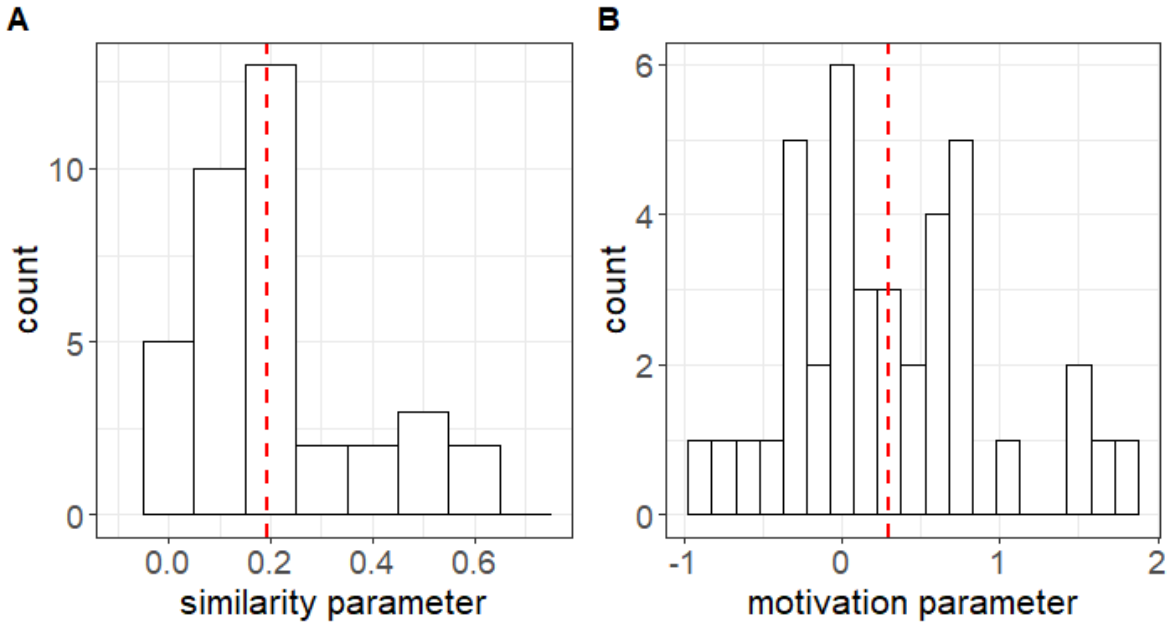

Figure 5. The distribution of the similarity and motivation parameters in Study 2. The mean of the similarity parameter was higher than zero (reflected by the dotted line) as well as the mean of the motivation parameter. The two parameters were uncorrelated.

Results of Study 2 provide clear support for our hypotheses, this time in a situation that activated an emotional motive to feel strong negative emotions. Results in our mixed model analysis suggest that participants were more influenced by stronger, compared to weaker group emotions. Furthermore, when learning that other group members expressed similar emotions to their own emotions, participants increased their emotions to be stronger than those of the group (and their own initial emotional ratings). Results of our linear computational model indicated that

a motivational model is superior to a similarity only model. Furthermore, participants' tendency to be influenced by their group was again uncorrelated with their context-specific emotional motivation.

Study 3:

Adding a Control Condition and Testing Moderation by Explicit Motivation Measure

The goal of Study 3 was to address two important questions that arose from Studies 1 and 2. The first question pertains to participants' emotional responses in the absence of any group feedback. The design of Studies 1 and 2 did not allow us to see whether ratings would change even without information about others' emotions. To examine this question, in Study 3 we replicated Study 1 but added a fourth condition to the task (in addition to group weaker, stronger, and same emotion) in which participants did not receive any group feedback. We hypothesized that in such condition, we would see no difference in participants' emotional ratings.

The second question raised by Studies 1 and 2 is whether participants' emotional motivation moderates participants' change in emotion during the task. So far, participants' motivation was measured in a separate pre-study, with questions about the motivation to express stronger and weaker emotions framed in absolute terms (i.e., unrelated to other group members' emotions). In this study we refined our measure to directly assess participants' motivation to express stronger or weaker emotions compared to their group. This was done for the same participants that completed our task. We hypothesized that the stronger a participant's motivation was to feel weaker emotions than other Americans, the larger the difference would be between that participant's first and second ratings.

Method

Participants. Power analysis of Studies 1 and 2 suggested that 30 participants would be enough to achieve the desired effect (see Supplementary Materials). However, in order to accommodate for the added condition (no group emotion condition), we increased the number of stimuli from 100 to 120.

Stimulus Set. Our final stimulus set included a total of 180 pictures, 120 depicting cases of outgroup threat and 50 neutral pictures. Both the outgroup threat picture and neutral pictures were similar to those of Study 1 with the addition of a few new outgroup threat pictures.

Measures. To measure participants' motivation in response to the pictures we used a measure that was similar to the one used in the Study 1 and 2 pre-tests, with a modification to better reflect our desire to look at social comparison. Participants saw a sample of pictures that were used in the study and were asked: "When you look at the pictures above, do you want to feel stronger or weaker negative emotions in response to these pictures than other Americans?" Instead of the scale in the Study 1 and 2 pre-tests, the current scale was from -50 (much weaker than others) to 50 (much stronger than others), 0 being neutral. Participants completed this measure after completing the task. In addition, we measured participants' political affiliation and identification with the group using similar scales to Studies 1 and 2 (see supplemental materials).

Procedure. The instructions and procedure were identical to Study 1 with the addition of a fourth, no group emotion condition. In this condition, participants received no indication regarding the average group emotion and were just asked to re-rate the pictures. As in Studies 1 and 2, the group emotion algorithm was constrained such that a trial could be considered as a weaker group emotion condition only when the initial rating was stronger than 1, and a trial could be assigned to the stronger group emotion condition only when the initial rating was weaker than 8. We therefore removed these cases (ratings 1 and 8) from our analysis (11% of all

outgroup threat picture ratings). Removing these ratings also assisted in reducing the possibility of regression to the mean in line with recommendations by Yu and Chen (2015). It did not, however, change the significance of the effects. This study was conducted as part of a larger project that included EEG (with a set of analysis that was designed to ask different questions than the one in this study); these measures will be the subject of a separate report.

Results and Discussion

Similar to Study 1 and 2, we analyzed the data from our task using two complementary methods, a mixed model analysis and a linear computational model. In addition to these two primary analyses, in secondary analyses we explored the connection between these processes and political affiliation and group identification (see supplementary materials).

Mixed Model Analysis. We used only the ratings of the non-neutral pictures in our analysis. To analyze these ratings, we first created a by-participant difference score for each picture, reflecting the change in participants' rating between the first and second phase of the task (before and after receiving the group feedback). A positive difference score for a certain picture indicated that participants' second rating was stronger than their initial rating, and the opposite for a negative difference score. We then conducted a mixed-model analysis comparing each of these conditions to zero (intercept = 0). Finally, we used by-participant and by-picture random intercepts. Looking first at the no group emotion condition, results indicated that the difference score was not significantly different from zero (b =-.04 [-.23, .15], SE = .09, $t(108)$ = -.40, p = .68, d = -.02). These results suggested that when participants received no group feedback, their first rating was similar to their second rating. Looking at the difference score for the weaker group emotion condition suggested a significant reduction between the first and second rating (b =-.29 [-.48, -.10], SE = .09, $t(110)$ = -3.02, p < .001, d = -.23). However, the

change in participants' ratings was not significant in the stronger group emotion condition (*b* =.15 [-.03, .34], *SE* = .09, *t*(104) = 1.56, *p* = .12, *d* = .12). Finally, our analysis revealed that when participants saw a group rating that was similar in emotional intensity to their own initial rating, they changed their rating to be significantly weaker than the group's emotion (and their own) (*b* =-.22 [-.41, -.03], *SE* = .09, *t*(108) = -2.27, *p* = .02, *d* = -.17, see Figure 6). See Table 3 for mean averages.

Figure 6. Change in emotional responses based on the perceived group emotion for each of the three conditions in Study 3. When no group feedback was present, participants' second response was similar to their initial response. When the group emotions were weaker than participants' own emotions, participants' second emotional response was weaker than their initial response. This difference score was significantly larger compared to participants' increase in emotions in the stronger group emotion trials. Finally, when participants learnt that the group's emotions were similar to their own emotions, they changed their emotions to be weaker than their initial ratings.

Table 3. *Group means and standard deviations for the three conditions in each phase in Study 3.*

	No Group Emotion	Weaker Group Emotion	Stronger Group Emotion	Same Group Emotion
Phase 1	5.31 (1.59)	5.32 (1.59)	5.38 (1.59)	5.41 (1.60)
Phase 2	5.27 (1.78)	4.98 (1.74)	5.50 (1.71)	5.15 (1.78)

We next examined whether participants' motivation to express stronger or weaker emotions than other group members moderated the difference between their first and second rating. To answer this question, we first excluded the no group emotion condition, as motivation should not have affected the ratings in this condition. We then examined the interaction between rating (first or second) and participants emotional motivation, looking at participants' emotional rating as the dependent variable. Similar to our previous analyses, we controlled for the presentation order of the pictures and used a by-participant and a by-picture random variables for our analysis. Looking first at the main effects of the analysis, results indicated a significant positive correlation between the motivation to feel weaker or stronger emotions in relation to others and participants' ratings, such that weaker motivation predicted a decrease in ratings (b = .56[.28, .84], SE = .14, $t(29) = 3.95$, $p > .001$, d = .33). Results also indicated that overall, participants' second rating was weaker than their initial ratings, as expected from the above results (b = -.11 [-.14, -.07], SE = .01, $t(4394) = -6.59$, $p > .001$, d = .64). Finally results also revealed a significant interaction between rating (first or second) and participants' motivation, such that participants' second rating was weaker than their first rating when participants' motivation was to express emotions weaker than other Americans (b = .06 [.03, .09], SE = .01 $t(4394) = 3.69$, $p > .001$, d = .36, Figure 7). These results are consistent with our expectation that

participants' motivation was one of the drivers of the difference between participants' first and second ratings.

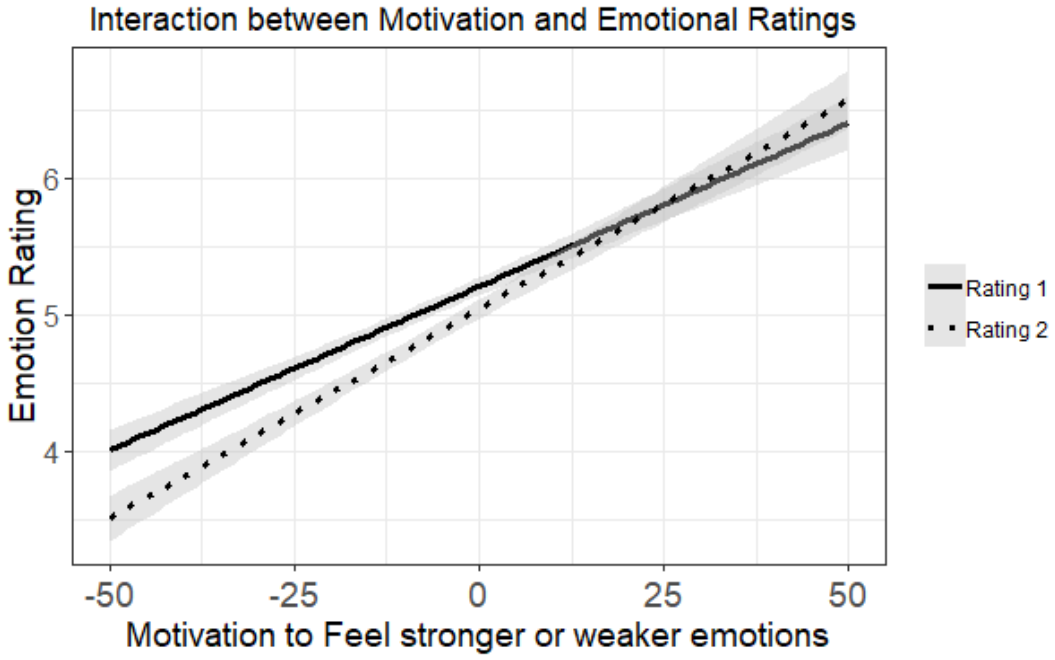

Figure 7. Interaction between participants' rating number (first and second) and their emotional motivation to express stronger or weaker emotions than others in their group. Results reveal a significant interaction such that participants' second rating is weaker than their first rating when their motivation is to feel less strong emotions than others in their groups.

Finally, we examined whether motivation affected some conditions more than other by creating a three-way interaction between participants' motivation, the condition, and the type of rating (first or second) predicting participants' rating. Results suggested that the three-way interaction was non-significant. This suggest that the effect of motivation on changes in ratings was consistent across conditions and did not influence one condition more than the rest.

Linear Computational Model. As in Studies 1 and 2, we used equations 3 and 4 (above) to compare the similarity only model, a linear model with a slope s_i, to the similarity + motivation model, a linear model with a slope s_i and an intercept m_i. Here again we removed the no group emotion condition from our analysis. Results indicated that the intercept of the similarity + motivation model was negative and significantly lower than zero (*M* =-.22 [-.36, -.08], *SE* = .07, *t*(2270) =-3150, *p* = .001) suggesting that participants' overall motivation was indeed to feel weaker emotions in this context. We then compared the similarity + motivation model to the similarity model, using a likelihood ratio test for nested models. Results indicated that the similarity + motivation model was significantly better compared to the similarity model ($\chi^2(1)$ = 19.92, p = .001).

Based on the fact that the similarity + motivation model was more successful than the similarity only model at predicting the results of Study 3, we were interested in learning more about the relationship of participants' motivation (m_i) and similarity (s_i). We estimated the parameters for each participant (see Figure 8 for the distribution of these parameters). As with Study 1, while the similarity parameter was greater than zero, the motivation parameter was less than zero (marked by the dotted line). We then correlated the similarity and motivation parameters. Similar to Studies 1 and 2, results indicated that the two parameters were uncorrelated (*r*(28) = .07 [-.29, .42], *p* = .68). These findings suggest that participants' tendency for similarity and motivation were separate drivers of participants' behavior.

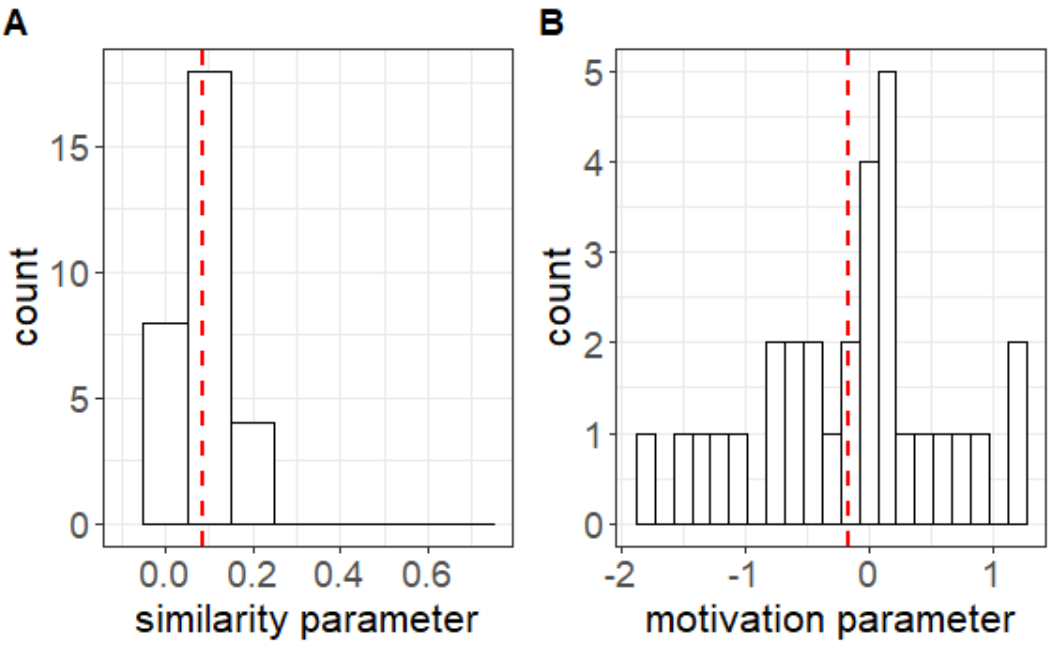

Figure 8. The distribution of the similarity and motivation parameters in Study 3. The mean of the similarity parameter was higher than zero (reflected by the dotted line) but the mean of the motivation parameter was lower than zero. The two parameters were uncorrelated.

Results of Study 3 address key questions raised by Studies 1 and 2 and replicate the findings of Study 1. First, results suggest that with a lack of group information, participants' ratings in the first phase are similar to their ratings in the second phase. Second, the difference between the first and second ratings is moderated by participants' emotional motivation for social comparison. Stronger motivation to feel weaker emotions compared to other Americans led to bigger reduction in participants' ratings between the first and second phase of the task. Taken together, our findings suggest that these results are robust, but it remains to be seen whether the effects identified in these laboratory studies would also be evident in the context of

natural emotional interactions in everyday life. The goal of Study 4 was to address this question by looking at natural interactions occurring on Twitter.

Study 4:

Emotional Influence in Response to the Ferguson Unrest on Twitter

The goal of Study 4 was to extend the findings of Studies 1-3 and examine processes of emotional influence in natural emotional exchanges on social media. To achieve this goal, we sought a situation similar to Study 2, in which we believed participants would be motivated to express strong negative emotional responses. Unlike our lab studies, we could not pretest whether users were motivated to experience strong negative emotions on Twitter. However, we chose to analyze tweets from the Ferguson unrest. The phrase "Ferguson unrest" refers to the outrage that followed the shooting of Michael Brown on August 9th, 2014 by the white police officer Darren Wilson. Outrage on social media in response to the incident was very strong and eventually grew into a full-blown social movement around the United States. We expected that users who tweeted about the Ferguson unrest would be motivated to express stronger emotions to emphasize their outrage in response to the incident. One way to affirm this prediction for users' motivation is by showing that the tweets were mostly written by liberals, which we show in our analysis. The fact that the current sample is predominantly liberal makes the set of predictions very similar to the ones of Study 2.

The outrage that was expressed on Twitter during the Ferguson unrest was one of the driving forces of the Black Lives Matter movement (BLM), a civil movement focused on collective action against police brutality towards Blacks in the Unites States. Previous analyses of the BLM movement has suggested that most of its Twitter activity was generated by liberal users who expressed outrage against police brutality (Garza, 2015). This supports a more general

observation that when people participate in social movements on social media, they attempt to maximize their outrage in order to prove loyalty to the cause and receive attention (Alvarez et al., 2015; Castells, 2012; Crockett, 2017; Droit-Volet & Meck, 2007).Therefore, the outrage expressed during the Ferguson unrest provided us with a field context for examining the laboratory effects we observed in our lab studies.

Method

We gathered tweets (brief public messages posted to twitter.com) in English which contained the keywords "#Ferguson", "#MichaelBrown", "#MikeBrown", "#Blacklivesmatter" and "#raceriotsUSA." We chose to use hashtags as search terms based on recommendations from previous studies suggesting that hashtags provide a useful filter to receive both relevant context as well as content that is mostly produced by people who support the specific cause (Barberá, Wang, et al., 2015; Tufekci, 2014). Tweets were collected from a period of nearly four months starting from August 9th 12:00PM to December 8th 12:00AM. The data was downloaded via GNIP (gnip.com) which allows users to download full archives of tweets related to a certain search. The total number of collected tweets was 18,816,807 which were generated by 2,411,219 unique users. Out of these tweets, 3,149,026 were original tweets (users writing their own texts), 618,192 were replies (users replying to someone else's tweet), and 15,102,222 were retweets (users merely sharing previously written tweets). A small portion of retweets included an original text from the user and were therefore counted as both replies and retweets.

Sentiment Analysis. To detect the emotion expressed in each tweet, we used the sentiment analysis tool SentiStrength, which is specifically designed for short, informal messages from social media (Thelwall, Buckley, & Paltoglou, 2012). SentiStrength takes into account syntactic rules like negation, amplification, and reduction, and detects repetition of

letters and exclamation points as amplifiers. It was designed to analyze online data and considers Internet language by detecting emoticons and correcting spelling mistakes. Compared to other sentiment analysis tools, SentiStrength has been shown to be especially accurate in analyzing short social media posts (Ribeiro, Araújo, Gonçalves, André Gonçalves, & Benevenuto, 2016). The analysis of each text using SentiStrength provides two scores (discrete numbers) ranging from 1-5, one score for positive intensity and one score for negative intensity. As we were interested in negative emotions, we focused our analyses on results of the negative sentiments. However, combining the negative and positive values led to similar results as the variance in the positive evaluations was relatively small.

Political Affiliation Analysis. One of the important characteristics of Studies 1-3 is that they exposed emotional processes beyond similarity occurring between ingroup members. Participants in these studies were mostly liberals who assumed that they were interacting with other mostly liberal participants. In order to make sure that the Twitter interactions we saw were reflecting intragroup dynamics rather than intergroup conflicts we decided to estimate participants' political affiliation. We took inspiration from recent studies that calculated Twitter users' political affiliation based on whether they were following more liberals or conservatives. The idea was that users who tend to follow Twitter accounts with a clear political affiliation are more likely to have a similar political affiliation (for similar discussion, see Bail et al., 2018; Barberá, Jost, Nagler, Tucker, & Bonneau, 2015; Brady, Wills, Jost, Tucker, & Van Bavel, 2017). To achieve this goal we used a list of 4,176 public figures and organizations whose political affiliations were evaluated in a recent study by Bail and colleagues (see Bail et al., 2018). We then gathered a complete follower list of a sample of our Ferguson dataset containing 104,831 users (total list size was 196.9 million users). Out of the sample that was gathered,

89.6% of the users were following at least one of these political Twitter accounts and 82.4% followed at least two of these accounts. We then examined how many participants followed more liberals than conservatives. Results suggested that out of our 104, 831 users, 84.5% of participants followed more liberal Twitter accounts compared to conservative ones. This provided us with strong evidence that the discussion we were observing was largely an intragroup discussion. These findings are also congruent with other analyses suggesting that Twitter interactions are ingroup interactions (Boutyline & Willer, 2017; Brady et al., 2017).

Results

The overarching goal of this study was to examine how exposure to others' emotions leads to changes in an individual's emotions. One challenge with analyzing Twitter data is that we do not have all the information regarding the emotions that participants were exposed to. However, an estimate of these emotions can be made using two approaches, each with its own advantages and disadvantages. We therefore decided to take both approaches, and see if they converged. Below we describe both approaches and show that they lead to similar results.

Our first approach, which we call the group average approach, is inspired by Ferrara and Yang's recent work on emotional contagion on Twitter (Ferrara & Yang, 2015). Ferrara and Yang examined changes in users' emotional expressions between a first and second tweet as a function of their exposure to others' emotions. Others' emotions were estimated by computing an average of the emotional content of similar tweets that preceded the users' second tweet. The time window used by Ferrara and Yang was one hour before users' second tweet. The assumption made by the authors is that this group average of tweets represents the emotional background in which participants were operating. Using this average approach, Ferrara and Yang were able to show patterns of emotional influence, but they did not report any bias in the degree

of influence between strong and weak emotions, as expected from our own analysis. The strength of this approach is that it simulates exposure to emotions of multiple group members, which is more similar to our operationalization of the group emotions in Studies 1-3. Its obvious limitation, however, is that we cannot know for certain that participants indeed saw these tweets before writing their second tweet.

Our second approach, which we call the original-reply approach, was designed to overcome the main limitation of the group average approach. In this analysis, we again examine cases in which participants wrote two tweets, and we look at emotional changes between those two tweets. However, this time we focus our attention on situations in which the second tweet was a reply to another user (see Figure 10 for a visual representation of our data reduction). The benefit of using replies as the second tweet is that we know exactly what participants saw before writing their second tweet. This is a tremendous advantage over the group average approach. The limitation of this approach is that we are examining emotional influence as a function of exposure to one group member rather than multiple members, which makes this analysis slightly different from those of Studies 1-3. Overall, we believe that these two approaches are complementary and together provide a better understanding of emotional influence.

Group Average Approach. To examine emotional influence using the group average approach, we first took all of the users who wrote more than one Ferguson related tweet (N=919,995). We then organized these tweets into tweet pairs. We then eliminated all of the tweet pairs that were written in a period of less than an hour from each other in order to calculate a one-hour window between the two tweets (not removing these tweets does not change the direction or significance of the results). We then calculated an average of all Ferguson related

tweets that were written up to an hour before participants' second tweet. This average rating represents the mean group emotion preceding participants' second tweet.

To analyze changes in users' emotions, we first created a by-user difference score, reflecting the difference in users' emotions between the first and second tweet. A positive difference score for a certain pair indicated that users' second tweet was stronger than their initial tweet, whereas a negative difference score for a certain pair indicated that users' second tweet was weaker than their initial tweet. We then divided the data into two conditions: weaker group emotion condition, in which the average of tweets preceding users' second tweet was weaker than users' initial tweet; and stronger group emotion condition, in which the moving average of tweets preceding users' second tweet was stronger than users' initial tweet. We could not estimate a same group emotion condition (this will be estimated in the original reply approach), as participants' ratings were whole numbers, while the moving averages were all non-whole numbers (see Figure 9A for a density plot of the moving average). This meant that the moving average was never similar to users' initial rating. Furthermore, due to the fact that the moving average was mostly a number between 1 and 2 (Figure 9A) we could not remove the cases in which participants' first rating was 1 or 5 as this would eliminate all of the stronger group rating trials.

Having these two conditions, we conducted a mixed-model analysis in which the group emotion was the independent fixed variable (group emotions were stronger than the participant's emotion, or weaker). We made sure that the intercept of the model was zero in order to compare participants' difference score in each of the conditions to zero. In addition, we used by-participant random intercept. Results suggested that the difference score in the weaker group emotion condition was significantly less than zero (b = -.69 [-.688, -.697], SE = .002, t(425,600)

= -285.2, $p < .001$, $d = -.58$) and that the difference score in the stronger group emotion condition was significantly greater than zero in absolute value (b =.84 [.847, .836], SE = .002, $t(425{,}600)$ = 314.4, $p < .001$, $d = .72$). These findings suggest that emotional similarity was operative. Similar to Studies 1-3, we compared the difference in users' tweets based on whether they were exposed to content that was weaker or stronger in emotional intensity than their initial tweet. This was done by reversing the difference scores in the weaker emotion condition and comparing them to the difference scores in the stronger emotion condition. Results suggested that the difference between the first and second tweet in the strong condition was significantly greater than in the weak condition (b =.11 [.101, .115], SE = .0023 $t(420{,}000)$ = 29.86, $p < .001$, $d = .10$, figure 9B). Importantly, the difference between stronger and weaker was smaller than the one found in our complementary approach (see below). This was probably caused by the increased noise in the analysis, as we cannot be certain that our estimate of the group emotion is what participants actually saw.

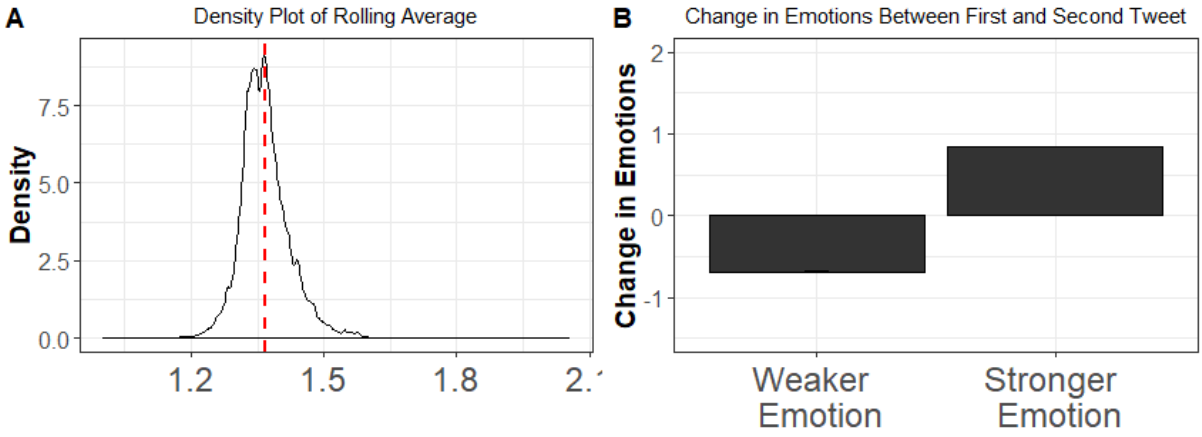

Figure 9. Results from the group average approach of Study 4. Panel A shows a density plot of the rolling average of all Ferguson tweets for a one-hour window. Panel B shows the difference between sentiment analysis of user 1 initial tweet and a later tweet for the three conditions in

Study 4. When the rolling average was weaker than the emotions expressed in user 1 initial tweet, user 1 second tweet was weaker in emotional intensity than their first tweet. This difference score was significantly smaller compared to user 1 increase in emotions compared to when the rolling average was stronger than user 1 initial tweet.

Original-Reply Approach. One of the limitations of the group average approach is that we do not know for certain that participants were exposed to other Ferguson related tweets before writing their own tweet. To overcome this limitation, we focused our analysis on situations in which the second tweet that participants wrote was a reply to another user. Using replies allows us to know exactly the content that participants saw before writing their own tweet. A second advantage of this approach is that it allows us to look at the same emotion condition and see how participants changed their emotions when replying to content that was identical in emotional expression to their own initial tweet. As mentioned, our focus was on changes in users' emotions in response to others' emotions. For this reason, our first data reduction step was to limit our search to situations in which users wrote at least two tweets, so that we could examine changes in their emotions over time. Our second step was to find cases in which we could estimate the emotions that users were exposed to before producing their second tweet. We therefore further reduced the data to cases in which users' second tweet was a reply to another user (see Figure 10). Although using only replies reduced the number of analyzed tweets, it is the optimal approach given our study goals because it enabled us to know what content each participant was exposed to before creating her own reply. Thus, limiting our focus to such cases allowed us to examine changes in users' emotional intensity (by comparing the emotions in their first and second tweets), considering the content to which they were replying.

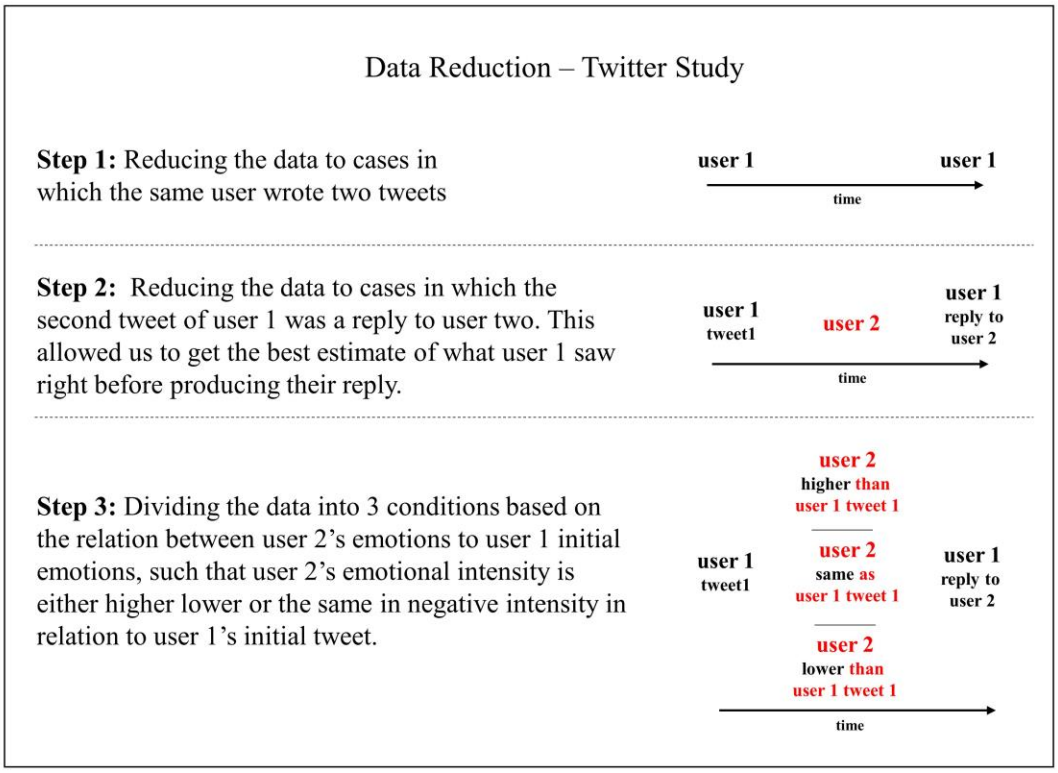

Figure 10. Data reduction steps of the original-reply approach in Study 4.

In addition to creating the tweet-reply pairs, we removed users who wrote more than 20 tweets in order to avoid bots or news services. To be consistent with Studies 1-3, we removed users whose initial emotional response was rated 1 or 5 by SentiStrength (the two extremes of the SentiStrength scale) as users who were in these extremes could only be assigned to 2 of the 3 conditions. For example, users whose first tweet was rated as 5 in emotional intensity could not have seen a later tweet that was rated stronger. These steps resulted in a sample of 38,162 pairs of tweet-replies for the analysis. To test for differences in users' emotional responses as a function of the emotional content to which they were exposed, we conducted a mixed model analysis similar to that conducted in Studies 1-3. Unlike previous studies, we did not analyze the

data using our computational model because we did not have enough repeated measures for every user in order to fit a stable by-participant similarity and motivation coefficients for each participant. To conduct a similar analysis to Studies 1-3, we created a difference score between users' second post (which was a reply) and their initial post. A positive score indicated an increase in negative emotional intensity, and a negative score indicated a decrease in negative emotional intensity. Similar to the previous studies, users' responses were categorized into three bins. In the weaker group rating bin, users replied to content that was rated as weaker in intensity than their initial tweet. In the stronger group rating condition, users replied to content that was rated as stronger in intensity than their initial tweet. In the same group condition, the content that they were replying to was rated as similar to their initial tweet.

Similar to Studies 1-3, we conducted a mixed-model analysis comparing the difference between users' reply and their initial tweet to zero for each condition, which served as a fixed variable. As some users had more than one pair of tweet-replies, we used a by-participant random intercept. We first examined changes in participants' emotions when replying to tweets that were either weaker or stronger than their original tweet (see Figure 11). Results suggested that in cases in which users replied to emotional content that was less negative than their initial tweet, they adjusted the content of their reply to be less negative (b = -.51 [-.52, -.49], SE = .007, t(29,160) = -70.30, p < .001, d = -.48). The opposite was also the case. When users were exposed to a reply that was more negative than their initial tweet, they adjusted their reply to be more negative (b =1.14 [1.12, 1.17], SE = .01, t(36,560) = 74.61, p < .001, d = 1.09). Similar to Studies 1-3, we compared the difference in users' tweets based on whether they were exposed to content that was weaker or stronger in emotional intensity than their initial tweet. This was done by reversing the difference scores in the weaker emotion condition and comparing them to the

difference scores in the stronger emotion condition. Results suggested that the difference between the first and second tweet in the strong condition was significantly greater than in the weak condition (b =.57 [1.10, 1.16], SE = .01, t(26210) = 32.48, p < .001, d = .40), replicating the findings of Study 2. We then examined changes in participants' emotions when replying to tweets that were similar to their initial tweets. Results indicated that in the same group emotion condition, users' difference scores were significantly higher than zero (b =.45 [.43, .47], SE = .01, t(26,250) = 46.23, p < .001, d = .43). These findings suggest that when users replied to content that was similar in negative emotional intensity to their initial tweets, they wrote a reply that was stronger in negative intensity than their initial tweet.

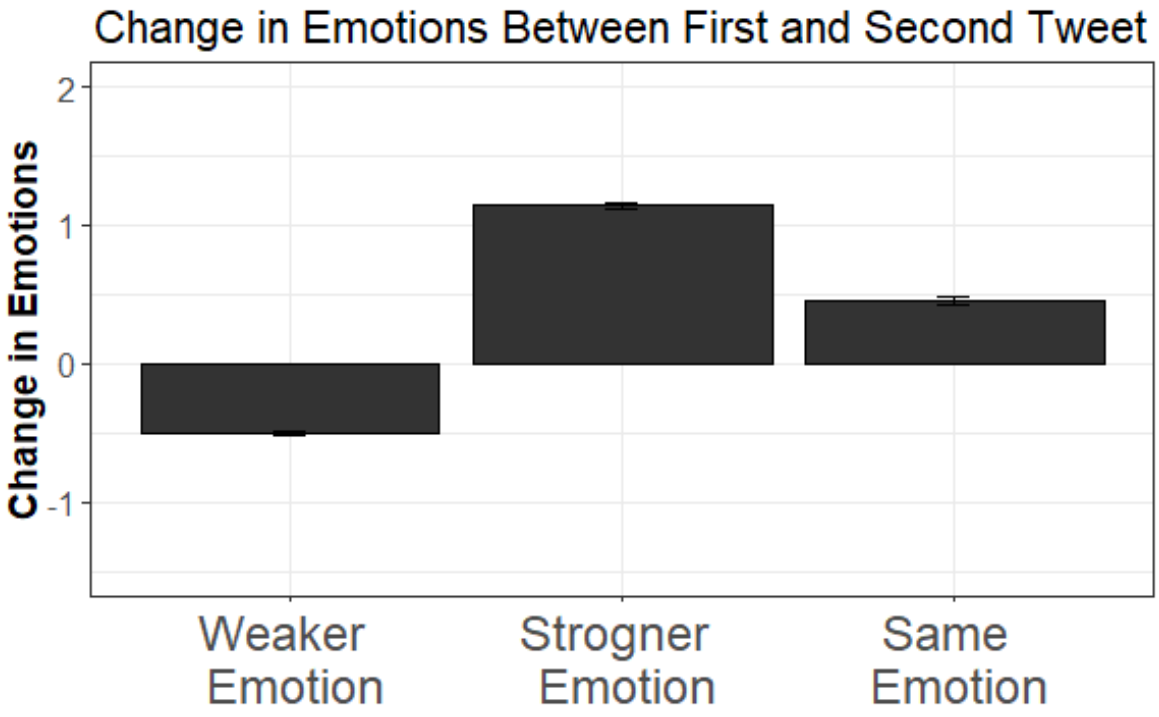

Figure 11. Difference between sentiment analysis of user 1 initial tweet and a later reply for the three conditions in Study 4. When user 2 tweet was weaker than the emotions expressed in user 1 initial tweet, user 1 second tweet was weaker in emotional intensity than their first tweet. This

difference score was significantly smaller compared to user 1 increase in emotions when replying to user 2 tweet that was stronger in emotional intensity than user 1's initial tweet. Finally, when user 1 replies to a user 2 tweet that was similar in emotional intensity to user 1's own emotions, user 1 changed their emotions to be stronger than their initial tweet.

Unlike Study 2, users' ratings of the first tweets were not equal across conditions. This led to a concern that our results might have been influenced by regression to the mean (less negative first tweets might be expected to be followed by more negative second tweets). To address this possibility, we conducted an additional analysis in which we held the first rating constant. As the general mean of the first tweet ratings was M = 1.96 (SD = 1.04), our initial analysis limited the initial ratings to 2. Results were similar to the primary analysis and indicated that the difference score in the weaker group emotion condition was significantly weaker than zero (b = -.42 [-.44, -.40], SE = .009, t(17700) = -45.12, p < .001, d = -.48). The difference score in the stronger group emotion condition was also significantly higher than zero (b =.72 [.69, 74], SE = .01, t(15000) = 51.18, p < .001, d = .83). Finally, in the same group emotion condition, users' difference score was significantly higher than zero (b =.11 [.09, .13], SE = .009, t(19400) = 11.33, p < .001, d = .12). These results suggest that our results cannot be attributed to regression to the mean.

To assess the robustness of our supplemental analyses, we conducted an additional analysis in which we held the emotional intensity of the initial tweet constant using an initial rating of 3, and this analysis yielded similar results. The weaker group emotion condition was significantly weaker than zero (b = -.26 [-.28, -.23], SE = .01, t(9326) = -23.51, p < .001, d = -.28). The difference score in the stronger group emotion condition was also significantly higher

than zero (b =.89 [.83, 96], SE = .01, t(10180) = 28.55, p < .001, d = .95). Finally, in the same group emotion condition, users' difference score was significantly higher than zero (b =.43 [.38, 46], SE = .02, t(9465) = 19.53, p < .001, d = .45).

Overall, results of Study 4 replicated the pattern revealed in Study 2 by looking at natural emotional interactions between group members on Twitter. We used two separate analyses, which provided converging estimates of emotional influence. These findings further buttress our findings, showing that they are supported both in the laboratory and everyday life.

General Discussion

In four studies, we examined how situations that activate emotional motives influence the tendency for emotional similarity. In Study 1, we identified a situation in which participants were motivated to feel weak negative emotions. In this situation, we showed that participants were more influenced by weaker compared to stronger group members' emotional responses. Furthermore, participants also tended to reduce their emotions when learning that others felt similar emotions to them. Using computational modeling, we ascertained that participants' tendency for emotional similarity did not correlate with their emotional motivation. In Study 2, we identified a situation in which participants were motivated to feel strong negative emotions. In this situation, we showed that participants were more influenced by stronger emotions and tended to increase their emotions when learning that others felt similar emotions to them. Here again we found that similarity and motivation were not correlated. Study 3 extended Studies 1 and 2 with two key additions. First, we added a no group emotion condition in which we showed that without group emotion feedback, participants do not change their emotions. Second, using a measure of emotional motivation that includes social comparison, we showed that this

motivation moderated the change in participants' ratings. Finally, in Study 4, using two complementary analyses, we replicated the findings of Study 2 in natural interactions on Twitter.

The Role of Motivated Processes

The current work joins a growing literature which suggests that affective processes are driven by individual motivations. The idea of motivated affective processes emerged from the emotion regulation literature, which argued that people are not necessarily passive as their emotions come and go, but instead have the ability to change their emotional responses (for reviews, see Gross, 1998, 2015). Thus, in many cases, emotional responses are shaped by a person's emotion goals. This suggests that the type and content of these goals may be important to understanding people's emotions (for reviews , see Tamir, 2009, 2015).

With the acknowledgement that emotional processes may be driven by various motivations, there have been growing attempts to understand the role of motivation in emotional processes that go beyond the individual, focusing on motivations for more social processes such as empathy (Zaki, 2014). In the group context, Porat and colleagues have conducted studies showing how group-related motivations lead group members to increase or decrease their emotions in group contexts (Porat, Halperin, Mannheim, & Tamir, 2016; Porat, Halperin, & Tamir, 2016). For example, group members may be motivated to experience sadness in collective memorial ceremonies, as such sadness provides the instrumental value of signaling true group membership (Porat, Halperin, Mannheim, et al., 2016).

While all these studies strengthen the notion that motivations are pertinent to understanding emotional processes, they all focus on such processes within individuals. The current work extends these recent developments by arguing that if motivational forces influence individual emotional processes, there is no reason to assume that such motivations may not play

a role in emotional influence between group members. Thinking about motivation influencing processes occurring between individuals is important because even minor motivational forces may unfold into much larger group-level phenomena.

It is important to note, however, that we do not see these motivated processes as necessarily conscious. Similar to other motivated processes, it may be possible that motivation is acting implicitly, as people construct their emotional experiences in relation to the stimuli, taking into account the group reference. Although in our pilot studies we show that when asked, participants are happy to report that they are indeed motivated to experience stronger or weaker emotions in relation to others, it is still unclear whether such motivations are consciously active when they are actually responding to people's emotions. Future work should attempt to compare implicit and explicit motivations and their affect on emotional influence. Addressing this issue may shed further light on how much participants' change in emotions is driven by their desire for self-presentation.

Potential Mechanisms

While our studies provide consistent evidence for the possibility that motivational forces play a role in emotional influence, further work should be done to examine the specific content of these emotional motivations. In the current set of studies and especially in Study 3, we suggest that one such motivation may be social comparison. Participants are motivated to feel stronger or weaker emotions compared to others in their group, and this motivation is what modifies the difference between their first and second emotional ratings. We chose to focus our attention on social comparison, as recent work suggested that such forces may be at play in the context of emotion (Ong et al., 2017) and because such processes seem to be especially important in eliciting polarization (Myers & Lamm, 1976).

At the same time, social comparison may be just one of several motivations that moderate emotional influence processes. One closely related motivation that may also play an important role is self-presentation. Emotions are very commonly used for self-presentation purposes (Clark, Pataki, & Carver, 1996; Jakobs, Manstead, & Fischer, 2001; Voronov & Weber, 2017). Driven by such motivation, group members may not only want to favorably compare themselves to other group members, but also may be interested in using their emotions to exhibit a certain value or attitude. Groups, societies, and cultures emphasize the experience of certain emotions in certain situations (Porat, Halperin, & Tamir, 2016; Tsai, 2007; Voronov & Weber, 2017) and therefore group members may aspire to express such emotions to prove their group membership. One meaningful difference between self-presentation and social comparison is in how sensitive these motivations are to the existence of an audience. We suggest that self-presentational motivations may be much more sensitive to the existence of an audience compared to social comparison motivations. Therefore, one way to tease these two motivations apart is to inform participants that an audience will observe their ratings and examine the influence of such information on the strength of the results.

More generally, both self-presentation and social comparison motivations are often driven by group norms (Ekman & Friesen, 1969; Hochschild, 1983). People both compare themselves to others in light of certain norms, as well as strive to present emotions that are congruent with these norms (Diefendorff, Erickson, Grandey, & Dahling, 2011; Eid & Diener, 2001). Norms therefore serve as a gravitational force on people's emotions and therefore may also impact emotional influence processes. Adherence to certain norms can be very useful in explaining our finding of asymmetry in emotional influence in the stronger/weaker group emotion conditions. It is less clear how norms would explain changes in emotions that occurred

in our group similar emotion conditions. In these cases, the group state (which is similar to the initial response of the individual) represents a descriptive emotional norm, while there may be an additional injunctive norm influencing the change in participants' emotions (Cialdini, Reno, & Kallgren, 1990). Further work should examine participants' perception of the norm and its influence on these processes.

Finally, beyond their desire to favorably compare or present themselves to other members in light of certain norms, people may be motivated to use their emotions to influence others in their group. If group members recognize that emotions are contagious, they may want to use their emotions as tools to influence others. In previous work, we showed that when group members learn that others in their group are over or under reacting emotionally to a certain situation, they may compensate for the inappropriate emotional response of others in their group (Goldenberg et al., 2014). For example, when White Americans learned that other White Americans were not feeling guilt in response to a racially segregated prom in a New-York school, they increased their own guilt in response to the information. This effect was mediated by group members' desire to convince others to join. In a similar vein, this set of studies also showed that participants may also decrease their emotions when learning that the group emotion is inappropriately strong, suggesting that motivation to influence others may not only lead to increases in emotions but also to decreases.

Implications for Group Processes

Emotions play a unique role in influencing overall group dynamics for a variety of reasons. First, due to their dynamic nature, emotions are much less stable than attitudes. Therefore, emotional responses to group-related events can drive group behavior at a much faster pace than would occur due to shifts in attitudes (Halperin, 2014, 2016). Second, emotions are

contagious and therefore spread quickly within groups, further increasing group members' responses to emotion eliciting situations (Rimé, 2009; Rimé et al., 1998). These group emotional states not only remain in the affective realm, but can also change attitudes. Changes in attitudes can both be in relation to a specific target such as an outgroup (Halperin & Pliskin, 2015; Halperin, Porat, Tamir, & Gross, 2013) or in relation to one own's group by increasing ingroup identification and perceived empowerment (Páez & Rimé, 2014; Páez et al., 2015).

When thinking about how the observed beyond similarity effects may influence group processes, the cases in which the motivation is to increase one's emotions are especially interesting. In these cases, group members aspire to feel stronger emotions than others and thus emotional dynamics contribute to overall amplification in group's emotions which may further escalate to collective action (van Zomeren, Leach, & Spears, 2012; van Zomeren, Postmes, & Spears, 2008). In cases in which group members are motivated to amplify their emotional responses, there may be a greater chance that certain emotional responses will spread and lead to collective action. Such motivation may not only increase influence but also group members' degree of sensitivity to others' emotions (Elias, Dyer, & Sweeny, 2017). Further research should examine how and to what extent beyond similarity processes influence collective action, and the mechanisms through which this may occur.

Emotional dynamics that lead to amplification or attenuation of a certain group emotion may create increased divisions within a larger group, and thus may also fuel processes of polarization and radicalization. If a certain emotional influence process leads a subgroup to amplify its emotions in response to a particular issue, other subgroups may react to such a change with further polarization (Iyengar et al., 2018; Myers & Lamm, 1976). Previous research suggests that groups tend to hold negative perceptions of emotional deviants (Szczurek, Monin,

& Gross, 2012). Such negative perceptions of deviants may further exacerbate these polarization processes and can play a role in radicalization (for a review see Doosje et al., 2016; Kruglanski et al., 2014). For example, the increase in outrage that has occurred as a result of the #BlackLivesMatter campaign also led to the backlash of the #AllLivesMatter and #BlueLivesMatter movements. Further work should examine how emotional dynamics in one sub-group influence emotional processes in other sub-groups.

Broader Implications

The current studies focused on motivated emotional influence in the context of political interactions and collective action. However, other domains can benefit from the findings of this project. One domain in which insights on from our studies may be useful is corporate behavior (Barsade & Gibson, 2012; Kelly & Barsade, 2001). Past work has examined the association between emotional norms, emotional influence, and group performance (Barsade, 2002; Barsade & Gibson, 2012; Barsade & O'Neill, 2014; Van Maanen, 1996). These studies have shown that emotional similarity of positive emotions is associated with positive organizational outcomes. One interesting question is how emotional motivations to express stronger positive or negative emotions may boost or hinder these similarity effects. Some organizations value the expression of positive emotions such as excitement (Grandey, 2015). Putting a high value on positive emotions may influence how easy it is for employees to influence each other's emotions. In other cases, putting less emphasis on positive emotions (or maybe even negative emotions such as stress and anxiety) may increase the chance that employees will transfer these negative emotions.

Second, there is growing interest in the effects of emotional dynamics on the behavior of smaller groups such as families and dyads (Beckes & Coan, 2011; Goldenberg, Enav, Halperin, Saguy, & Gross, 2017; Reed, Randall, Post, & Butler, 2013). Family emotional dynamics are

crucial in explaining well-being (Lara, Crego, & Romer-Maroto, 2012; Larson & Almeida, 1999). For example, dysfunctional emotional dynamics in families may result from negative emotional reciprocity (Cordova, Jacobson, Gottman, Rushe, & Cox, 1993). A recent study attempted to explore these processes, finding that reduction in emotional expressions in response to a spouse's overreaction predicts relationship quality (Goldenberg, Enav, et al., 2017). However, further thinking about the role of motivation in influencing these dysfunctional processes, and how it can be attenuated or enhanced, may help improve family dynamics.

Finally, the question of how and why some emotional dynamics spread quickly while others die out has a direct connection to a much more general question of diffusion, which has so far been researched under the heading of "cascades" (Cheng, Adamic, Dow, Kleinberg, & Leskovec, 2014; Watts & Strogatz, 1999). The idea has clear resonance with the reasoning and findings of the current project. While some social dynamics tend to cascade and spread quickly, others die out. Understanding the conditions in which social interactions cascade has been an interest of other domains such as mathematics, computer science, and sociology (Cheng et al., 2018, 2014; Goel, Watts, & Goldstein, 2012; Granovetter, 1978; Strang & Soule, 1998). The current work represents a contribution to our thinking about the emotional processes that may contribute to these cascades, thus supplementing prior work in this space.

Limitations and Future Directions

The present research is to our knowledge the first that has revealed the impact of situation-specific emotional motives on emotional similarity effects. However, it is important to note two limitations of the current findings.

First, the current work focused on examining the emotional dynamics that lead group members to be more influenced by stronger or weaker emotions but has not examined the

specific reasons that may drive group members to do so. As suggested above, prior research has provided important clues about the forces that may lead group members to desire to feel certain emotions. However, further work should connect these motivations to the processes that were examined here. More specifically, future work should not only measure these motivations, but also manipulate them and test whether such manipulation impacts the strength of emotional influence. The current set of studies also examined emotional process that were different in type due to the context in which they were elicited. Therefore, different motivations may be operative on these different emotional processes. These questions regarding the specific nature of emotions and how they are motivated by specific motivations should all be further examined in future research.

A second limitation of the present work is its reliance on emotion self-reports. Based on the current studies, it is not yet clear how "deep" social influence penetrates. When participants change their emotion ratings, are there changes in other emotion response systems (such as peripheral physiology or expressive behavior)? It is clear that changes in ratings may be consequential in their own right – as they may in turn influence others' responses to a situation. Recent work suggests that exposure to other's ratings may indeed influence both neural and physiological measures of emotions (Koban & Wager, 2016; Willroth et al., 2017), but further work should explore these processes in the context of the current paradigm.

These limitations notwithstanding, the idea of situation-specific emotional motives provides a number of exciting avenues for further understanding the unfolding of emotions in social interactions. Thinking more about emotional dynamics and the ways they unfold over time will allow us to better explain not only individual-level behavior, but also group-level behavior, and the fascinating interplay between emotions at individual and group levels.

Broader Context

Whether we're thinking of emotional influence in general – or emotional contagion in particular – we often tend to think about an automatic process, unaffected by motivation, in which people "catch" the emotions of others in their group. However, as theories of motivated cognition and emotion suggest, people may have motivations that affect even very basic psychological processes such as emotional influence. The current research adopts this approach and suggests that motivational processes to increase or decrease one's emotions can influence the ways in which one's emotions are influenced by other group members. We show that motivation affects emotional influence not only in the lab, but also in emotional interactions on social media. These findings further our ability to predict the outcomes of emotional interactions among group members, especially in response to socio-political situations, in which emotional influence processes among group members sometimes lead to a dramatic increase in group emotions but at other times do not. Quantifying motivational processes as we have done in our studies here may assist in predicting the temporal dynamics of consequential group emotions.

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