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Research article

# The effects of self-other overlap and group efficacy on group-based anger and collective action tendency: An online experimental study☆

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ABSTRACT

Collective emotions and actions represent foundational constructs in social psychology, significantly influencing societal dynamics and responses. Within this framework, the Self-Other Overlap (SOO) - wherein individuals perceive minimal distinction between their own and others' identities - has been identified as an impactful factor at the interpersonal level. However, the extrapolation of SOO's implications at the collective, group level remains an underexplored domain in contemporary research.

In addressing this lacuna, the present research endeavors to elucidate the multifaceted implications of SOO on group emotions and actions, contextualized within societal challenges such as "food hygiene problems". Utilizing validated instruments including the Self-Other Overlap Scale, Group-Based Anger Scale, Collective Action Tendency Scale, and Group Efficacy Scale for Coping Situations, this study adopts a tripartite situational experiment, engaging a collective sample of 359 participants, systematically recruited via the *Credamo* smart research platform to ensure representativeness.

Study 1 examined the potential influence of variable SOO degrees on Group-Based Anger (GA) and Collective Action Tendency (CAT). Study 2 further refined the exploration, discerning the differential impacts of SOO targets on GA and CAT. Conclusively, Study 3 sought to ascertain the potential moderating role of Group Efficacy (GE) within the SOO-GA-CAT relationship.

The empirical findings yielded several salient insights: notably, an augmentation in SOO levels corresponded with an amplification of GA and CAT. Furthermore, a delineation in SOO targets, specifically from external to ingroup entities, manifested in a pronounced augmentation of GA and CAT. Intriguingly, while elevated SOO predisposed heightened CAT, the modulatory effect of GE on CAT manifested predominantly in lower SOO contexts.

In summation, the present study underscores the pivotal role of SOO magnitude and orientation as determinants of GA and CAT. The nuanced interplay between SOO degree and GE, particularly vis-à-vis CAT, provides a fresh scholarly perspective, contributing to the enriched understanding of group dynamics and collective behavioral paradigms.

## 1. Introduction

In the landscape of human behaviors, collective expressions of emotions and actions are both intricate and foundational. Just as fish are evolutionarily adapted to water and geese to migratory formations, humans are innately oriented towards group-based emotions and actions, guided by evolved socio-cognitive mechanisms [1,2]. These collective tendencies serve as a cornerstone in shaping contemporary societal dynamics. Notably, recent advancements in neuromarketing and advertising provide insights into the depth and complexities of such emotional processes and their pivotal roles in decision-making [3,4]. When confronted with incidents deemed as unjust or uncivilized by a social group, individuals within that group often express anger and resort to collective action to articulate their demands, whether peaceful or violent. Accordingly, investigating the factors and mechanisms influencing group emotions and actions is pivotal for understanding and addressing collective behavior - a perspective relevant to both researchers and practitioners in the field.

The interplay of perceived injustices and collective sentiments often culminates in group-based anger, compelling individuals to engage in collective actions, both peaceful and confrontational. Such anger emerges from cognitive evaluations of group-specific challenges [5]. When groups discern inequalities, it fosters feelings of relative deprivation, fueling emotions like anger, which in turn catalyzes collective action [6,7]. Importantly, this anger seldom targets an entire outgroup but is directed at the perceived provocateurs [8].

Collective actions, multifaceted in nature, encompass initiatives by group members to redress perceived imbalances and champion shared interests [1]. While these actions are not strictly delineated by participant metrics or spatiotemporal parameters, they are influenced by the complexity of the underlying issues and the interconnectedness of the stakeholders [9,10]. Therefore, examining the factors influencing group-based anger and collective action can offer a meaningful lens to comprehend group phenomena and provide a benchmark for regulating collective actions.

A pivotal concept in this discourse is the Self-Other Overlap (SOO). SOO represents the merging of individual identities with others, leading to shared perspectives and attributes [11]. Previous research has shown that enhancing the degree of SOO significantly influences sympathy, assistance towards others, harm reduction [12], stereotype reduction [13], inter-group bias reduction [14], and prosocial behavior interventions [15,16]. On the other hand, E. R. Smith et al. [17] posited that group-based emotions stem from the evaluation of the current status of intergroup relations between ingroups and outgroups (also see E. R. Smith & Mackie [18]). These emotions are experienced following an assessment that centers around group interests [19]. This raises the intriguing possibility: Can the principles of SOO (including the extent and the target) be extended to understand group-based anger and collective action dynamics?

Furthermore, group efficacy, a primary driver of collective action as per the two-path model of collective action [20], attracts attention from researchers in fields like education [21], community work [22], and collective response to climate changes [23]. Group efficacy, which is the belief that collective action can effect desired changes [24], is a crucial predictor and driver of collective action [25–27]. An immediate question emerges: How would this belief influence the impact of SOO on group emotions and actions?

### 1.1. Research gaps and objectives

Despite the documented influence of the degree of SOO on interpersonal and inter-group emotions and actions, few studies have investigated its potential impact on group-based anger and collective action tendency. SOO, as a phenomenon of information representation overlap, may stimulate individuals to empathize with others' perspectives [28], and treat others' gains and losses as if their own (Aron et al., 2004). When others face unfair treatment, will individuals, due to their self-other overlap, perceive a corresponding sense of deprivation and injustice and generate group-based anger [6]? If so, will the level of SOO affect the degree of group-based anger and collective action tendency?

Against this backdrop, based on the two-path model of collective action [20], our research endeavors to bridge this knowledge void through a series of situational survey experiments centering around the "food hygiene problem". These experiments are geared to.

A. Assess the impact of varying SOO degrees on group-based anger and collective action tendencies.
B. Examine the influence of the SOO target (be it ingroup or outgroup members) on these dynamics.
C. Explore the interplay between SOO magnitude and group efficacy in shaping collective action propensities.

This paper will unfold in three distinct yet interconnected studies. The first study focuses on the effects of varying SOO degrees on group-based anger and collective action tendencies, an area not thoroughly explored before. The second study introduces the novel aspect of SOO targets, investigating their impact on group dynamics. The final study offers an original exploration of the interaction between SOO and group efficacy. Together, these studies provide a comprehensive examination of SOO in group dynamics, contributing to our understanding of collective behavior. The structured approach is promised to elucidate the complex interplay between individual and group psychology, offering valuable insights for societal cohesion and harmony.

## 2. Study 1: exploring the role of self-other overlap in group-based anger and collective action tendency

### 2.1. Aim and hypothesis

Building on the backdrop of the "food hygiene problem", this study seeks to probe the influence of the extent of self-other overlap on group-based anger and the subsequent proclivity towards collective action. Rooted in prior research which underscores the centrality of group emotion in propelling collective action, our goal was to determine whether group-based anger acts as a conduit between the self-other overlap and collective action tendencies. Thus, our hypotheses were.

A1 The extent of self-other overlap is a significant predictor of group-based anger and the propensity for collective action.
A2 Group-based anger serves as a mediator between the self-other overlap and the inclination towards collective action.

### 2.2. Methods

#### 2.2.1. Participants

Utilizing the Credamo smart research platform,[1] participants were randomly sourced from every province and region across the nation. During the pilot testing phase, we collected responses from 38 participants based a rule of thumb of at least 15 participants per experimental group. These participants were randomly assigned by the platform to different experimental groups without their awareness. After a rigorous quality assessment, which excluded rapid completions (less than 200 s) and those failing attention-check questions, 30 valid responses remained. A preliminary analysis using JASP revealed an effect size of 0.623. Subsequently, using G*Power 3.1 with parameters such as the two-tailed test, effect size $f = 0.623, \alpha = 0.05$, $1-\beta = 0.8$, and $df = 1$, a sample size of 84 was deemed necessary for our single-factor between-subject design. To ensure the robustness of our results, the data collection was extended, accruing a total of 87 valid responses after two rounds of quality reviews.[2] Each participant received a remuneration of 1 yuan for their valid response. A detailed demographic breakdown of participants is available in Table S1.

#### 2.2.2. Instruments

The instruments used in this study were as follows:

Self-Other Overlap (SOO): the construct was measured by the static Inclusion of Other in the Self (IOS) scale [29]. The scale shows the subjects seven pairs of circles: the left circle of each pair of circles represents themselves, and the right circle represents others. The two circles in the 7 pairs of circles have evolved from non-overlapping to complete overlapping. The subjects were asked to choose a pair of circles that best represent their relationship with others.

Group-based Anger (GA): the construct was measured by an adapted scale in reference to the group-based anger questionnaire in the studies of Van Zomeren et al. [5] as well as Shi and Cui [30] and was prepared in combination with the characteristics of the concrete situation in this study. It included 4 items, such as "The restaurant management's indifference to consumer complaints made me angry". The Likert 7-point scoring method was used and the Cronbach's α was 0.742.

Collective Action Tendency (CAT): the construct was measured by an adapted scale based on previous studies [31] and was prepared in combination with the characteristics of the concrete situation in this study. It included 4 items, such as "I am willing to work with other consumers to put pressure on the restaurant management to pay attention to the health problems in a face-to-face manner." The Likert 7-point scoring method was used and the Cronbach's α was 0.828.

To mitigate the influence of social desirability, half of the items in the scales of group-based anger and collective action tendency were reversed.

Situation of the "food hygiene problem": "Please imagine that if one day (the name of your friend) found some foreign matter in a restaurant meal, and his/her reaction to the food hygiene problem did not get the attention of the restaurant management, then you just met (the name of your friend) at dinner."

#### 2.2.3. Procedure

We implemented a fully randomized single-factor between-test design, with SOO as the independent variable, and GA and CAT as the dependent variables. Participants were randomly divided into two groups: high SOO (self-intimate others) and low SOO (self-acquainted others).

Participants were asked to imagine a same-sex friend (an intimate friend for the high SOO group and an acquainted friend for the low SOO group), write about their physical characteristics and interests, and choose a pair of circles from the IOS scale that best represented their relationship with the imagined friend. Participants were then exposed to the "food hygiene problem" scenario, after which they completed the GA and CAT scales.

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[1] A powerful, large-scale smart research platform that provides both online research design and data collection services in both the Chinese and English languages (https://www.credamo.com). The validity of the research platform and its 2.8 million + subject pool was accepted by highly-recognized academic journals such as *Journal of Personality and Social Psychology*, *Personality and Social Psychology Bulletin*, *Journal of Organizational Behavior*, *Psychological Science*, etc.

[2] Details can be found at the Science Databank repository: https://www.scidb.cn/anonymous/aklSdkVq (the same for Study 2 and 3).

## 2.3. Results

### 2.3.1. Manipulative test of the degree of self-other overlap

To test the effectiveness of the manipulation on the degree of self-other overlap, an independent-sample *Student's t*-test was performed. It was found that the degree of overlap in the high SOO group ($\overline{x} = 5.60$, SE = 0.19) was significantly higher than that in the low SOO group ($\overline{x} = 3.61$, SE = 0.20), ($t_{(1, 85)} = 7.216$, $p < 0.001$), and thus the manipulation was effective.

### 2.3.2. An analysis of the influence of self-other overlap on group-based anger and collective action tendency

A One-way ANOVA was conducted with the degree of self-other overlap as the independent variable and group-based anger and collective action tendency as the dependent variable. As shown in Table 1, the main effects of SOO was found to be significant for both GA ($F_{(1, 85)} = 22.14$, $p < .001$, $\eta_p^2 = 0.207$) and CAT ($F_{(1, 85)} = 26.47$, $p < .001$, $\eta_p^2 = 0.237$). A correlation analysis found that SOO was positively correlated with GA ($r = 0.404$, $p < 0.001$) and CAT ($r = 0.543$, $p < 0.001$). These data are consistent with the hypothesis A1.

### 2.3.3. Mediation analysis of group-based anger

Since Cialdini et al. [12] pointed out the influence of self-other overlap on group emotion, a large number of empirical studies have also proved the driving effect of group emotion on collective action [32,33]. Therefore, we also analyzed the mediation effect of GA between SOO and CAT (Table 2).

The Bootstrap confidence interval of the total effect was [0.516, 1.166], excluding "0″, indicating that the total effect was significant. The Bootstrap confidence interval of the direct effect was [0.707, 0.102], excluding "0″, indicating that the direct effect was significant. Bootstrap confidence interval of indirect effects was [0.222, 0.703] excluding "0″, indicating that the indirect effects were significant. To sum up, GA plays a partial intermediary role between SOO and the CAT, which is consistent with the hypothesis A2.

## 2.4. Intermediary discussion

This study elucidates several key findings.

(1) The degree of self-other overlap can be effectively manipulated by prompting participants to visualize and describe either an intimate friend or an acquaintance, substantiating previous findings [12].
(2) In the context of a "food hygiene problem," the degree of self-other overlap significantly predicts group-based anger and collective action tendency. This aligns with prior research demonstrating a positive predictive relationship between self-other overlap, emotional identification, and prosocial behavior [34]. It suggests that the presence of friends potentially heightens the subject's identification with the ingroup. Consequently, they perceive the problem more from the ingroup members' perspective, which leads to group emotions and collective action tendencies [34,35]. As outlined by E. R. Smith et al. [17], group emotions differ from individual emotions. Individuals with strong identification can generate group emotions due to their group affiliation, even if the group events do not directly affect them. Furthermore, viewing others' resources, perspectives, and characteristics as an extension of oneself [36] can trigger feelings of injustice or deprivation when confronted with the loss of ingroup members' interests, thereby fostering group-based anger and collective action.
(3) Group-based anger serves as a partial intermediary between the degree of self-other overlap and the collective action tendency. This observation aligns with Van Zomeren et al. [5], who suggested that both emotion-focused and problem-focused pathways drive collective action. In the emotion-focused pathway, the negative emotions, including anger, that group members experience when confronting group issues or social comparisons stimulate the development of a collective action tendency [37]. This emotional reaction spurs individuals to participate in collective action [38]. However, due to constraints such as group efficacy and resources [39], the group-based anger might only partially influence individuals' final willingness to act.

## 3. Study 2: effects of the targets of self-other overlap on group-based anger and collective action tendency

### 3.1. Aim and hypothesis

Research by Simpson and Todd [40] suggests that even a cordial relationship with a single member of an outgroup can generate an extended inter-group contact effect. This can effectively lessen an individual's bias against the outgroup and foster a more positive

**Table 1**
Analysis of Variance of the Effect of Self-other overlap on Group-based anger and Collective Action Tendency.

| | Group(M±SE) | | *F* | *p* |
|---|---|---|---|---|
| | Self-the intimate friend ($n = 43$) | Self-the acquainted friend ($n = 44$) | | |
| GA | 6.39 ± 0.08 | 5.77 ± 0.11 | 22.14 | <0.001 |
| CAT | 6.25 ± 0.09 | 5.41 ± 0.17 | 26.47 | <0.001 |

GA: Group-based Anger; CAT: Collective Action Tendency.

**Table 2**
Mediation analysis of group-based anger.

| Effect | Effect size | Standard Error | 95% Confidence Interval | | Proportion of effect |
| --- | --- | --- | --- | --- | --- |
| | | | Lower Bound | Upper Bound | |
| Indirect effect | 0.436 | 0.125 | 0.222 | 0.703 | 51.84% |
| Direct effect | 0.405 | 0.152 | 0.102 | 0.707 | 48.16% |
| Total effect | 0.841 | 0.164 | 0.516 | 1.166 | – |

attitude towards it. Concurrently, several studies have demonstrated that self-other overlap can enhance inter-group relations by reducing inter-group bias [35] or stereotypes [36].

In light of these findings, our study aims to examine how an individual's perception of an outgroup might change in situations of inter-group conflict when the self-other overlap target is a member of the outgroup. More specifically, will individuals show reduced group-based anger towards outgroups and demonstrate lower tendencies for collective action to alter the unfair circumstances? Hence, we propose the following hypothesis:

B1: Individuals identifying with an outgroup member (self-other overlap target) will exhibit lower levels of group-based anger and collective action tendency than those identifying with an ingroup member.

E. R. Smith et al. [17] posit that group emotion emerges from the evaluation of inter-group relationships between ingroups and outgroups. Consequently, for studies involving outgroup-related group emotions, the outgroup should be established within the context of group emotion induction. To operationalize this, we created two groups in our study scenario: the customer group (to which the subject belongs, representing the ingroup), and the restaurant management group (accused of hygiene violations, representing the outgroup). This set-up allows us to examine the influence of the self-other overlap target on group-based anger and collective action tendencies.

### 3.2. Methods

#### 3.2.1. Participants

Similar to Study 1, the pilot test for the current study gathered responses from 34 randomly sourced participants from *Credamo*'s subject pool, who were randomly assigned by the platform to different experimental groups without their awareness. After implementing a rigorous quality assessment, which excluded rapid completions (less than 200 s) and those failing attention-check questions, 30 valid responses were retained. Preliminary analysis using JASP indicated an effect size of 0.681. Using G*Power 3.1 and parameters such as the two-tailed test, effect size $f = 0.681$, $\alpha = 0.05$, $1\text{-}\beta = 0.8$, and $df = 1$, a sample size of 70 was deemed necessary for our single-factor between-subject design. To ensure the robustness of our findings, data collection was further extended, culminating in 81 valid responses after two rounds of quality reviews. Participants were remunerated with 1 yuan for each valid response. A comprehensive demographic breakdown of the participants is presented in Table S1.

#### 3.2.2. Instruments

We employed the SOO, GA, and CAT scales, consistent with Study 1. In addition, we created a situational material, modified by 10 graduate students, that asked participants to imagine themselves witnessing a hygiene-related dispute in a restaurant. The experimental design is illustrated in Fig. 1.
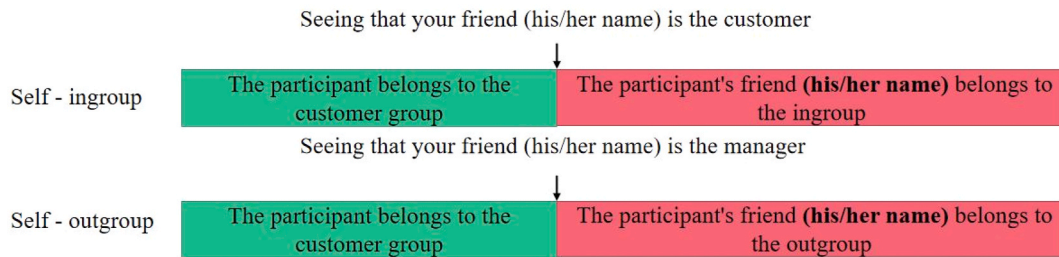
#### 3.2.3. Procedure

We implemented a completely randomized single-factor between-subject experimental design, utilizing the target of self-other overlap (ingroup/outgroup) as the independent variable, and group-based anger along with collective action intention as dependent variables. The participants were divided into two groups based on the identity of the "friend" in the situational material, one with the friend as a customer (self-ingroup-other) and the other with the friend as a manager (self-outgroup-other).

In this experiment, we randomly distributed questionnaires of different targets of self-other overlap via the *Credamo* platform. In order to ensure the quality of the subjects' responses and the sufficiency of imagination, situational photos were presented in the material and the subjects were asked to anticipate potential actions by the overlapping targets.

At the beginning of the experiment, after filling in the demographic information such as gender, age, education background, occupation, etc., the subjects were asked to imagine an intimate friend, a very close friend who had been with the subjects for more than 3 years, and then write down the name of the friend (the text value filled in by the subjects was then used in subsequent materials and items), and describe their physical characteristics and interests. After the description was completed, the manipulation of the degree of self-other overlap was tested through the static IOS scale. Afterwards, the subjects would read the situation material of the "food hygiene problem" as described above, and filled in the blanks as required. The instructional words were: "You came close and found that the customer/manager was (the name of your friend). Please simply imagine what (the name of your friend) might say and do." After the description was completed, the subjects were presented with the Group-based Anger scale and the Collective Action Tendency scale.

Imagine that you walk into a restaurant for a meal one day and find a customer complaining to the restaurant manager about the hygiene issues in the food, but the manager doesn't pay any attention. Then an argument breaks out between the two sides. You get closer and find that the (customer/manager) is none other than the (the name of your friend). Please briefly imagine what the (the name of your friend) might say or do.

Seeing that your friend (his/her name) is the customer

| | | |
|---|---|---|
| Self - ingroup | The participant belongs to the customer group | The participant's friend **(his/her name)** belongs to the ingroup |

Seeing that your friend (his/her name) is the manager

| | | |
|---|---|---|
| Self - outgroup | The participant belongs to the customer group | The participant's friend **(his/her name)** belongs to the outgroup |

**Fig. 1.** Schematic diagram of the manipulation process of the target of self-other overlap. This figure illustrates the manipulation process of the target of self-other overlap in Study 2. The top text represents the information presented to participants during the experiment, while the colored bar at the bottom corresponds to the text color, indicating whether participants perceived their overlapping targets as ingroup or outgroup members. Specifically, the green text instructed participants to perceive themselves as part of the customer group, while the red text manipulated participants' perception of the target of self-other overlap as either an ingroup member (customer) or an outgroup member (restaurant manager). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

### 3.3. Results

There was no significant difference between the degree of overlap of the self-ingroup-other group ($\bar{x} = 5.55$, SE $= 0.20$) and the degree of overlap of the self-outgroup-other group ($\bar{x} = 5.34$, SE $= 0.19$), $t_{(1,79)} = 0.752$, $p = .454$, Cohen's $d = 0.167$.

A one-way ANOVA was conducted with the target of SOO as the independent variable and GA and CAT as dependent variables (Table 3). It was found that the main effect of the target of SOO on GA and CAT was significant, and the self-ingroup-other group's GA ($F_{(1,79)} = 41.98$, $p < 0.001$, $\eta_p^2 = 0.347$) and CAT ($F_{(1,79)} = 56.45$, $p < 0.001$, $\eta_p^2 = 0.417$) were significantly lower than the self-outgroup-other group, which confirms hypothesis B1.

### 3.4. Intermediary discussion

Our findings show a significant effect of the target of self-other overlap on group-based anger and collective action tendency. Notably, when the overlap target was an outgroup member (manager), participants exhibited lower levels of anger and collective action tendency than when the target was an ingroup member (customer).

The results align with those of Study 1 when participants viewed the situation from the perspective of ingroup members, enhancing common interests [12] and promoting group emotions and collective action tendency [17]. When participants identified with outgroup members, they may have included the restaurant management group into their self-constructs, thereby reducing their ingroup "customer" anger and action desire.

It's important to note that while self-other overlap can promote inter-group relations, it might sometimes contribute to preferential treatment or favoritism, intensifying inter-group conflicts or complicating their resolution. This was evident in participants attributing situational factors to the restaurant management, such as assuming insects were added by customers or suggesting that such health issues are rare and not due to neglect.

## 4. Study 3: effects of self-other overlap and group efficacy on collective action tendency

### 4.1. Aim and hypothesis

Collective action theory suggests that group members are more likely to engage in collective action when they perceive their group as having adequate capabilities and resources to address potential issues, and when they believe that their desired outcomes are

**Table 3**
Analysis of variance of the impact of target of self-other overlap on group-based anger and collective action tendency.

| | Group (M±SE) | | $F$ | $p$ |
|---|---|---|---|---|
| | Self-Ingroup-Other ($n = 40$) | Self-Outgroup-Other ($n = 41$) | | |
| GA | $6.11 \pm 0.12$ | $4.71 \pm 0.18$ | 41.98 | <0.001 |
| CAT | $6.09 \pm 0.11$ | $4.37 \pm 0.29$ | 56.45 | <0.001 |

GA: Group-based Anger; CAT: Collective Action Tendency.

achievable [26]. Group efficacy significantly influences collective action tendency [41,42], and may even alter the effects of self-other overlap. Consequently, this study incorporates group efficacy into the framework established in Study 1, and examines how self-other overlap and group efficacy jointly impact collective action tendency. The proposed hypothesis is as follows:

C1: An interaction exists between the degree of self-other overlap and group efficacy in relation to collective action tendency.

### 4.2. Methods

#### 4.2.1. Participants

Similar to Study 1 & 2, for pilot testing, initial responses from 65 participants were collected as there were four experimental groups that awaited random assignment in this study. After conducting a rigorous quality assessment, which excluded rapid completions (less than 200 s) and those failing attention-check questions, 59 valid responses were retained. Preliminary analysis using JASP indicated an effect size of 0.297. Utilizing G*Power 3.1 and parameters such as the two-tailed test, effect size $f = 0.297$, $\alpha = 0.05$, $1-\beta = 0.8$, $df = 1$, and number of groups = 4, a sample size of 150 was determined to be necessary for our two-factor between-subject design. To bolster our study's reliability, data collection was extended, resulting in 165 valid responses after two quality review rounds. Given the questionnaire's comprehensive nature in this study, participants received a remuneration of 1.5 yuan for each valid response. Detailed demographics of the participants are provided in Table S1.

#### 4.2.2. Instruments

The SOO, GA, and CAT scales were consistent with Study 1.

Group efficacy (GE): the construct was measured by an adapted version of the group efficacy questionnaire prepared by Van Zomeren et al. [31], and the Cronbach's $\alpha$ was 0.833. was used to measure the subjects' perception of the ability of their ingroup (customers) to solve the food hygiene problem. The questionnaire included 4 items, for example, "Do you think we consumers can unite to make the restaurant management pay more attention to the restaurant hygiene problem?"

Group efficacy manipulation materials: The materials used for manipulating group efficacy were drawn from the method outlined in Shi and Cui's research [30]. In the high group efficacy (GE) scenario, the in-group members had successfully resolved numerous complex problems through their efforts. In contrast, the low GE scenario depicted in-group members struggling to overcome numerous challenges, despite their persistent efforts. To instill the sense of group efficacy among the participants, we presented them with a piece of news encapsulating the above scenarios. Following this, participants were asked to recount the primary content of the news to foster deeper comprehension. In order to ensure the efficacy and understanding of the news content, we enlisted the help of 10 graduate students from our university. These students were asked to rate the difficulty of comprehending the content. We subsequently selected two pieces of news that were similarly challenging to understand and roughly equivalent in word count, to serve as the high and low GE scenarios, as follows:

High GE situational materials: "Recently, the Consumer Association of your city has actively cooperated with the Municipal Bureau of Industry and Commerce to open a special line for consumer rights protection. The special line has successfully helped more than 230 consumers to protect their rights over the past month, with remarkable results, such as Ms. Cheng's complaint about the restaurant recharge card problem and Mr. Li's complaint about the restaurant sanitation problem reported by this station. Under the guidance of the special line, More and more consumers actively contact the industrial and commercial administration departments and other complaints consumers, and successfully safeguard their rights through legal means."

Low GE situational materials: "Recently, the consumer rights protection statistical report of the Consumer Association of your city shows that the success rate of consumer rights protection in this city is less than 20%, and consumer rights protection is difficult. For example, Ms. Cheng's complaint about the restaurant's recharge card and Mr. Li's complaint about the restaurant's health problems reported by our TV station before, although consumers' awareness of legal rights protection is increasing, the high cost of rights protection and the existence of such problems as the merchants' prevarication make it difficult for consumers to defend their rights."

#### 4.2.3. Procedure

The study utilized a completely randomized 2 (Self-Other Overlap: high/low) by 2 (Group Efficacy: high/low) between-subject experimental design. This led to a total of four groups, into which participants were randomly assigned. The independent variables under investigation were the degree of self-other overlap and group efficacy, while the dependent variable was the collective action tendency.

At the commencement of the experiment, participants filled out demographic information, including their gender, age, educational background, occupation, etc. To control the degree of self-other overlap, participants were asked to envision either a close friend or a casual acquaintance. They were instructed to write down the friend's name (which was then used in subsequent materials and items), as well as describe their friend's physical attributes and interests. Once the descriptions were completed, the degree of self-other overlap was assessed using the Inclusion of Other in Self (IOS) scale. Subsequently, participants were shown the group efficacy situational materials and were asked to summarize the main content to ensure their comprehension. Following this, a "food hygiene problem" scenario was presented. The group efficacy manipulation material was then shown again, followed by a repeat of the "food hygiene problem" scenario. At this point, participants were asked to imagine their friend's reactions and actions in response to the scenario and write them down. The procedure concluded with participants being asked to complete the Collective Action Tendency Scale. The aim was to gauge their inclination towards participating in collective action in response to the presented scenarios.

### 4.3. Results

#### 4.3.1. Manipulative test of the degree of self-other overlap and the degree of group efficacy

To test the effectiveness of self-other overlap manipulation, an independent Student's $t$-test was conducted. It was found that the degree of overlap in the high SOO group ($\overline{x} = 5.56$, SE = 0.13) was significantly higher than that in the low SOO group ($\overline{x} = 2.61$, SE = 0.09), $t_{(1,163)} = -19.13$, $p < 0.001$), suggesting that the manipulation was effective.

To test the effectiveness of group efficacy manipulation, an independent Student's $t$-test was conducted. It was found that the group efficacy level of the high GE group ($\overline{x} = 6.07$, SE = 0.06) was significantly higher than that of the low GE group ($\overline{x} = 5.22$, SE = 0.12), $t_{(1,163)} = -5.97$, $p < 0.001$, suggesting that the manipulation was effective.

#### 4.3.2. An analysis of the influence of self-other overlap and group efficacy on collective action tendency

The descriptive statistics of the experimental results are shown in Fig. 2. A two-factor analysis of variance found that the main effect of SOO grouping was not significant ($F_{(1,161)} = 1.258$, $p = .264$, $\eta_p^2 = 0.007$), the main effect of GE grouping was significant ($F_{(1,161)} = 12.427$, $p < 0.001$, $\eta_p^2 = 0.07$), and the interaction between SOO groups and GE groups was also significant ($F_{(1,161)} = 4.090$, $p = .045$, $\eta_p^2 = 0.023$), confirming the hypothesis C1.

As shown in Table 4, The effect of group efficacy on collective action tendency was no statistical significance in the context of high self-other overlap ($F_{(1, 78)} = 1.102$, $p = .692$, $\eta_p^2 = 0.297$). On the contrary, in the context of low self-other overlap, group efficacy had a significant impact on collective action tendency ($F_{(1, 85)} = 15.872$, $p < 0.001$, $\eta_p^2 = 0.157$).In order to supplement and verify the relationship between group efficacy and collective action tendency, the scores of each item in the questionnaire of collective action tendency were analyzed. It can be seen that there was a positive correlation between group efficacy and collective action tendency, as shown in Table 5.

### 4.4. Intermediary discussion

This study has revealed several noteworthy findings.

(1) By presenting varied scenarios, in which the subjects' ingroup members are depicted as capable (or incapable) of problem-solving through collective efforts, and requiring imaginative description, the level of group efficacy can be manipulated. Prior research suggests that the portrayal of group efficacy should be as realistic as possible, and maintain a consistent level of difficulty to enhance the control effect [30]. This study provides a successful example of such an approach.

(2) The degree of self-other overlap and group efficacy were found to interactively influence collective action tendency. This can be interpreted using the two-path model of collective actions.

First, when the degree of self-other overlap was high, the collective action tendency was generally elevated, but the impact of group efficacy on the collective action tendency was statistically insignificant. As suggested by Study 1, when subjects perceive a high degree of overlap with their ingroup members, they experience a heightened level of group-based anger due to perceived unfair treatment. This heightened emotional state leads to an increased inclination toward collective action. Under these circumstances, collective action appears to be driven primarily by the emotional focus path. The non-significant effect of group efficacy in these situations may be attributed to a possible ceiling effect.

Conversely, when the degree of self-other overlap is low, group efficacy has a significant positive predictive effect on collective action tendency. This can be understood from the problem focus path's perspective: when group-based anger and other emotions are mitigated through high group efficacy in problem-solving, the emotional impetus for group action weakens. However, if individuals have adequate resources, the collective action tendency increases [43].
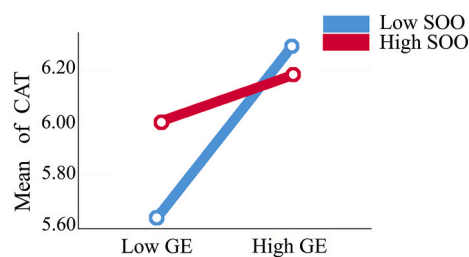


**Fig. 2.** Interaction of self-other overlap and group efficacy on collective action tendency. The horizontal axis represents the grouping based on the degree of self-other overlap (high/low), the column color represents the grouping based on group efficacy (high/low), and the vertical axis represents the mean value of collective action tendency. As depicted in the figure, there was no significant difference in collective action tendency between the high and low group efficacy groups when self-other overlap was high. However, a significant difference in collective action tendency was observed between the high and low group efficacy groups when self-other overlap was low. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

**Table 4**

Descriptive statistics of self-other overlap and group efficacy on collective action tendency.

| Degree of Self-Other Overlap | High Group Efficacy ($n = 79$) | Low Group Efficacy ($n = 86$) |
|---|---|---|
| | (M±SE) | (M±SE) |
| High Overlap (n = 78) | 6.17 ± 0.12 | 5.99 ± 0.12 |
| Low Overlap (n = 87) | 6.27 ± 0.09 | 5.62 ± 0.13 |

**Table 5**

Correlation between group efficacy and collective action tendency.

| Variable | | GE | CAT1 | CAT2 | CAT3 | CAT4 |
|---|---|---|---|---|---|---|
| 1. GE | Pearson's r | – | | | | |
| | p-value | – | | | | |
| 2. CAT1 | Pearson's r | 0.332 | – | | | |
| | p-value | <0.001 | – | | | |
| 3. CAT2 | Pearson's r | 0.411 | 0.511 | – | | |
| | p-value | <0.001 | <0.001 | – | | |
| 4. CAT3 | Pearson's r | 0.478 | 0.439 | 0.493 | – | |
| | p-value | <0.001 | <0.001 | <0.001 | – | |
| 5. CAT4 | Pearson's r | 0.434 | 0.326 | 0.446 | 0.467 | – |
| | p-value | <0.001 | <0.001 | <0.001 | <0.001 | – |

GE: Group Efficacy; CAT: Collective Action Tendency.

Taking into account the positive predictive effect of the degree of self-other overlap on group-based anger, it can be inferred that, during the experiment, when the degree of self-other overlap is low, the collective action tendency of the subjects depends more heavily on the perceived level of group efficacy.

## 5. Overall discussion

The intrigue surrounding the generation and alteration of group-based anger and collective actions has consistently been a point of focus for researchers [1,2,5,44]. The exploration into this domain is pivotal for both understanding and managing collective action. In the realms of emotion and action, self-other overlap has often been highlighted as a significant influencer. It has the potential to elicit compassion, drive assistance towards others, reduce harm [12], mitigate inter-group bias [14], and even encourage prosocial behavior [15,16].

### 5.1. Discussion of key findings

To navigate the intricate dynamics between self-other overlap, group efficacy, group-based anger, and collective action tendencies, we chose the "food hygiene problem" as a contextual backdrop for our study. The series of studies conducted unveiled a myriad of findings, each contributing uniquely to our understanding of the phenomena under investigation.

In Study 1, the influence of the degree of self-other overlap on group-based anger and the collective action tendency was the focal point. The findings not only underscored the profound relationship between self-other overlap, group-based anger, and collective action tendencies but also illuminated the mediator role that group-based anger played. The results accentuated the manner in which individuals integrate peers' perspectives and resources into their own identities [28], paving the way for feelings of relative deprivation [45] and subsequently fueling group-based anger and a propensity for collective action [6]. This cascade of effects eventually culminates in group-based anger, spurring collective action tendencies. This trajectory resonates with previous studies that have emphasized the emotional pathways leading to collective action [5,46].

Study 2 deviated slightly, concentrating on the target of self-other overlap and how it impacts group-based anger and collective action tendencies. Consistent with previous research by Laurent and Myers [14], our results indicated that subjects whose self-other overlap targets were outgroups exhibited significantly lower levels of group-based anger and collective action tendency compared to subjects whose self-other overlap targets were ingroup members. This finding suggests that a high degree of self-other overlap can effectively reduce stereotypes or engender helpful behaviors toward outgroup members. It aligns with the perspective of expanding intergroup contact effects [35], where even a friendship relationship with an outgroup member can diminish individual prejudice against that outgroup. In our experiment, subjects whose self-other overlap targets were restaurant management (outgroups) tended to attribute negative incidents, such as bugs found in food, to customers themselves, rather than placing blame on the restaurant. This phenomenon can be understood through the lens of the self-expansion model, where self-other overlap as an internal mechanism of empathy promotes friendly behavior and reduces harm [12,47]. It also aligns with the notion that individuals tend to use situational factors to explain others' negative behaviors [11]. Such findings bolster the notion that self-other overlap can serve as a bridge to reduce intergroup tensions and biases, promoting a more harmonious coexistence. However, caution is necessary as self-other overlap may also influence individuals' fair judgment of intergroup conflicts and impede normal rights protection actions, leading to negative outcomes such as favoring kin over others.

The dual-path model posits that collective action is influenced by both the emotional focus pathway and the problem focus pathway, with group-based anger and group efficacy playing pivotal roles, respectively [5]. Study 1 focused on the emotional focus pathway, elucidating the mediating role of group-based anger between self-other overlap and collective action tendency, but it did not explore the problem focus pathway. On the other hand, Study 3 introduced the concept of group efficacy to examine the interaction between self-other overlap and group efficacy in shaping collective action tendency. The results revealed an interaction effect, indicating that under conditions of high self-other overlap, the impact of group efficacy on collective action tendency was not significant. This might be attributed to the convergence of perspectives and positions among subjects with high self-other overlap, as well as their inclination to maintain their own interests. As a result, they already exhibited a high level of group-based anger and collective action tendency, with collective action being primarily driven by the emotional focus pathway. In contrast, under conditions of low self-other overlap, the positive effect of group efficacy on collective action tendency reaffirmed the effectiveness of the problem focus pathway. In this case, when group members recognized a problem as collective and aimed to protect and enhance collective status and interests, group efficacy emerged as a crucial predictor of collective action. This finding is consistent with previous research emphasizing the importance of group efficacy in collective action efforts [26,48,49]. The results of Study 3 demonstrate that the effects of self-other overlap and group efficacy on collective action are intertwined. They also shed light on the importance of enhancing self-other overlap among members of a group with low cohesion and limited intimacy in order to stimulate collective action and address disadvantaged situations. Moreover, nurturing group efficacy is crucial for the success of collective action, involving factors such as members' acquired and vicarious experiences and effective leadership and participation [21,50–53].

### 5.2. Implications for managerial and academic contexts

The exploration of the interplay between self-other overlap, group efficacy, group-based anger, and collective action tendencies not only offers a deeper understanding of these phenomena but also carries significant implications for both managerial and academic contexts.

In the managerial context, from a practical standpoint, understanding these dynamics is crucial for effective organizational behavior and conflict management. Managers and leaders who grasp the profound influence of self-other overlap among employees are better equipped to foster a culture of unity and minimize intergroup biases. This can lead to the prevention of collective actions, such as strikes or protests, that might disrupt operations. By addressing the emotional and cognitive triggers underpinning such actions, strategies can be formulated to address root concerns proactively. Moreover, in the realm of talent development and management, the findings of our study are invaluable. HR professionals can glean insights from our research to tailor training programs that accentuate group cohesion, shared goals, and mutual understanding. Such initiatives, rooted in an in-depth understanding of collective action tendencies, can cultivate a work environment that is both harmonious and productive, leading to enhanced employee satisfaction and overall organizational efficiency.

In the academic context, on the theoretical front, our study fills a significant gap in the literature. By integrating the elements of self-other overlap with group efficacy, we offer a fresh perspective on the drivers of collective action tendencies. This novel approach not only challenges and extends current theoretical frameworks but also sets the stage for further inquiries in this domain. The insights gained can be pivotal for scholars aiming to delve deeper into the intricate mechanisms that drive collective action and the emotions and cognitions underpinning it. From a practical academic standpoint, especially within academic institutions such as universities, our findings have significant implications. Faculty and administration can leverage the insights from our study to foster a greater sense of unity among students, diminish biases between different academic cohorts, and encourage cohesive group actions in academic projects and endeavors. Understanding the dynamics of self-other overlap can be especially beneficial in multi-disciplinary courses, where students from diverse academic backgrounds collaborate. This can lead to a more harmonious academic environment, fostering both collaboration and competition in healthy measures. Additionally, our methodological approach, characterized by the two-step sampling process and the use of the *Credamo* platform, can be adopted by researchers and students in academic settings for their empirical studies, ensuring methodological rigor.

In conclusion, the implications of our study span a wide spectrum, touching both the managerial and academic arenas. They provide actionable insights for interventions in organizational and academic settings and lay the groundwork for future theoretical and practical explorations. The knowledge gained underscores the importance of understanding the complex dynamics of group emotions and actions in diverse settings.

### 5.3. Limitations and future research directions

While our study offers a wealth of insights, it is essential to acknowledge its limitations and propose avenues for future exploration to build upon our findings. Firstly, our survey experiment design was inherently limited to individual-level data, which poses challenges when examining group-level constructs like group efficacy, group anger, and collective action tendency. Despite internal consistency analysis yielding satisfactory results for group members' responses, there remains a possibility of errors stemming from the inability to capture dynamic interactions among group members and other contextual factors [54]. This underscores the importance of future research exploring these dynamic processes through alternative methodologies. Another constraint pertains to the specific context of our study, the "food hygiene problem", which might circumscribe the generalizability of our findings to other scenarios or cultural settings. It would be valuable for future investigations to replicate our study across diverse contexts, thereby enhancing the universality of our conclusions. Moreover, our exploration primarily concentrated on the psychological mechanisms of normative collective action, leaving non-normative collective actions relatively untouched [55]. Given the multifaceted nature of collective

action, future research should delve into the psychological underpinnings of non-normative actions, such as violent protests, offering a more holistic view of the subject. Lastly, the demographic composition of our subjects, though encompassing a nationwide range, was predominantly individuals aged between 20 and 40 years with high school education or higher. Future research endeavors should aim for a more demographically varied sample, ensuring findings that are more universally applicable.

Looking forward, future research should strive to validate and extend our findings across diverse contexts to ensure the universality of our conclusions. An in-depth examination of non-normative actions would broaden the understanding of the emotional drivers behind different types of collective actions. Furthermore, incorporating a broader range of measurement tools and methodologies, such as semi-structured interviews followed by quantitative validations and neuromarketing tools [56], could unravel additional factors influencing collective action tendencies.

In essence, while our study provides a strong foundation, there is a vast expanse of uncharted territory in the realm of collective action tendencies. The limitations of our research, coupled with the proposed future directions, offer a roadmap for subsequent scholarly endeavors, promising richer insights and a deeper understanding of the subject.

## 6. Conclusion

In summary, our study elucidates the roles of self-other overlap and group efficacy in the formation of group-based anger and collective action tendencies. We found that self-other overlap is a significant predictor of these phenomena, with group-based anger acting as a partial mediator. The interaction between self-other overlap and group efficacy also revealed nuanced insights into the conditions that foster collective action tendencies.

These findings have practical relevance for promoting and guiding collective action in social contexts and offer a starting point for fostering empathy and shared identity within groups. The study's limitations, however, point to the necessity for further research in more varied contexts, with a more comprehensive approach to measuring collective action and a broader sample representation. Addressing these gaps will enable a more nuanced understanding of collective action mechanisms, contributing to strategies that foster positive social change through collective endeavors.

## Declarations

The studies involving human participants were reviewed and approved by *the Institutional Review Board of School of Psychology, Fujian Normal University* (Approval No. 2022062301). The patients/participants provided their written informed consent to participate in this study.

## Data availability statement

The data for this study have been deposited in the Science Databank repository: https://www.scidb.cn/anonymous/aklSdkVq.

## CRediT authorship contribution statement

**Bin Yin:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Cheng-Yang Fei:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e28346.

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