Perceived Shared Emotions in Groups Influenced by Environmental Condition and Gender

Ymke Liezen

Student number: S4644506

Psychology department, University of Groningen

PSB3N-BT15 Bachelor thesis

Groups number: 18

Supervisor: L. (Lisa) Willemsen, MSc

Second evaluator: prof. dr. A.C. (Anita) Keller

In collaboration with: Paul Bîrzu, Gelbrich Haaijer, Madelief van Holst, Nathalie Mulder, Youki Velthuis

10 January 2026

A thesis is an aptitude test for students. The approval of the thesis is proof that the student has sufficient research and reporting skills to graduate, but does not guarantee the quality of the research and the results of the research as such, and the thesis is therefore not necessarily suitable to be used as an academic source to refer to. If you would like to know more about the research discussed in this thesis and any publications based on it, to which you could refer, please contact the supervisor mentioned.

Abstract

Emotions play a central role in social communication, particularly in emergency situations where individuals rely on emotional cues to assess danger and coordinate behavior. Previous research has primarily examined emotion perception in group settings under neutral conditions, leaving limited insight into how emotions are perceived in high-stress contexts. In the present study, we investigate whether environmental condition (emergency versus non-emergency) and observers' gender influence the perceived shared emotions in groups. Based on theories of emotion perception and intergroup emotion, we predict that observers perceive emotions as more intense in emergency situations than in non-emergency situations (H1), and that gender influences this effect (H2). We conducted an online between-subjects experiment (N = 69) in which participants were randomly assigned to observe groups in either an emergency or a non-emergency context. Perceived emotions from an observer's perspective were assessed using a self-report measure capturing anxious, enthusiastic, and uncertain emotions. Data were analyzed using one-way and two-way ANOVAs. Results showed that anxious and uncertain emotions were perceived as more intense in emergency situations than in non-emergency situations. No overall gender differences in emotion perception were observed. However, interaction effects between environmental condition and gender emerged for enthusiastic and uncertain emotions. To conclude, environmental condition shapes the perception of shared emotions in groups, while gender effects depends on contextual conditions. Theoretical and practical implications are discussed.

Keywords: perceived emotion, environmental condition, emergency situation, non-emergency situation, gender.

Introduction

Emotions are fundamental tools for communication in everyday social interactions. People constantly perceive and interpret others' emotional expressions, drawing inferences about the expresser, the context, and themselves. These interpretations, however, can vary widely, leading to diverse conclusions among observers (Lange et al., 2021). In certain conditions, such as emergency situations, emotional communication becomes particularly crucial. In emergencies, individuals often rely on emotional cues to assess danger, coordinate responses, and decide on appropriate actions (Lerner et al., 2003). Despite the importance of this process, little is known about how emotions expressed in group settings are perceived under such high-stress circumstances. It is particularly relevant to understand how emotional communication works through the observer's eye, and as a result, potential dangerous escalation can be better anticipated and prevented in the future. Whereas previous research has mainly focused on how individuals perceive emotions in groups under neutral or controlled conditions (Im et al., 2017; Grimm et al., 2013; Lange et al., 2021)), leaving open the question of how these perceptions function in high-stress or emergency conditions. Therefore, the first aim of this study is to examine to what extent observers perceive emotions in groups differently between emergency and non-emergency conditions.

Previous research has shown that gender can influence how emotions are perceived and interpreted. Women, for instance, tend to be better in recognizing subtle or less intense emotional expressions than men (Fischer et al., 2018). Yet, it remains unclear how these gender-related differences operate in high-stakes conditions like emergencies, where emotional expressions may be more intense, ambiguous, or collectively displayed. Therefore, the second aim is to investigate the role of gender in perceiving group emotions in emergency conditions. Understanding this dynamic can contribute to a better comprehension of emotional communication in crisis conditions.

Defining Emotions, Communication and Related Concepts

According to Lange et al. (2021) emotions are changes that are synchronized in multiple components in response to a stimulus that is relevant. As such, emotions form an essential part of the process that is interacting with the environment. This implies that emotions are cognitive representations of the event's meaning and that they are affective responses to such events (Frijda & Mesquita, 2004). Therefore, emotions serve a function within the social system (Averill, 1983). Emotions are seen as interchangeable with the social system. Thus, emotions can be used to define events to other individuals as emotionally valent ones (Frijda & Mesquita, 2004).

Observers can perceive emotions from the multiple components that include a particular emotion. Therefore, only expressive behaviors are perceivable by observers. Thus, a person's feelings, cognitions, physiology, and motivations are often undetectable by observers (Lange et al., 2021). Observers draw inferences about characteristics of the environment based on the emotions they perceived. These characteristics are the expresser, the situation, and the self, which can in turn influence the observers' behavior. Due to the multiple components of emotions and that only expressive behaviors are perceivable the inferences drawn by observers can vary (Lange et al., 2021).

An emergency is defined by three components. First component is a threat of death, whether the threat is real or perceived. Second component is that the threat affects a large number of people at once, as a burning building that is filled with people. The last component is that the opportunity to escape to safety is limited (Drury, 2018). Emergencies often cause negative emotions such as panic, anxiety, and nervousness (Grimm et al., 2013). These and all emotions play an important factor in decision-making in individuals in emergencies (Zhao et al., 2023).

The Role of Perceiving Emotions in Emergency versus Non-emergency Situations

Intergroup emotion theory (IET) suggests that self-definition via a salient social identity provides a basis of the experience of group-based emotions. These emotions arise from intergroup appraisals, and in turn predict intergroup action tendencies, such as removing an obstacle together in an emergency (Livingstone et al., 2011). When different social identities become salient, the emotions associated with events are also affected. In other words, according to Livingstone et al (2011), intergroup emotions are influenced by self-categorization. For the observer, the emotions in a group give an indication of the situation of the group (Magee & Tiedens, 2006). This is particularly important in emergency setting where the emotions, or the situation itself can be negatively loaded or ambiguous.

Individuals use the emotions of others to provide information about events, leading to shared emotions. Which is especially important in emergencies where people have limited information (Drury, 2018). According to Rimé (2007), the more a person (source person) expresses emotion, the more the sharing partner responds. When in an emergency, this leads to providing the source person help and support, comfort and consolation, empathy and bonding. After sharing emotions in a collective event, feelings of mutual confidence and solidarity, as social consequences, were enhanced. These social consequences were higher, when the shared emotions were more intense (Drury, 2018; Rimé, 2007).

When emotions are in synchrony, emotions are intensified. The specific nature of the pooled feelings does not matter (Páez et al., 2015). According to Durkheim (1912), the emotions can range from extreme depression to ecstatic enthusiasm. However, what is essential is that individuals are gathered together, that the same feeling is perceived among others, and that they are in the same action (Páez et al., 2015). Under conditions in which events are uncertain individuals are more motivated to use other's emotions to draw conclusions (Van Doorn et al., 2015). Therefore, in an emergency, seeing others being anxious, will often lead people to feel the same (Drury, 2018). According to Li and Zhong

(2022), there is a positive association between negative emotions and people's risk perceptions. When the negative emotion is higher, the risk is perceived to cause major impacts. Which in turn is leading people to adopt relevant coping behaviors. Several social-psychological variables may influence an individual's perception of risk. These variables shape an individual's capacity and willingness to cope with certain natural or man-made risk, such as floods or war (De Dominicis et al., 2015).

Other studies, such as Lerner et al. (2003) and Zhang et al (2022), found that negative emotions increases risk perception and motivates individuals to engage in preventive behaviors. This also holds for passive emotions as anxiety and nervousness (P. Li & Zhong, 2022). Rimé (2007) found that negative emotional loaded events can co-occur with positive emotional loaded events. When in an emergency people often feel and perceive negative emotions as fear, anxiety, and panic. However, even with these negative emotions, people can perceive solidarity and hope (Rimé, 2007). Therefore, understanding how people perceive emotions in emergency situations can help equip practitioners with actionable tools to improve their responses in similar situations.

The Role of Gender of the Observer in Perceiving Emotions in Groups in Emergency versus Non-emergency Situation

Fischer et al. (2018) suggest the emotional sensitivity hypothesis (ESH). The hypothesis states that women are more sensitive to subtle cues. This indicates that they perceive emotions as more intense, however only when the cues are subtle or low intense. Research shows that women tent to detect anger, sadness and disgust more rapidly and more intense than men (Montagne et al., 2005). However, Sarauskyte et al. (2022) found that women show not an advantage across all emotions and all situations. Another explanation is that the differences in emotion perception are due to learned social roles. Bredner (2003) explained that men are learned to not express emotions and to perceive emotions as less

intense than they may be. While women are more communal and are taught to be emotional. Thus, they perceive emotions as more intense than they may be. Specifically looking into negative emotions, these are also perceived differently. Men tend to perceive negative emotions more as anger, while women perceive negative emotions more as anxiety. Such differences are also explained by the social role theory (SRT) (Li et al., 2023).

Plant et al. (2000) suggest that the stereotypes of the social role theory affect the interpretation of both ambiguous and unambiguous emotional expressions that is viewed as biased. In cases where the expressions of both genders are perceived through the filter of gender stereotypes of emotion, this perception results in conformation of the stereotype. These stereotypes are that women are more sensitive and emotional (intense), whereas men tend to be less diverse in emotion (i.e. anger). These perceptions will lead to an interpretation that is biased and will influence the responds of the observer. In an emergency this might have implications if these interpretations result in a self-fulfilling prophecy and leads to inferences by observers that vary. There is no research found on other types of gender besides men and women.

Prior findings suggest that shared emotions are perceived to be more intense in groups in emergency situations, as opposed to less shared emotion that are perceived as less intense in groups in non-emergency situations. According to Páez et al. (2015) and Rimé (2007), when emotions are in synchrony, and therefore shared emotions, they are more intense. Hence, in an emergency there is expected to be more help and support, comfort and consolation, empathy and bonding.

Furthermore, when considering gender, one would expect that female observers will perceive the shared emotions in groups as more intense than male observers, and this gender difference will be larger in emergency situations than non-emergency situations. According to Fischer et al. (2018) emotional sensitivity theory shows that women perceive emotions as

more intense, in particular, emotions as anger, sadness and disgust. However, Plant et al. (2000) suggests that stereotypes of the social role theory lead to the believe that women perceive emotions as more intense.

Overview of the Present Study

In the present study, the aim is to investigate how environmental conditions and the observer's gender influence perceived shared emotions in groups. By examining these constructs, we seek to assess the independent and combined effect of environmental conditions and gender on perceived emotions. Participants will be randomly assigned to one of two conditions, where they will observe emotions in groups that either in an emergency situation or neutral situation.

The hypotheses of this study are as followed:

H1: Observers will perceive emotions in groups as more intense in emergency situations compared to non-emergency situations.

H2: Female observers will perceive the shared emotions in groups as more intense than male observers, and this gender difference will be larger in emergency situations than non-emergency situations

This study is designed to advance understanding of how emotions are perceived in emergency situations and to examine whether differences exist between male and female observers. By identifying both the independent and combined effects of environmental conditions and gender, this research aims to contribute to the broader literature on perceived emotions in emergencies and the potential role of the observer's gender as an influencing factor. The findings are expected to provide deeper insights into groups operating in such conditions and may inform the development of guidelines to better support individuals in emergency situations.

Methods

Participants

A total of 77 participants from the first year of the English and Dutch track in Bachelor Psychology at the University of Groningen took part in the present study. Following data screening and application of exclusion criteria, eight participants were removed as the result of a failed attention check. The final sample consisted of 69 participants (51 female, 14 male, 3 non-binary, 1 gender not specified). Participants' ages ranged from 18 to 38 years (M = 19.6, SD = 2.5). All participants met the inclusion criteria, which required them to be fluent in English and aged 18 or above. All participants were recruited through the university's study program (SONA), which compensated them with course credit. A sensitivity power analysis for the effect of environmental conditions on perceived emotions (Hypothesis 1) indicates that this sample allows us to detect a large effect size (ω^2 = 0.41) with a power of 80% (α = .05).

Research Design and Procedure

The study employs a between-subjects experimental design to examine how environmental conditions (emergency or non-emergency) and the observer's gender influence the perceived shared emotions in groups. Ethical approval for this online study was obtained from the Ethical Committee of the Faculty of Behavioral and Social Sciences at the University of Groningen (PSY-2526-S-0043). Data were collected via an online questionnaire, which was created and administered using the Qualtrics platform (Qualtrics, Provo, UT). It was published via SONA from November 14 to November 26, 2025. The participants were recruited through this platform. Prior to the start of the online study, participants had to give informed consent. The first section of the questionnaire contained demographic information. Once the participants filled in this part of the questionnaire, they were randomly assigned to one of two conditions (emergency vs. non-emergency). The participants were notified what the conditions were, however, they were not notified in which

condition they were in. After this, they were instructed to observe the behavior of the individuals depicted. The video needed to be displayed in full-screen mode on the device and was permitted to be replayed as many times as needed. Next, they were presented with a video that corresponded with the condition they were in. After the participants finished watching the video, they filled in the attention check. If they passed the check, the questionnaire continued with the following scale: Common Fate, Solidarity, Cooperation, and Emotion (see Appendix 1). This study focuses only on emotions, therefore this scale is further explained. The other scales are excluded from this study. Once the questionnaire was completed, the participants were debriefed and thanked for their participation. Altogether, the questionnaire took about 25 minutes to complete, and the participants were rewarded with 0.4 SONA credits.

Measures

Experimental condition

Participants were randomly presented with one of four pre-recorded video clips that were developed in a research project by Willemsen et al. (2025). Each video depicted either three or four people exiting individual cubicles, where they were filling in a mock survey, and moving toward an exit. The videos differed in their situational framing (emergency vs. non-emergency). In two of the four videos, the situation was framed as an emergency situation. The individuals heard a fire alarm and a voiceover telling them that they had to evacuate their cubicle and move toward the exit. When they followed the exit signs and went through a door, they encountered a physical obstruction, which consisted of stacked chairs and tables in front of the exit. The obstacle required a degree of effort to pass. The other two videos followed the same structure but were framed as a non-emergency situation. Instead of an alarm, the individuals heard an announcement stating that the current assignment was over and that they had to move toward the exit. These videos had the same obstacle at the exit.

Attention check

To ensure participants were paying attention, they were asked to identify the sounds they had heard in the video. They could select multiple answers from the following options: fire alarm, announcement, tire screeching, birds chirping, children playing, and not hearing any sound. Participants who failed the attention check were excluded from the analyses.

Emotion

Participants were instructed to think about the emotions displayed by the people in the video and then answer the prompt: "In my opinion, the people in the video felt…" for 15 emotions. Based on correlations, the 15 items of the Emotion scale were separated into three clusters of emotions: Anxious, Enthusiastic, and Uncertain (Willemsen et al., 2025). The Anxious emotions cluster contained six items; an example item is "alarmed". The Enthusiastic emotions cluster also contained six items; an example item is "energized". The Uncertain emotions cluster contained three items; an example item is "confused". The scale was measured on a 7-point Likert scale, ranging from -3 (*strongly disagree*) to 3 (*strongly agree*). Internal consistency in the current sample was good ($\alpha = .82$).

Gender

Participants were asked to fill in their gender in the demographic section in the questionnaire. It consisted of one item: "What is your gender?" The answers consisted of: Female (1), Male (2), Non-binary (3), Prefer to self-describe (4), and Prefer not to say (5).

Analyses

All analyses were conducted using JASP (version 0.95.3). Hypothesis 1 will be tested using a one-way between-subjects ANOVA with perceived emotions as the dependent variable and the environmental condition (non-emergency = 0, emergency = 1) as the between-subject factor with two levels. Hypothesis 2 will be tested using a two-way between-subjects ANOVA with perceived emotions as the dependent variable. The first between-

subject factor is the environmental condition with two levels (non-emergency = 0, emergency = 1), and the second between-subject factor is gender with 2 levels (female = 1, male = 2). Because the non-binary and not specified groups had very small sample sizes, these categories were excluded from the analyses.

Results

Preliminary analysis

Homoscedasticity was tested by Levene's test and showed no violations ($F(3,61) = 1.15$, $p = .337$; $F(3,61) = 0.70$, $p = .555$; $F(3,61) = 2.54$, $p = .065$). Normality was tested by a Q-Q plot and Shapiro-Wilk test ($W(68) = 0.97$, $p = .095$; $W(68) = 0.96$, $p = .200$ and showed only violation for uncertain emotions ($W(68) = 0.89$, $p = < .001$) (see Appendix B). Due to Central Limit Theorem (CLT), this study can assume normality, because there are over 30 participants (Moore et al., 2014). The descriptive statistics can be found in Table 1.

Table 1

Descriptive Statistics

Variable	*M*	*SD*
Anxious Emotions		
1. NonEmergency	-0.539	1.004
2. Emergency	0.556	1.071
3. Female	-0.043	1.266
4. Male	0.157	0.724
Enthusiastic Emotions		
1. NonEmergency	-1.010	0.801
2. Emergency	-0.859	0.882
3. Female	-1.007	0.815
4. Male	-0.679	0.905
Uncertain Emotions		
1. NonEmergency	1.414	0.894
2. Emergency	2.063	0.700
3. Female	1.758	0.926
4. Male	1.643	0.591

Effect of situational context on perceived emotions

Anxious emotions

There was a significant difference in anxious emotions between conditions (emergency vs. non-emergency), $F(1,63) = 18.11$, $p = < .001$, $\eta^2_p = 0.223$. Participants in the emergency condition ($M = 0.56$, $SD = 1.07$) experienced more emotions that were considered anxious than participants in the non-emergency condition ($M = -0.54$, $SD = 1.00$), as shown in Figure 1. This finding supported Hypothesis 1.

Enthusiastic emotion.

There was not a significant difference in enthusiastic emotions between conditions (emergency vs. non-emergency), $F(1,63) = 0.521$, $p = .473$, $\eta^2_p = .008$. Participants in the

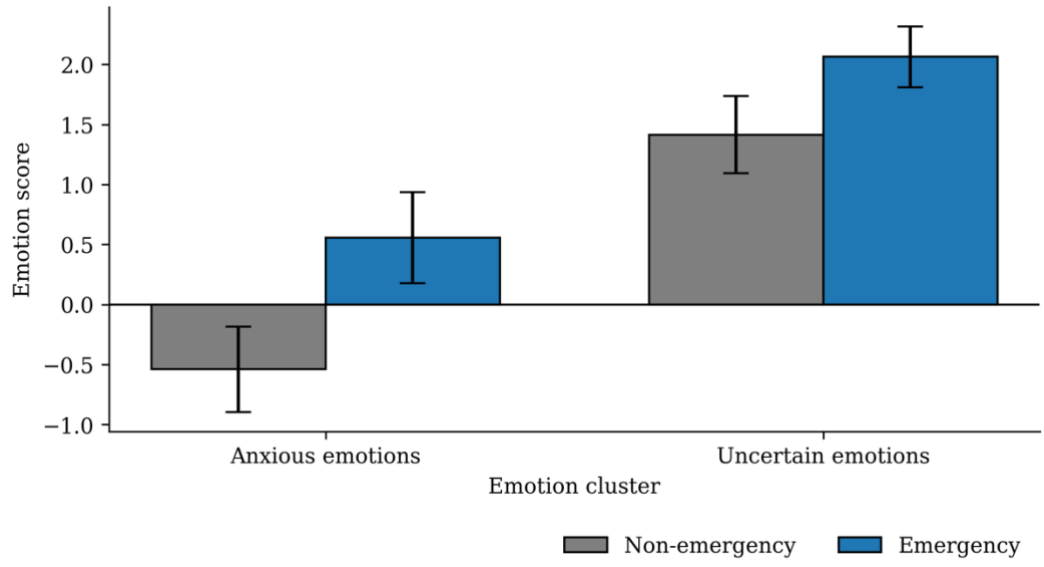
emergency condition (M = -0.86, SD = 0.88) experienced the same amount of emotions that were considered enthusiastic compared to participants in the non-emergency condition (M = -1.01, SD = 0.80), as shown in Figure 2. This finding did not support Hypothesis 1.

Uncertain emotions

There was a significant difference in uncertain emotions between conditions (emergency vs. non-emergency), $F(1,63) = 10.553$, $p = .002$, $\eta^2_p = .143$. Participants in the emergency condition (M = 2.06, SD = 0.70) experienced more emotions that were considered uncertain than participants in the non-emergency condition (M = 1.41, SD = 0.89), as shown in Figure 1. This finding supported Hypothesis 1.

Figure 1

Mean anxious and uncertain emotion per condition



Noot. Error bars represent 95% confidence intervals.

Effect of situational context and gender on perceived emotions

Anxious emotions

There was a significant difference in uncertain emotions between condition (emergency vs. non-emergency), $F(1,61) = 6.57$, $p = .013$, $\eta^2_p = .097$. Participants in the emergency condition ($M = 0.56$, $SD = 1.07$) experienced more emotions that were considered anxious than participants in the non-emergency condition ($M = -0.54$, $SD = 1.00$). However, there was no significant difference in anxious emotions between gender (male vs. female), $F(1,61) = 0.55$, $p = .460$, $\eta^2_p = .009$. Male participants ($M = 0.16$, $SD = 0.72$) experienced no difference in emotions that were considered anxious than female participants ($M = -0.04$, $SD = 1.27$). The interaction effect was not significant $F(1,61) = 3.09$, $p = .084$, $\eta^2_p = .048$. Male and female participants showed similar differences in anxious emotions between the emergency and non-emergency conditions. Thus, the effect of condition on anxious emotions was similar for both genders. These findings do not support Hypothesis 2.

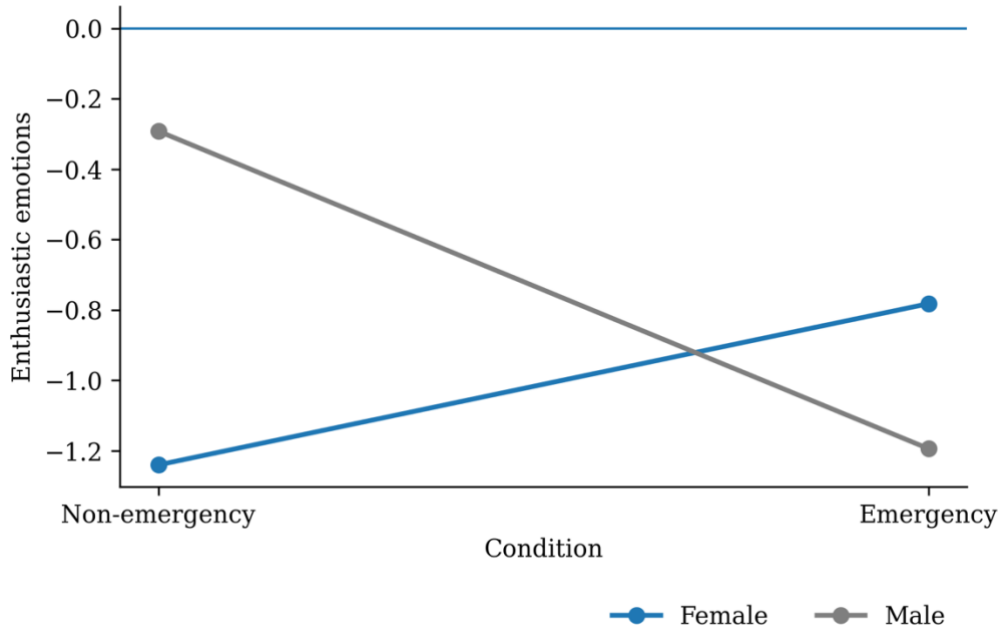
Enthusiastic emotion

There was not a significant difference in enthusiastic emotions between condition (emergency vs. non-emergency), $F(1,61) = 0.85$, $p = .360$, $\eta^2_p = .014$. Participants in the emergency condition ($M = 0.56$, $SD = 1.07$) experienced the same amount of emotions that were considered enthusiastic compared to participants in the non-emergency condition ($M = -1.01$, $SD = 0.80$). Moreover, there was no significant difference in enthusiastic emotion between gender (male vs. female), $F(1,61) = 1.23$, $p = .271$, $\eta^2_p = .020$. Male participants ($M = -0.68$, $SD = 0.91$) experienced no difference in emotions that were considered enthusiastic than female participants ($M = -1.01$, $SD = 0.82$). The interaction effect was significant $F(1,61) = 7.95$, $p = .006$, $\eta^2_p = .115$, as shown in Figure 2. To further examine the differences, a simple effects analysis was conducted. This analysis showed a significant effect of gender within the non-emergency condition, $F(1, 61) = 8.66$, $p = .005$, with male participants ($M = -0.29$, $SD = 0.53$) reporting higher levels of enthusiastic emotions than female participants (M

= -1.24, *SD* = 0.71). In contrast, no significant difference was found between male participants (*M* = -1.19, *SD* = 0.98) and female participants (*M* = -0.78, *SD* = 0.86) in enthusiastic emotions within the emergency condition, $F(1, 61) = 1.32$, $p = .256$. These findings partially support Hypothesis 2.

Figure 2

Interaction between condition and gender on enthusiastic emotions.



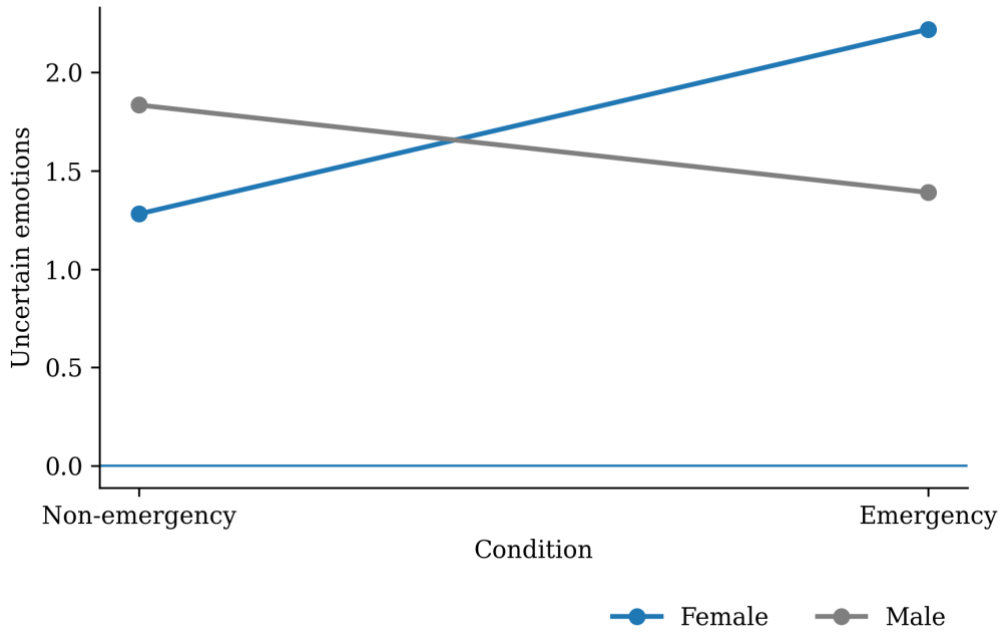
Uncertain emotions

There was no significant difference in uncertain emotions between condition (emergency vs. non-emergency), $F(1,61) = 1.13$, $p = .292$, $\eta^2_p = .018$. Participants in the emergency condition (*M* = 2.01, *SD* = 0.70) experienced the same amount of emotions that were considered uncertain than participants in the non-emergency condition (*M* = 1.41, *SD* = 0.89). Moreover, there was not a significant difference in uncertain emotion between gender (male vs. female), $F(1,61) = 0.35$, $p = .555$, $\eta^2_p = .006$. Male participants (*M* = 1.64, *SD* =

0.59) experienced no difference in emotions that were considered uncertain than female participants (M = 1.76, SD = 0.93). The interaction effect was significant $F(1,61) = 8.86$, p = .004, η^2_p = .127, as shown in Figure 3. To further examine the differences, a simple effects analysis was conducted. This analysis showed no significant difference between male participants (M = 1.83, SD = 0.36) and female participants (M = 1.28, SD = 0.98) in uncertain emotions within the non-emergency condition, $F(1, 61) = 3.18$, p = .079. In contrast, a significant effect of gender was found within the emergency condition, $F(1, 61) = 5.75$, p = .020, with female participants (M = 2.22, SD = 0.60) reporting higher levels of uncertain emotions than male participants (M = 1.39, SD = 0.77). These findings partially support Hypothesis 2.

Figure 3

Interaction between condition and gender on uncertain emotions



Discussion

The aim of this study was to investigate how environmental conditions and the observer's gender influences the perceived shared emotions in groups. It was predicted that observers will perceive emotions in groups as more intense in emergency situations compared to non-emergency situations (H1). Furthermore, it was predicted that female observers will perceive the shared emotions in groups as more intense than male observers, and this gender difference will be larger in emergency situations than in non-emergency situations (H2). The results provided partial support for both hypotheses.

The findings of this study revealed partial evidence for Hypothesis 1. The perceived emotions in groups were found to be observed as more intense in emergency situations for anxious and uncertain emotions. Which is consistent with the theoretical framework, were was stated that emergencies often elicit negative emotions such as panic, anxiety, and nervousness (Grimm et al., 2013). This is also in line with the theories that state that stressful or emergencies conditions heighten attention to negative emotional cues because they provide crucial information about potential environmental danger (Drury, 2018; Lerner et al., 2003). However, there was no evidence that observers perceived enthusiastic emotions as more intense in emergency situations. This suggests that positive emotions may be less apparent in emergency settings.

Furthermore, the findings of this study revealed partial evidence for Hypothesis 2. No significant differences were found in how male and female observers perceived group emotions. This partially contradicts the emotional sensitivity hypothesis, which suggests that women more readily detect subtle emotions cues (Fischer et al., 2018), and other theories indicating that women perceive negative emotions more strongly (Montagne et al., 2005). However, significant interaction effects were found for enthusiastic and uncertain emotions, indicating that the effect of the emergency condition on these emotions may depend on

observer's gender rather than being stable across conditions. There was no significant interaction effect for anxious emotions.

For enthusiastic emotions, the significant interaction between environmental conditions and the observer's gender was further clarified by simple effects analysis. This analysis showed that gender differences emerged only in the non-emergency condition, where male observers perceived higher levels of enthusiastic emotions than female observers. In contrast, no gender differences were found in the emergency condition. This suggests that gender-related differences in the perception of positive emotions are context-dependent and become apparent primarily in low-stress situations, whereas emergency situations may reduce or override such differences. This pattern aligns with the emotional sensitivity hypothesis (Fischer et al., 2018), which proposes that gender differences in emotion perception are most pronounced when emotional cues are subtle. In non-emergency situations, enthusiastic emotions may be expressed less intensely, allowing such differences to emerge. In emergency situations, however, emotional expressions may be more salient or uniformly interpreted, reducing gender-related variation in perception.

For uncertain emotions, simple effects analysis showed gender difference emerged only in the emergency condition, where female observers perceived higher levels of uncertain emotions than male observers, whereas no gender differences were observed in the non-emergency condition. This indicates that gender-related differences in the perception of uncertainty emerge specifically in high-risk situations. This result is in line with research suggesting that women show greater sensitivity to ambiguous or uncertain emotional cues in threatening situations (Fischer et al., 2018; Van Doorn et al., 2015). The ambiguity and limited information characteristic of emergency situations may therefore enhance sensitivity to uncertainty-related cues among female observers.

Limitations and Future Directions

Several limitations must be considered when interpreting the results of this study. Firstly, this study has an unequal gender distribution, with a higher number of females than males. This unequal distribution may limit the generalizability of the finding, and therefore the results should be interpreted with caution when drawing conclusions. Additionally, the small number of male participants may have limited the ability to detect significant main effects involving the observer's gender and environmental condition on perceived emotions. Future research should conduct a study with an equal gender distribution to improve the generalizability and to examine whether significant effect can be identified.

Secondly, the sample consisted exclusively of psychology students from a single university, which limit the generalizability of the findings. Therefore, the participants may have the same demographical information, which influences how emotions are perceived. Future research should include a more diverse sample in terms of demographical information to examine whether the observed effect generalize to broader populations.

Lastly, due to online administration of the study, participants completed the task in uncontrolled environments, which may have led to increased distraction and variability in attentional engagement, thereby influencing emotion perception. Future research could replicate the study in laboratory settings to better control environmental factors and ensure consistent levels of participant engagement.

This study has several strengths. The first strength is the application of both one-way and two-way ANOVA. Therefore, the study systematically examined main and interaction effects, allowing for a comprehensive examination of the combined influence of environmental condition and the observer's gender on perceived emotion in groups. Another strength of this study is the use of clustered emotions. By clustering emotions into anxious, enthusiastic, and uncertain categories, the study captured multiple dimensions of emotional perception, allowing for a more nuanced understanding of how different types of emotions are

affected by environmental condition. Lastly, participants were randomly assigned to the emergency and non-emergency condition, which reduces selection bias and strengthens internal validity by ensuring that observed differences are attributable to the experimental manipulation.

Theoretical and Practical Implications

A contribution of this research lies in its demonstration that context shapes the perception and interpretation of emotions, extending existing work on this matter (Lange et al., 2021; Im et al., 2017). By showing that emotions as anxiety and uncertain emotions are more observed in emergencies, this study emphasized the function of emotions perception in high-risk environments. Furthermore, the findings challenge the emotional sensitivity hypothesis by demonstrating that there were no differences found between male and female observers in perceiving emotions. Due to the interaction effect found, the emotional sensitivity hypothesis is partially supported, and refined by demonstrating that gender differences are not global but depends on the contextual and emotions conditions. This applies especially for enthusiastic and uncertain emotions. A further, and theoretically significant, implication is that the study contributes to group-level emotion theories by showing that observers' perception of collective emotions are shaped by contextual framing, especially negative emotions in high-risk situations. The heightened perception of these negative emotions in emergency settings supports the intergroup emotion theory (Livingstone et al., 2011), which posits that these emotions stem from how individuals evaluate situations in terms of intergroup relations and can predict intergroup action tendencies from a distance.

These findings have important practical implication for crisis communication strategies/management and emergency communication. Increased sensitivity to negative and uncertain emotions cues in emergency situations suggests that individuals may rely heavily on emotions information when assessing risk. Crisis communication strategies could utilize this

heightened sensitivity in emergencies to provide clear, direct behavioral guidance, and to reduce ambiguity. Furthermore, when individuals infer danger based on the emotions they perceive (Lange et al., 2021), emotional contagion can spread rapidly through a crowd, shaping collective safety decisions (Drury, 2018). A better understanding of these processes may help the development of public-alert systems and crowd-management protocols that aim to minimize uncertainty, prevent panic escalation, and promote adaptive responses during crises.

In addition, these findings may have implication for the design of training and decision-support tools in professions that require rapid emotion assessment under pressure, such as law enforcement, fire department, and healthcare. Awareness that the perception of uncertain emotions can differ across observers, particularly in emergency situations, may help professionals to establish a training. Incorporating this knowledge into training programs could support more accurate assessments of environmental risk and improve communication and decision-making in high-stakes environments.

Conclusions

Overall, these findings indicate that environmental condition plays a key role in how emotions are perceived by external observers, particularly in emergency situations. By demonstrating that gender differences of observers emerge only under specific emotional and environmental conditions, this study contributes to a more nuanced understanding of emotions perception in high-risk situations.

References

Averill, J. R. (1983). Studies on anger and aggression: Implications for theories of emotion. *American Psychologist*, *38*(11), 1145–1160. https://doi.org/10.1037/0003-066x.38.11.1145

Brebner, J. (2003). Gender and emotions. *Personality And Individual Differences*, *34*(3), 387–394. https://doi.org/10.1016/s0191-8869(02)00059-4

De Dominicis, S., Fornara, F., Cancellieri, U. G., Twigger-Ross, C., & Bonaiuto, M. (2015). We are at risk, and so what? Place attachment, environmental risk perceptions and preventive coping behaviours. *Journal Of Environmental Psychology*, *43*, 66–78. https://doi.org/10.1016/j.jenvp.2015.05.010

Drury, J. (2018). The role of social identity processes in mass emergency behaviour: An integrative review. *European Review Of Social Psychology*, *29*(1), 38–81. https://doi.org/10.1080/10463283.2018.1471948

Drury, J., Brown, R., González, R., & Miranda, D. (2015). Emergent social identity and observing social support predict social support provided by survivors in a disaster: Solidarity in the 2010 Chile earthquake. *European Journal Of Social Psychology*, *46*(2), 209–223. https://doi.org/10.1002/ejsp.2146

Durkheim, E. (1912). Les formes élémentaires de la vie religieuse [The Elementary Forms of Religious Life]. Paris, France: Alcan.

Fischer, A. H., Kret, M. E., & Broekens, J. (2018). Gender differences in emotion perception and self-reported emotional intelligence: A test of the emotion sensitivity hypothesis. *PLoS ONE*, *13*(1), e0190712. https://doi.org/10.1371/journal.pone.0190712

Frijda, N. H., & Mesquita, B. (2004). The social roles and functions of emotions. In *American Psychological Association eBooks* (pp. 51–87). https://doi.org/10.1037/10152-002

Grimm, A., Hulse, L., Preiss, M., & Schmidt, S. (2013). Behavioural, emotional, and cognitive responses in European disasters: results of survivor interviews. *Disasters*, *38*(1), 62–83. https://doi.org/10.1111/disa.12034

Im, H. Y., Albohn, D. N., Steiner, T. G., Cushing, C. A., Adams, R. B., & Kveraga, K. (2017). Differential hemispheric and visual stream contributions to ensemble coding of crowd emotion. *Nature Human Behaviour*, *1*(11), 828–842. https://doi.org/10.1038/s41562-017-0225-z

Jans, L., Postmes, T., & Van Der Zee, K. I. (2011). The Induction of Shared Identity: The Positive Role of Individual Distinctiveness for Groups. *Personality And Social Psychology Bulletin*, *37*(8), 1130–1141. https://doi.org/10.1177/0146167211407342

Lange, J., Heerdink, M. W., & Van Kleef, G. A. (2021). Reading emotions, reading people: Emotion perception and inferences drawn from perceived emotions. *Current Opinion in Psychology*, *43*, 85–90. https://doi.org/10.1016/j.copsyc.2021.06.008

Leach, C. W., Van Zomeren, M., Zebel, S., Vliek, M. L. W., Pennekamp, S. F., Doosje, B., Ouwerkerk, J. W., & Spears, R. (2008). Group-level self-definition and self-investment: A hierarchical (multicomponent) model of in-group identification. *Journal Of Personality And Social Psychology*, *95*(1), 144–165. https://doi.org/10.1037/0022-3514.95.1.144

Lerner, J. S., Gonzalez, R. M., Small, D. A., & Fischhoff, B. (2003). Effects of Fear and Anger on Perceived Risks of Terrorism. *Psychological Science*, *14*(2), 144–150. https://doi.org/10.1111/1467-9280.01433

Li, L., Zhou, J., Zhuang, J., & Zhang, Q. (2023). Gender-specific emotional characteristics of crisis communication on social media: Case studies of two public health crises. *Information Processing & Management*, *60*(3), 103299. https://doi.org/10.1016/j.ipm.2023.103299

Li, P., & Zhong, F. (2022). A Study on the Correlation Between Media Usage Frequency and Audiences' Risk Perception, Emotion and Behavior. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.822300

Livingstone, A. G., Spears, R., Manstead, A. S. R., Bruder, M., & Shepherd, L. (2011). We feel, therefore we are: Emotion as a basis for self-categorization and social action. *Emotion*, *11*(4), 754–767. https://doi.org/10.1037/a0023223

Magee, J. C., & Tiedens, L. Z. (2006). Emotional Ties That Bind: The Roles of Valence and Consistency of Group Emotion in Inferences of Cohesiveness and Common Fate. *Personality And Social Psychology Bulletin*, *32*(12), 1703–1715. https://doi.org/10.1177/0146167206292094

Montagne, B., Kessels, R. P. C., Frigerio, E., De Haan, E. H. F., & Perrett, D. I. (2005). Sex differences in the perception of affective facial expressions: Do men really lack emotional sensitivity? *Cognitive Processing*, *6*(2), 136–141. https://doi.org/10.1007/s10339-005-0050-6

Moore, D. S., McCabe, G. P., & Craig, B. A. (2014). *Introduction to the Practice of Statistics*. Macmillan Higher Education.

Páez, D., Rimé, B., Basabe, N., Wlodarczyk, A., & Zumeta, L. (2015). Psychosocial effects of perceived emotional synchrony in collective gatherings. *Journal Of Personality And Social Psychology*, *108*(5), 711–729. https://doi.org/10.1037/pspi0000014

Plant, E. A., Hyde, J. S., Keltner, D., & Devine, P. G. (2000). The Gender Stereotyping of Emotions. *Psychology Of Women Quarterly*, *24*(1), 81–92. https://doi.org/10.1111/j.1471-6402.2000.tb01024.x

Rimé, B. (2007). The Social Sharing of Emotion as an Interface Between Individual and Collective Processes in the Construction of Emotional Climates. *Journal Of Social Issues*, *63*(2), 307–322. https://doi.org/10.1111/j.1540-4560.2007.00510.x

Van Beest, I., & Williams, K. D. (2006). When inclusion costs and ostracism pays, ostracism still hurts. *Journal Of Personality And Social Psychology*, *91*(5), 918–928. https://doi.org/10.1037/0022-3514.91.5.918

Van Doorn, E. A., Van Kleef, G. A., & Van Der Pligt, J. (2015). Deriving meaning from others' emotions: attribution, appraisal, and the use of emotions as social information. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.01077

Van Mourik Broekman, A., Gordijn, E. H., Koudenburg, N., & Postmes, T. (2017). Reshaping social structure through performances: Emergent solidarity between actors and observers. *Journal Of Experimental Social Psychology*, *76*, 19–32. https://doi.org/10.1016/j.jesp.2017.12.002

Willemsen, L.J., Greijdanus, H.J.E., Hindriks, F.A., & Postmes, T. (2025). Processes underpinning spontaneous cooperation during emergency situations [Manuscript for publication]. Department of Social Psychology, University of Groningen.

Zhang, W., Li, L., Mou, J., Zhang, M., Cheng, X., & Xia, H. (2022). Mediating Effects of Attitudes, Risk Perceptions, and Negative Emotions on Coping Behaviors. *Journal Of Organizational And End User Computing*, *34*(6), 1–22. https://doi.org/10.4018/joeuc.308818

Zhao, Y., Jiang, Y., Zhang, W., & Zhu, Y. (2023). Relationship between Risk Perception, Emotion, and Coping Behavior during Public Health Emergencies: A Systematic Review and Meta-Analysis. *Systems*, *11*(4), 181. https://doi.org/10.3390/systems11040181

Appendix A

Qualtrics

1. Research information	**'Perceived Group Cohesion during Emergency vs. Non-emergency Situations' (EC code: PSY-2526-S-0043)** **Why do I receive this information?** You are being invited to participate in the current research as you are 18-years or older. This is the only requirement for participation in this study. This information page is intended to provide you with the necessary information for you to make an informed decision about participating in this study. The researchers who are conducting this study all belong to the Social Psychology Department at the University of Groningen. The research team is made up of the following members: Lisa Willemsen (PhD candidate and project coordinator), Dr. Hedy Greijdanus (Principal investigator), Prof.dr. Tom Postmes (Co-investigator) Prof.dr. Russell Spears (Co-investigator) Prof.dr. Frank Hindrinks (Co-investigator), Paul Birzu (Third year Bachelor student), Gelbrich Haaijer (Third year Bachelor student), Ymke Liezen (Third year Bachelor student), Nathalie Mulder (Third year Bachelor student), Madelief van Holst (Third year Bachelor student), Youki Velthuis (Third year Bachelor student) **Do I have to participate in this research?** Your participation is completely voluntary. There are no consequences for ending your participation at any time. **Why this research?** The intention of this research is to understand observer differences in group cohesion during an emergency vs. a non-emergency situation. **What do we ask of you during the research?** This experiment is approximately 25 minutes long and requires your once-off participation. There is no follow-up. Part 1: After you have read the information about the study (this page), you will be asked to provide informed consent. The experiment does not begin until you have given consent. Part 2: You will be asked to watch one video. This will either be an emergency situation or a non-emergency situation. You will then be asked to complete a series of questionnaires that will examine different aspects of group cohesion. *As compensation, you will receive 0.4 SONA credits.* **What are the consequences of participation?** In participating, you will contribute to knowledge gain about group cohesion in different situations **How will we treat your data?** We will collect quantitative data from the questionnaires. The de-identified and aggregated data collected during this experiment will be disseminated in academic journals and at conferences. De-identified data is data that has your personal data removed. The data will be stored in a secure folder on the UG Y-drive. All data collected from you will be stored for 10 years. In order to be transparent about our research practices, the de-identified and aggregated data from this study will be published on open-source websites. De-identified data might also be provided to external researchers for replication purposes. **What else do you need to know?** You may always ask questions about the research. You can do so by emailing Lisa Willemsen (l.j.willemsen@rug.nl). Do you have questions/concerns about your rights as a research participant or about the conduct of the research? You may also contact the Ethics Committee of the Faculty of Behavioural and Social Sciences of the University of Groningen: ec-bss@rug.nl Do you have questions or concerns regarding the handling of your personal data? You may also contact the University of Groningen Data Protection Officer: privacy@rug.nl *As a research participant, you have the right to a copy of this research information.*
2. Consent	**Informed consent for 'Perceived Group Cohesion during Emergency vs. Non-emergency Situations' (EC code: PSY-2526-S-0043)** I have read the information about the research. I have had enough opportunity to ask questions about it. I understand what the research is about, what is being asked of me, which consequences participation can have, how my data will be handled, and what my rights as a participant are. I understand that participation in the research is voluntary. I myself choose to participate. I can stop participating at any moment. If I stop, I do not need to explain why. Stopping will have no negative consequences for me. Below I indicate what I am consenting to. *You have a right to a copy of this consent form.* Consent to participate in the research:

	o Yes, I consent to participate. (1) o No, I do not consent to participate. (2) Consent to processing my personal data: o Yes, I consent to the processing of my personal data as mentioned in the research information. I can ask to have my data withdrawn and erased. I can also ask for this if I decide to stop participating in the research. (1) o No, I do not consent to the processing of my personal data. (2)
3. Demographics	Please enter in your SONA identification number. What is your gender? o Female (1) o Male (2) o Non-binary (3) o Prefer to self-describe: (4) o Prefer not to say (5) How old are you?
4. Instructions	READ THE FOLLOWING INFORMATION CAREFULLY 1. You need to have a stable, good internet connection. 2. Please make sure you have the **volume on** when watching the video. 3. Watch the video in **full screen mode** to avoid cutting off parts of the video. 4. Complete this survey in one go **without taking a break.** If you exit out the survey, you will not be able to come back in. Thank you for your participation. You may now continue on to the study.
5. Video	Watch the video below. Pay close attention to how people behave, alone as well as together. You can watch the video as many times as you like. When you are ready, click the arrow to move on to the survey questions.
6. Attention check	Which sounds did you hear? ☐ Fire alarm (1) ☐ Announcement (2) ☐ Tire screeching (3) ☐ Bird chirpings (4) ☐ Children playing (5) ☐ I did not hear any sound (6)
7. Attention check failed	Unfortunately, this study requires you to have the volume on. As this was not possible for you, you cannot participate further in this study. *If you have questions regarding this, please contact Lisa Willemsen at l.j.willemsen@rug.nl for further information*
8. Common fate	Think about how the people in the video behaved, then please indicate the extent you agree with the following statements.

	Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither disagree or agree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)

	They were all in it together	o	o	o	o	o	o	o
	They all shared the same fate	o	o	o	o	o	o	o
	It was all of them against the situation	o	o	o	o	o	o	o
	It was everyone for themselves	o	o	o	o	o	o	o

9. Belonging (Solidarity)	Think about how the people in the video behaved, then please indicate the extent you agree with the following statements.							
		Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither disagree or agree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
	They were united	o	o	o	o	o	o	o
	They felt a sense of group belonging	o	o	o	o	o	o	o
	They excluded one or more individuals	o	o	o	o	o	o	o

	They felt connected with one or more of the others	o	o	o	o	o	o	o
	They were like strangers to each other	o	o	o	o	o	o	o

10. Identification (Solidarity)	Think about how the people in the video behaved, then please indicate the extent you agree with the following statements.							
		Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither disagree or agree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
	They identified with each other	o	o	o	o	o	o	o
	They looked like they felt solidarity with the others in the group	o	o	o	o	o	o	o
	They looked like they were be glad to be in the group	o	o	o	o	o	o	o
	They were similar to each other	o	o	o	o	o	o	o

	They had a lot in common with each other	o	o	o	o	o	o	o

11. Entitativity (Solidarity)	Think about how the people in the video behaved, then please indicate the extent you agree with the following statements.							
		Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither disagree or agree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
	They were a unit	o	o	o	o	o	o	o
	They felt a sense of togethernes s	o	o	o	o	o	o	o
	They felt that they could act as one	o	o	o	o	o	o	o
	They felt that they worked well together	o	o	o	o	o	o	o

12. Cooperation	Think about how the people in the video behaved, then please indicate the extent you agree with the following statements.							
		Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither disagree or agree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
	They worked well together	o	o	o	o	o	o	o

	They worked together successfully	o	o	o	o	o	o	o
	They worked together spontaneously	o	o	o	o	o	o	o
	Working together was discussed before they did it	o	o	o	o	o	o	o
	One person took a leadership position	o	o	o	o	o	o	o
	Working together looked like it was a communal decision	o	o	o	o	o	o	o

13. Emotions

Think about the emotions that you saw the people in the video experiencing. Which emotions did you perceive?

"In my opinion, the people in the video felt…"

	Strongly disagree (-3)	Disagree (-2)	Somewhat disagree (-1)	Neither disagree or agree (0)	Somewhat agree (1)	Agree (2)	Strongly agree (3)
energised	o	o	o	o	o	o	o
alarmed	o	o	o	o	o	o	o

	excited	o	o	o	o	o	o	o
	confused	o	o	o	o	o	o	o
	startled	o	o	o	o	o	o	o
	surprised	o	o	o	o	o	o	o
	scared	o	o	o	o	o	o	o
	anxious	o	o	o	o	o	o	o
	eager	o	o	o	o	o	o	o
	stressed	o	o	o	o	o	o	o
	like this was fun	o	o	o	o	o	o	o
	there was a sense of urgency	o	o	o	o	o	o	o

	enthusiastic	o	o	o	o	o	o	o
	in control	o	o	o	o	o	o	o
	uncertain	o	o	o	o	o	o	o
14. Debrief	**Debrief for 'Perceived Group Cohesion during Emergency vs. Non-emergency Situations' (EC code: PSY-2526-S-0043)** Thank you for participating! Your participation will help us understand how people perceive group cohesion in different situations. We expect that there is a difference in how observers perceive cooperation, common fate, perceived emotions, and solidarity in an emergency (vs. non-emergency) situation compared to the lived experiences of people in those situations. More information? If you want to receive the results once they are available or have any other questions, please email Lisa Willemsen (l.j.willemsen@rug.nl).							

Appendix B

Assumption checks

Figure 1

Levene's test and Q-Q plot for Anxious emotions

Assumption Checks

Test for Equality of Variances (Levene's)

F	df1	df2	p
1.148	3.000	61.000	0.337

Q-Q Plot

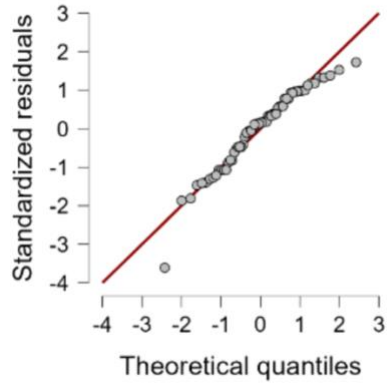


Figure 2

Levene's test and Q-Q plot for Enthusiastic emotions

Assumption Checks ▼

Test for Equality of Variances (Levene's)

F	df1	df2	p
0.700	3.000	61.000	0.555

Q-Q Plot

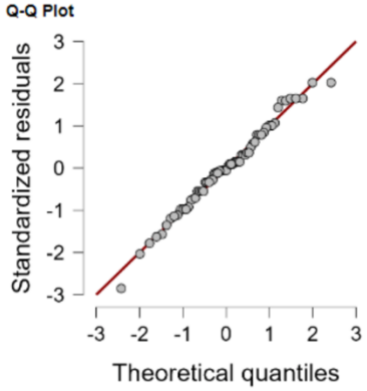


Figure 3

Levene's test and Q-Q plot for Uncertain emotions

Assumption Checks ▼

Test for Equality of Variances (Levene's)

F	df1	df2	p
2.537	3.000	61.000	0.065

Q-Q Plot

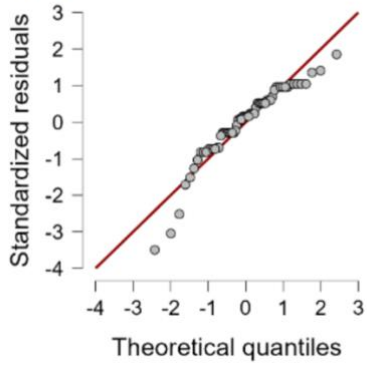


Table 1

Shapiro-Wilk test

	anxious emotions	enthusiastic emotions	uncertain emotions
Shapiro-Wilk	0.968	0.975	0.885
P-value of Shapiro-Wilk	0.095	0.200	< .001