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In-group versus Out-group Preferences in Intergroup Conflict: An Experiment [*]

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Abstract

Individuals participating in a group conflict have different preferences, e.g., maximizing their own payoff, maximizing the group's payoff, or defeating the rivals. When such preferences are present simultaneously, it is difficult to distinctly identify the impact of those preferences on conflict. In order to separate in-group and out-group preferences, we conduct an experiment in which human in-group or out-group players are removed while keeping the game strategically similar. Our design allows us to study (i) how effort in a group conflict vary due to in-group and out-group preferences, and (ii) how the impact of these preferences vary when the two groups have explicitly different social identities. The results of our experiment show that the presence of in-groups enhances concern about individual payoffs. A further presence of out-groups moderates the concern for individual payoffs through an additional concern for own group payoffs. The negative effect of the in-group preferences and the positive effect of the out-group preferences are weaker when group members have a common social identity.

1. Introduction

Human beings often engage in inter-group conflict. The examples of such conflicts range from civil war and ethnic tensions to elections, group lobbying, and sports. Inter-group conflicts have several interesting features. The group members exert individual efforts that collectively determine the 'group effort', which influences the likelihood of the group winning the conflict. All the members of the winning group share the spoils of the conflict, but incur the cost individually. Formally, this is similar to a group contest. Contests, in which individuals spend costly and irretrievable resources in order to secure some valuable reward(s), are a standard way of modelling conflicts (Garfinkel and Skaperdas, 2007). Group conflicts are modelled as group contests in which multiple individuals create a group and jointly contest against other groups for a reward. In this study, we use a bilateral group contest to investigate how preferences towards own group (in-group preferences) and towards the opponent group (out-group preferences) impact individual decisions in intergroup conflict.

Very often the production of group effort is assumed to be additive of the individual efforts (e.g., Katz et al., 1990), and the function that determines the winning group is assumed to take a logit form (Tullock, 1980) to capture the noise in conflict outcome. The issue of sharing the reward is often resolved by intragroup conflict (Munster, 2007; Choi et al., 2016). In case there is no such intra-group conflict, then all the members in a group share the benefits irrespective of their individual efforts in the conflict, and individuals have an incentive to free ride on their group members (Bornstein and Ben-Yossef, 1994).[1]

Since it is difficult to obtain field data on group conflicts; researchers frequently resort to laboratory experiments. In a majority of them, the prize value is exogenously given and all the members of the winning group obtain the same gross benefits upon winning. All players individually choose how much effort to contribute to the group contest, and an individual's material payoff is the difference between the gross benefits and the individual effort. Many such studies report group-level spending at more than double the equilibrium prediction (Abbink et al., 2010; Ahn et al., 2011; Sheremeta, 2011; Eisenkopf, 2014; Chowdhury et al.,

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[1] An intergroup lottery contest with additive group effort and public good prize allows individuals with lower valuation for the reward to free ride on individuals with higher valuation. The equilibrium spending at the group level can be uniquely defined by a pure strategy equilibrium, but there exists a continuum of pure strategy equilibria at the individual level if all players attach the same value to the reward, or at least two players attach the highest value (Baik, 1993). Consequently, some players free ride with positive probability. Note that this free-riding phenomenon depends on the group effort production technology. When the technology is additive or a best-shot type (Chowdhury et al., 2013), then free-riding occurs. With complementarity in effort (Lee, 2014; Kolmar and Rommeswinkel, 2016) free-riding might not occur.

2016). There are various explanations for this behavior (Sheremeta, 2020). The final payoff of an individual may comprise material as well as non-material components. People could make errors. Or, group-related preferences and the psychological significance of winning or losing can account for the final payoffs being different from the material payoffs (Sheremeta, 2015).

Group-related preferences ought to be interpreted, therefore, as a composite construct involving love, hate, positive synergy, reciprocation, and retaliation preferences that may arise in a group setting. Additionally, in most real life intergroup conflicts, the conflicting parties also bear different social or categorical identities (ethnic, political, racial, gender etc.), which provides the basis for belonging to one specific side in a conflict. This is documented theoretically by Sen (1985, 2007), experimentally by Sherif et al. (1961), Chowdhury et al. (2016), and from the field data by Esteban et al. (2012 a,b) among others (see Chowdhury, 2021 for a survey).[2]

Social psychology and behavioral economics suggest some closely entwined concepts which are relevant in the context of a group conflict. The *role identity*, for example, refers to the fact that being in a group one is expected to contribute to the group in a certain way (Charng et al., 1988; Charness and Chen, 2020). Another concept is the *common fate identity* (Campbell, 1958; Gaertner and Dovidio, 2011) that comes from the consequential commonality shared by the individuals on the same side in a conflict – if their group wins, they all win; if their group loses, so do all of them. Their payoffs, however, can still be different depending on their individual efforts, and this potential disparity can give rise to preferences for within-group fairness and equality (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Reichmann, 2007). Role and common fate identity are expected to increase group cohesion, strengthening effort incentives. Preferences for within-group fairness and equity, however, can either increase or decrease effort depending on an individual's belief about whether the other members in their group are spending less or more effort. A perceived threat from the contesting group(s) should induce more effort (Weisel and Zultan, 2016). Finally, parochial altruism can also induce more effort to increase own group's payoff over the opponent group (Abbink et al., 2012).

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[2] Research on group psychology discourses heavily on the emotions of in-group love and out-group hate (e.g., Allport, 1954; Sherif, 1966; Brewer, 1999). Behavioral economics accommodates the impact of such emotions on individual decision-making under the umbrella term of 'other-regarding preferences' (Cooper and Kagel, 2016). Note, however, that a bilateral group contest over a public good prize is special in characterizing conflicting interests at both intra-group and inter-group level. For this reason, we refrain from using the common terms such as 'in-group love' and 'out-group hate'. Instead, preferences relating to other people in the same group are called 'in-group preferences' and preferences relating to people in the contesting group are called 'out-group preferences' – referred to as 'group-related preferences' when taken together.

To summarize, effort provision in a group conflict is a function of the material payoffs and group-related preferences. In this study, we focus on the group-related preferences. While the general structure of any bilateral or multilateral group conflict can be sufficient for the development of group-related preferences, the simultaneous presence of categorical identities can affect the salience of such preferences. In a laboratory experiment, we study (i) how effort in a group conflict vary due to in-group and out-group preferences, and (ii) how the impact of these preferences vary when the two groups have explicitly different social identities.

We approach the first question with a set of experimental treatments designed to switch off the payoff consequences for the respective in-group and out-group players. Payoffs, as pointed out earlier, can consist of material and non-material elements. Accordingly, to completely switch off the payoff consequences of a subject's actions on other players, subjects' decisions are matched with stored decisions of participants from previous sessions. We refer to such participants as 'historical' subjects. Participants from previous sessions have already been paid, do not learn about the present events, and do not face any further consequences thereof. Interaction with such 'historical' others, as opposed to an interaction with 'active' others, should be free of social preferences regarding potential financial and psychological payoffs to the others. This should also neutralize the associated group preferences.

We name the treatments in terms of whether a subject is faced with real active subjects or not. In the IN-OUT treatment, a subject plays with 'active' others in both in-group and out-group. In the IN treatment, a subject plays with 'active' others in their own group but 'historical' others in the out-group. Finally, in the NONE treatment, a subject plays only with 'historical' others in both in-group and out-group. Consequently, group-related preferences should be composed of both in-group and out-group preferences in IN-OUT treatment but only of in-group preferences in the IN treatment. The decisions in the NONE treatment should be independent of any group-related preferences.

To address the second question related to social identity, we group all our subjects into two clusters based on minimal identities assigned to them in the laboratory (Tajfel, 1970). Subjects in each cluster are then matched into contest groups (each with 3 subjects in it). Each group always contests a group from the other cluster. Subjects were aware of this matching in the R (revealed) condition, and unaware of this in the C (concealed) condition.
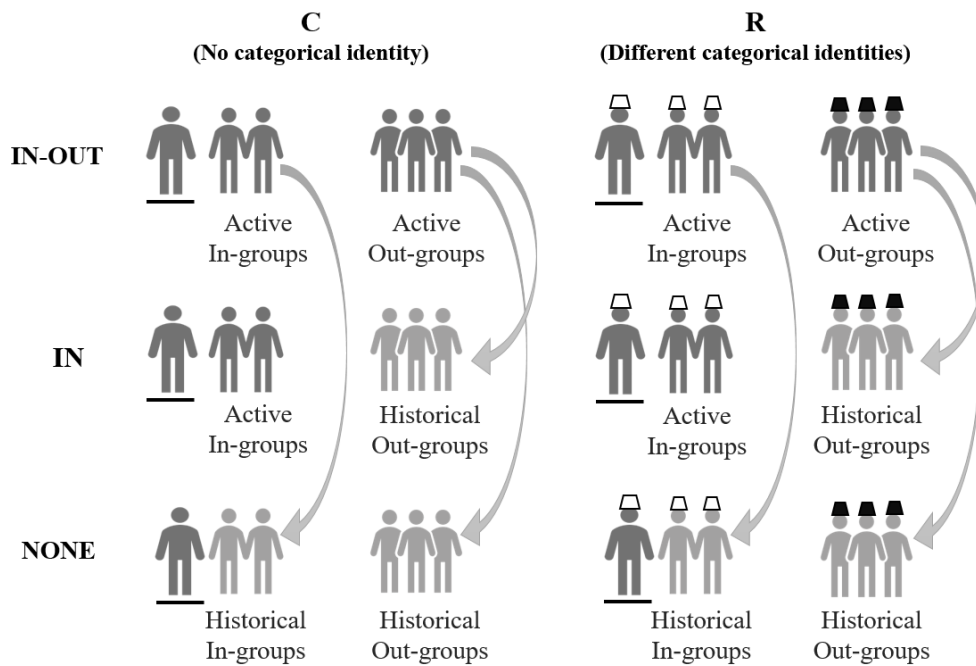
Figure 1. Experimental design.

Figure 1 summarizes the experimental design. In each group, the in-group and out-group players are defined from the perspective of the underlined subject on the left. The dark figures represent active subjects making simultaneous decisions and the light figures represent historical subjects. As subjects are randomly matched into groups, all figures have the same color. The color of the hats for the groups in the R treatments represent the identity clusters. Contesting groups in the C treatments are indistinguishable from one another, while contesting groups in the R treatments have different minimal identities, as represented by the white and black hats. From the perspective of the underlined subject, all subjects in both contesting groups are active subjects in the IN-OUT treatments, only the in-group subjects are active and out-group subjects are historical in the IN treatments, and all in-group and out-group subjects are historical in the NONE treatments. The arrows indicate that the historical subjects replicate the decisions made by the active subjects in the IN-OUT treatments. For this reason, implementing this design required carrying out the IN-OUT treatments first, followed by the IN and the NONE treatments, respectively. The instructions are provided in Appendix A.

The differential effects of in-groups vis-à-vis out-groups have been studied in the context of other social dilemma games but not for an inter-group contest.[3] Using our experimental design,

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[3] E.g., Prisoner's Dilemma and iterated Prisoner's Dilemma (Bornstein and Ben-Yossef, 1994), iterated Prisoner's Dilemma maximizing-difference (Halevy et al., 2008), and stag-hunt and battle-of-the-sexes (Ahmed, 2007).

we are able to observe how in-group preferences motivate effort in comparison to no group-related preferences, and how the additional presence of an out-group may alter this motivation.

The results of our experiment show that the presence of in-groups enhances concern about individual payoffs but the additional presence of out-groups moderates concern for individual payoffs through an additional concern for group payoffs. The negative effect of the in-group preferences and the positive effect of the out-group preferences are weaker when group members have a common social identity.

The effort-increasing effect of out-groups have been reported in other studies (albeit in the context of social dilemma games). But the finding that the presence of in-groups does not induce higher effort, instead may make individuals more concerned about their own individual payoffs, is an interesting and novel result. While this finding is in contrast to the classical claim of the existence of in-group love independently of out-group hate (Brewer, 1999), it is consistent with the idea of social comparison. Individuals, in a social situation, are concerned about their own payoff in comparison to others. Hence, they care only about intra-group comparison when only in-groups are present but once the out-groups are there, they may view their own group as a unit and may partially shift their focus to the inter-group comparison.

Further details about the experimental implementation is given in Section 2. The results are presented in Section 3, and Section 4 concludes.

2. Experimental design and procedures

We use a 3x2 between-subject design with a total of 6 treatments and 180 subjects. There are 3 different group matching variations – IN-OUT, IN, and NONE; each conducted separately under 2 identity conditions – C (concealed) and R (revealed).

Part I of the experiment consists of a painting choice task (Tajfel, 1970) which is used for assigning subjects with the minimal identities. This is common knowledge in the R treatments. However, neither the minimal identities nor the use of these identities for group assignment in Part II are revealed to subjects in the C treatments.

At the beginning of the experiment, each subject is shown five pairs of paintings. Subjects are informed that each pair consists of one painting by Paul Klee and another by Wassily Kandinsky but they do not know which painting belongs to whom. Subjects are asked to indicate their preferred paintings in each pair. Depending on the median preference, subjects are then assigned to one of the two identity clusters – the KLEE cluster and the KANDINSKY

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cluster. In the C treatment, subjects are explicitly told that subsequent parts of the experiment are completely independent of this choice task. They are paid a lump sum amount of money for completing this task under both the C and R treatments.

At the beginning of Part II, subjects from the same identity cluster are randomly matched into groups of three. Every group is then matched with a group from the other identity cluster. The inter-group contest in Part II has two phases: first a one-shot inter-group lottery and then 20 repetitions of the same game in the second phase. Subjects were not aware of the repeated contests at the time of making their decisions in the one-shot contest. The composition of any given group remained the same throughout but the opponent group changed randomly in each period. Each subject, at the beginning of each period of the inter-group contest, was endowed with 60 Experimental Currency Units (ECU) which had to be allocated between a private and a group account. Every subject individually and independently decided how much to allocate to which account. Once all subjects have made their decisions, a computerized Tullock lottery was conducted with the total ECUs in the two contesting groups' accounts. Each subject in the winning group was rewarded with 60 ECU. The outcome from each lottery period was shown before the next period begins. There were no carryovers from one period to another.

The equilibrium group effort for this contest is 15 ECU. Though, unlike majority of contest studies, our interest does not lie in deviations from equilibrium. Outcome or payoffs from any of the previous periods were not observable. We also restricted subjects' access to pen and paper during the experiment to avoid heterogeneity in the accessibility of contest history.

Besides random assignment to the C and R condition, subjects were randomly assigned to one of the three treatments. In the IN-OUT treatments all groups were fully active groups. There were two IN-OUT treatments (IN-OUT-C and IN-OUT-R) consisting of 30 subjects each. All 30 subjects participated in the same session, and depending on their identity clusters, each subject was assigned to one of the five KLEE and five KANDINSKY groups. Composition of each group remained unchanged over all lottery periods. However, a given KLEE group was matched against one of the 5 different KANDINSKY groups in each period. This matching was done according to a preset random order.

In the IN treatment, a fully active group contested a fully historical group. Subjects from the same identity cluster were randomly matched into three-player groups. Unlike IN-OUT, the KLEE groups were not matched with any of the KANDINSKY groups playing in that session and vice-versa. Instead, a KLEE group in the IN treatment faced the same opponent-group

(historical) decisions in each period as the KLEE group from the IN-OUT treatment faced from their opponents. Similarly, the KANDINSKY group in the IN treatment faced the historical KLEE group from the IN-OUT treatment. If a group won in the IN treatment, then each subject received 60 ECUs. If they lost, nobody received any reward (including the historical group from the IN-OUT treatment). Thus, any decision made by any subject in the IN treatment did not have any consequences for any out-group players.

In the NONE treatment, an active subject grouped with two historical subjects contested a historical group. Each subject was randomly assigned to role-play as one player of a particular group from the same identity cluster in the corresponding IN-OUT treatment. Given this, if the active subject's group won in the NONE treatment, then this subject received 60 ECUs. If they lost, nobody received any rewards. Thus, any decisions made by any subject in the NONE treatment did not have any consequences for any in-group or out-group players.

Note that the across-session matching of effort decisions is always specific to the identity condition (C or R). Hence, for any $j \in \{1, 2, 3, 4, 5\}$ and any $i \in \{1, 2, 3\}$, the KLEE-j (KANDINSKY-j) groups in IN-OUT-C, IN-C, and NONE-C face the same out-group decisions. Each member i of group j in the NONE treatment participates separately and are neither aware of nor affected by another subject in the same treatment. To elaborate, one subject in NONE-C role-plays member 1 of the KLEE-j group in IN-OUT-C and faces members 2's and 3's decisions, as well as the opponent group's decisions, exactly as experienced by the original member 1 in the KLEE-j group from IN-OUT-C. Another subject role-plays as member 2 of the KLEE-j group in IN-OUT-C and faces the same set of in-group and out-group decisions as experienced by member 2 in KLEE-j in IN-OUT-C. Each treatment had 30 subjects, with 3 subjects in each of the 10 groups (5 KLEE and 5 KANDINSKY groups).[4]

At the end of the experiment, 5 of the 20 lottery periods were randomly chosen for payment. Subjects also answered a cognitive reflection test (CRT), a questionnaire about perceived group-related preferences, a questionnaire about the reason behind their decisions, and a demographic questionnaire.[5]

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[4] Denoting the effort decision of member i in group j of identity cluster k in treatment m as e_{ijkm}, we can find the overall impact of the in-group preferences by comparing $\sum_{i \in j} e_{ijk(NONEC)}$ with $\sum_{i \in j} e_{ijk(INC)}$ for all j and k, and the impact of the out-group preferences by comparing $\sum_{i \in j} e_{ijk(INC)}$ with $\sum_{i \in j} e_{ijk(INOUTC)}$ for all j and k. Similarly, for the R condition.

[5] The use of CRT was motivated by Cox (2017) and Sheremeta (2020), who report significant negative correlation between CRT score and effort spending in one-shot contests. The group preference questionnaire was adapted from Hinkle et al. (1989) and Insko et al. (2013). Although, Sheremeta (2011) and Shupp et al. (2013) report that attitudes towards risk and ambiguity do not explain contest expenditure, we controlled for both these attitudes.

3. Results

We begin our analysis with the summary statistics of effort decisions. Table 1 summarizes the means and standard deviations of individual effort and group effort in each treatment, separately for the one-shot contest and the repeated contest of 20 periods. The first and the third columns aggregate the observations from all subjects in each treatment. The second and the fourth columns do the same for all groups. There are 30 individuals matched into 10 distinct groups in each of the IN-OUT and IN treatments. For the NONE treatments, we determine the group effort by summing up the efforts from the three individual subjects role-playing as the three members of one particular historical group. The group average in each treatment is obviously three times the individual average. Nevertheless, we present both as a prelude to our further analysis which we carry out at both group and individual levels.

Table 1: Average effort in one-shot and repeated contests.

Treatment	One-shot (Period 1)		Repeated (Period 2 – 21)	
	Individual	Group	Individual	Group
IN-OUT-C	21.23 (10.62)	63.70 (18.62)	14.90 (11.34)	44.71 (14.26)
IN-OUT-R	20.60 (12.77)	61.80 (19.41)	15.64 (10.81)	46.92 (10.98)
IN-C	19.23 (09.86)	57.70 (17.58)	14.36 (12.19)	43.10 (13.72)
IN-R	21.40 (11.26)	64.20 (18.55)	15.05 (12.23)	45.16 (15.50)
NONE-C	19.93 (10.86)	62.40 (13.75)	14.83 (12.78)	44.64 (09.99)
NONE-R	21.66 (13.12)	62.87 (18.10)	15.50 (15.29)	46.78 (10.62)
No. of Obs.*	30	10	600	200

Note: Number of obs. is same in every treatment. Corrected standard deviations are in parentheses.

Table 1 shows that the average effort in all treatments is very similar. Average effort in all treatments is also lower for the repeated contest, which is expected due to learning. Variation in individual effort remain similar for the one-shot and the repeated contest, though variation in average effort across groups is much lower for the repeated contest. Also, we observe that the average group effort in all treatments are around four times of the equilibrium benchmark in the one-shot game and around three times in the repeated game (recall, the equilibrium group effort is 15). There are various explanations for this overbidding and overspreading of effort (see Dechenaux et al., 2015 and Sheremeta, 2020). However, discrepancy from equilibrium behavior is not our focus in this study. Our specific interest lies in examining whether and how the presence of other in-group and out-group members affect contest behavior. In what follows, we begin by comparing average group efforts across the various treatments.

3.1 Group level analysis

Standard non-parametric tests such as the Kruskal-Wallis test, and the Wilcoxon-Mann-Whitney rank-sum test for comparison between a pair of treatments show no difference in average effort in the one-shot contest (all p-values are greater than 0.05).

To compare efforts in the repeated game, we first elaborate on what constitutes an independent observation in each the respective treatments. In all treatments, each subject's decision constitutes an independent observation in the one-shot contest. However, it is not the case the in repeated contest. In the repeated contest of the IN-OUT treatment, the random matching in each period means neither subject's decisions, nor a group, nor a pair of contesting groups can be treated as an independent observation. The IN treatment, on the other hand, matched the active groups with historical groups and therefore, each thee-player group constitutes one independent unit of observation in the repeated contest. Finally, each subject in the NONE treatment was matched with historical in-groups and out-groups and never interacted with other subjects in the same session. Each subject, therefore, comprises an independent observation.

Similar to the one-shot contest, standard non-parametric tests based on the average total effort in each group over the 20 periods of the repeated contest show no difference between the various treatments (all p-values are greater than 0.05). To take a closer look at how group effort evolves over the course of the experiment, we examine how group effort varies over time in the different treatments.

Result 1: *Groups start with relatively lower efforts and efforts fall less steeply in the NONE treatment under revealed identity and in the IN-OUT treatment under concealed identity but effects disappear over time.*

Support: Table 2 reports a mixed effect model which allows the slopes and intercepts to vary across the comparable groups, showing that the downward trend of group effort is similar in IN-OUT and IN under the concealed identity condition. The downward trend under the revealed identity condition, on the other hand, is similar between IN and NONE. Under concealed identity, groups in the NONE treatment start with relatively lower efforts but the positive interaction term indicates that the efforts do not fall as steeply over time. The same is true for the IN-OUT treatment under revealed identity.

Table 2: Mixed effect regression of group effort on period and treatment.

Group Effort	C	R
Intercept	61.81 (4.62) ***	52.46 (4.35) ***
IN	0.17 (4.08)	12.37 (4.66) ***
NONE	- 8.04 (4.08) **	9.31 (4.66) **
Period	- 1.49 (0.32) ***	-0.48 (0.28)*
IN x Period	- 0.15 (0.31)	-1.22 (0.36) ***
NONE x Period	0.68 (0.32) **	- 0.85 (0.36) **

Note: *, **, and *** indicate a p-value < 0.1, < 0.05, and < 0.01. Standard errors are in parentheses.

The lack of significance at the aggregate level can be due to a number of reasons, e.g., the low salience of matching variation and/or low salience of the minimal identity manipulation. The design feature of matching the active groups with historical in-groups and out-groups is similar in nature to what Cox (2017) implement in the context of an individual lottery contest. Cox (2017) also fails to find any treatment difference at the aggregate level between the standard human-human contest and a human-robot contest where the robot imitates some historically active player's effort decisions. Our study complements Cox (2017) by indicating that this particular design feature may not be successful in removing social preferences in contests. The low salience of the minimal identity elicitation is also reported by Chowdhury et al. (2016) at a group contest level. They show that revealing real identity (ethnicity) of the subjects increases effort, but revealing an induced identity (calling the groups as green or blue) does not do so. We add to that result with a minimal identity created through painting choice.

Although there are no significant differences across treatments on average, we find several interesting patterns while examining the difference in total effort from two comparable groups in two treatments for each period, and then taking the average of this differences over the 20 periods. The summary statistics for these average differences between the comparable groups are presented in Table 3. While the high standard deviations explain the lack of statistical significance, we can see that the average group effort for the comparable groups in the repeated contest is highest for IN-OUT followed by NONE and IN. This also holds for the concealed condition of the one-shot contest. This suggests that the presence of the in-group players in absence of an out-group reduces effort (IN has lower average effort compared to NONE) but the additional presence of an out-group increases effort (IN-OUT generates higher average effort compared to IN).

Table 3: Average difference in effort between comparable groups

Pair of treatments	One-shot		Repeated	
	C	R	C	R
IN-OUT and IN	6.0 (26.31)	- 2.4 (29.99)	1.61 (20.89)	1.76 (22.59)
IN and NONE	-2.1 (33.03)	- 0.8 (34.18)	- 1.40 (23.18)	- 1.33 (26.93)
IN-OUT and NONE	3.9 (28.04)	- 3.2 (23.64)	0.21 (23.16)	0.43 (26.88)

These numbers suggest that the presence of in-groups enhances concern about individual payoffs but the additional presence of out-groups moderates concern for individual payoffs through an additional concern for group payoffs. Higher effort in IN-OUT than IN is consistent with parochial altruism (Abbink et al., 2012), and the standard conjecture from social psychology about the motivational effect of inter-group conflict that "*intergroup conflict serves as a unit-forming factor that enhances group identification beyond categorization and labeling alone*" (Bornstein and Ben-Yossef, 1994, p. 64). However, the intra-group conflict of interest crowding out individual payoff concerns, i.e., lower effort in IN compared to NONE, is not well-researched. To take a closer look at the same, we now focus on the individual effort.

3.2 Individual level analysis

Given that the group equilibrium is 15, we classify the individual efforts below 5 (i.e., one-third of the group equilibrium, or a fair share) as 'selfish' and individual efforts above 15 (i.e., above the group equilibrium) as 'parochially-altruistic', the rest is called 'neutral'.

The frequency of selfish effort is higher in the IN and NONE treatments compared to the IN-OUT treatment under both concealed and revealed identity conditions (lower panel of Table 4). The frequency of selfish effort is similar in the IN and NONE treatments under concealed identity, but not under revealed identity. This suggests that under concealed identity, subjects in the IN treatment behaved more similarly to subjects in the NONE treatment. That is, in the absence of social identity, the presence of in-groups does not reduce selfish behavior, but the addition of out-groups is needed for that. In the presence of a common social identity, however, the presence of in-groups reduces selfish behavior.

Result 2. *Selfish effort decisions are more frequent in the IN and NONE treatments than in the IN-OUT treatment. Selfish effort decisions occur at a similar rate in the IN and NONE treatments under concealed identity, and at a similar rate in the IN-OUT and IN treatments under revealed identity.*

Support: Table 4 reports an ordered probit model to predict the probabilities for selfish, neutral, and parochially-altruistic effort decisions under different matching and identity. The coefficients, with standard errors in parentheses, are in the upper panel. The lower panel lists the predicted probabilities along with the observed frequencies in parentheses.

Table 4: Ordered probit regression for different effort categories.

Effort	All	C	R
R	0.06 (0.04)		
IN	-0.15 (0.05)***	-0.17 (0.06)***	-0.12 (0.06)
NONE	-0.22 (0.05)***	-0.16 (0.06)***	-0.28 (0.06)***
Predicted probabilities	Selfish (<5 ECUs)	Neutral (5 to 15 ECUs)	Parochial-altruist (>15 ECUs)
All IN-OUT	0.19 (207)	0.35 (439)	0.46 (554)
All IN	0.22 (264)	0.37 (447)	0.41 (489)
All NONE	0.24 (303)	0.37 (430)	0.38 (467)
C IN-OUT	0.19 (113)	0.35 (217)	0.45 (270)
C IN	0.24 (148)	0.37 (219)	0.38 (233)
C NONE	0.23 (143)	0.37 (224)	0.38 (233)
R IN-OUT	0.16 (94)	0.35 (222)	0.48 (284)
R IN	0.20 (116)	0.36 (228)	0.43 (256)
R NONE	0.25 (160)	0.38 (206)	0.37 (234)

Note: *, **, and *** indicate a p-value < 0.1, < 0.05, and < 0.01. Standard errors are in parentheses in the upper panel, observed number of occurrences in parentheses in the lower panel.

These estimations are commensurate with our conjecture that the additional presence of out-groups induces higher effort, which is especially clear from the lower selfish behavior and higher parochially-altruistic behavior in the IN-OUT treatment under concealed identity. The addition of in-groups does not affect behavior, as the frequency of selfish and parochially-altruistic effort decisions is similar between IN and NONE under concealed identity. Revealing identity lowers selfish behavior from NONE to IN to IN-OUT. This indicates that our minimal identity elicitation worked, although it did not impact the average effort. Table 4 also shows that effort decisions are highly concentrated between 5 and 15 ECUs.[6]

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[6] We also examined the specific factors related to the contest structure which make individuals adjust their decision and their effect on the direction of adjustment. Those results did not vary substantially between treatments. Therefore, the results are not reported here for the sake of brevity.

3.3 Group-satisfaction and conflict

Finally, we turn our attention to the group-satisfaction index (GI) to gather further support for our findings. The group-satisfaction index for each individual has a positive or negative value ranging between (-11, 11). Ceteris paribus, the happier an individual is to belong to a group and the more they think that the other members in the group have been cooperative, the higher is their score on the group-satisfaction index.

Result 3: *Individual effort in the IN treatment exhibits negative association with the group-satisfaction index under concealed identity (C). Under revealed identity (R), individual effort is positively associated with the group-satisfaction index in the IN treatment, and negatively associated in the IN-OUT treatment.*

Support: The GI is built as a Likert scale measure from the group-preference questionnaire (see Appendix B). The Cronbach's α is sufficiently high (0.81), indicating internal consistency. Table 5 shows regressions of the average individual effort in each treatment on the GI-score, identity condition, and the interaction between the two. The GI-score is negatively associated with individual effort in the IN treatment, but not significant in the IN-OUT or NONE treatments. While revealing identity has no statistical impact on average effort, it significantly increases average effort in the IN-OUT treatment among subjects with high GI-scores.[7] One possible explanation is that subjects view the IN treatment more as a public good game and therefore have higher preferences for within-group equality. Accordingly, subjects who did not feel exploited within their group responded positively to the questions in the group-identification questionnaire and scored higher GI.

The presence of in-groups with similar social identity increases effort and moderates the aversion to intra-group exploitation. In the IN-OUT treatment, the introduction of social identity increases group identification and expectations for fairness. This indicates that subjects in the IN-OUT treatment do not focus as much on the intra-group comparison when the groups do not differ in terms of social identity. The common social identity makes them aware of the conflicting interests at the intra-group level. In the IN treatment, on the other hand, subjects normally focus on the aspect of intra-group conflict which gets diluted in the presence of the additional layer of a common social identity.
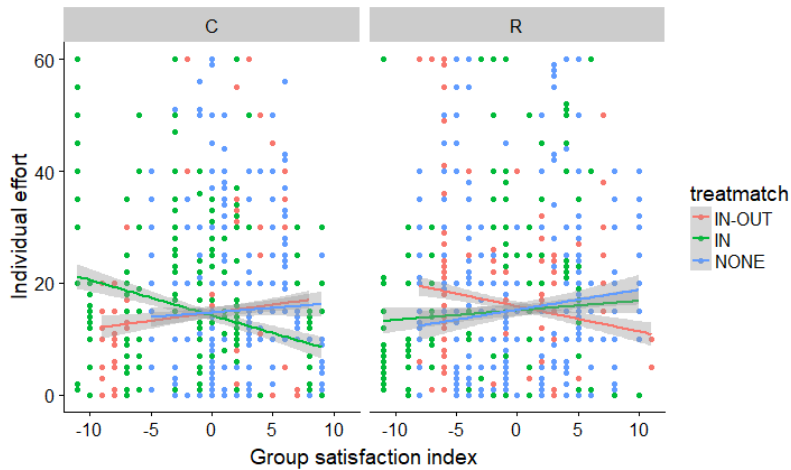
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[7] Technically, we cannot claim causation as group satisfaction was measured after the experiment. The GI score serves as a proxy for subjects' concern for their own groups over the course of the game.

Table 5. Regression of individual effort on identity and group-satisfaction

Group Condition	IN-OUT	IN	NONE
Revealed (R)	1.71 (1.51)	0.86 (2.71)	- 0.66 (3.05)
GI-score	0.19 (0.26)	- 1.01*** (0.24)	0.19 (0.46)
R x GI-score	- 0.83** (0.35)	0.86** (0.37)	0.31 (0.62)
Intercept	13.91*** (1.51)	12.59*** (1.91)	13.01*** (2.16)

Note: *, **, and *** indicate a p-value < 0.1, < 0.05, and < 0.01. Standard errors are in parentheses.

The lack of significance of the GI in the NONE treatment is an obvious consequence of our experimental design. The fitted regressions in Figure 2 show that the correlation between individual effort and GI are opposite between the concealed and revealed identity condition for both IN-OUT and IN treatments. Specifically, under concealed identity, there is a negative association between individual effort and GI in the IN treatment. One potential explanation is that subjects were happy about their groups when they could spend less effort. Not surprisingly, there is a positive association between effort and GI in the IN-OUT treatment, supporting the notion that the presence of out-groups induces inter-group identification. Under revealed identity, stronger group-satisfaction is associated with higher effort.

Figure 2: Individual effort plotted against group-satisfaction index.

4. Discussion

We use a novel experimental design to study the group-related preferences in inter-group conflicts. While other experiments study social preferences by using strategy method (Hermann and Orzen, 2008), by pairing up active human subjects with inactive subjects

(Ahmed, 2007) or previously active subjects as in our experiment (Cox, 2017), our design is the first to implement this design feature to study group contests.

The results show little support for group-related preferences affecting strategic choices in inter-group contests. We do not find any significant difference in the average efforts across treatments. However, a closer examination of individual decisions shows that the presence of in-groups enhances concern about individual payoffs but the additional presence of out-groups moderates concerns for individual payoffs through an additional concern for group payoffs. The negative effect of the in-group preferences and the positive effect of the out-group preferences are weaker when group members have a common social identity.

We also find that under concealed identity, low effort decisions are more common among subjects who reported higher post-conflict satisfaction with their own group under the absence of out-groups. Under revealed identity, this relationship is reversed. This supports our conjecture that subjects view their own group as a social unit only in the presence of an outgroup or a common social identity among the group members. Thus, we can interpret the presence of out-groups and a common social identity as substitutable motivational factors.

Creating groups on the basis of a minimal identity may be one of the reasons why our experiment shows only marginal effect of group-related preferences. Chowdhury et al. (2016) showed that while real identity is significant in increasing conflict, a minimal identity is not. Hence, implementing the present design under a real identity elicitation may exhibit stronger group-related preferences. In our experimental setting, where there is no real life conflict, it is possible that subject care mainly about their payoffs and not social preferences; this would explain subjects' general tendency to match the average effort from others in all treatments except NONE because there were no other players in NONE to match with.[8] Also, it is possible that joy of winning or judgmental biases (Sheremeta, 2020) may offset any potential motivational effect of social preferences. Finally, given that our experimental design is between the third (generic social context) and the fourth (induced identity level) hierarchies of social context according to the taxonomy of social context of Huettel and Kranton (2012), the manipulations along the matching dimension and the identity dimension invoke unrelated neuro-cognitive processes. Answers to these questions are beyond the scope of our study.

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[8] This experiment considered the contesting groups to be 'symmetric' in the sense that both are trying to win a reward. Different contexts of group conflict such as attack and defense (Chowdhury and Topolyan, 2016) or gain and loss frames (see Chowdhury et al., 2018) may bring about different results. However, no research has been carried out to investigate the effects of either identity or in-group out-group preferences in attack and defense.

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Appendix A: Sample instructions

Part I Instruction:

In Part I, everyone will be shown 5 pairs of paintings by two artists Paul Klee and Wassily Kandinsky. Each pair will contain one painting by Klee and one painting by Kandinsky. However, there will be no information on which painting belongs to which artist. Each pair of paintings will also be shown in the same order to all the participants. Please state your preferences over each pair of paintings by clicking on the 'Select' button corresponding to your preferred painting. A red check mark appears against your selected painting. Please note that you may not select both the paintings in a pair at the same time and you may not go back to a previous pair at any point. So, please make sure that the red check mark is visible against your preferred painting while confirming your choices by clicking on the 'Confirm' button that appears below each screen. The next pair of paintings will be shown only after you have confirmed your preferences over the current pair.

After everybody submits their preferences over all 5 pairs, each of you will be classified as either a KLEE person or a KANDINSKY person. All participants will be privately informed about their individual classification.

Part II Instruction sample (NONE-C)

The second part of today's experiment consists of a decision-making task that is closely described by the following situation. Your role in the actual task will be instructed later. Suppose, there are 2 groups, Group A and Group B, and there is a reward that can be won by only one of the two groups. There are 3 members in each group and each member has 60 ECU in their individual accounts. Each member of a group independently decides how many ECU to allocate to the group account, the allocation can be any number of ECU from 1 to 60 inclusive. The total allocations in the two groups' accounts determine which group receives the reward. Each member in the reward-receiving group earns another 60 ECU in their individual account as reward. The final earnings of an individual is the final amount of ECU in their individual accounts.

How is the receiver of the reward determined?

Each penny in Group A's account is exchanged for an 'A' token. Each penny in group B's account is exchanged for a 'B' token. All 'A' and all 'B' tokens are put into the same box and shuffled well. One token is drawn blindly. If it is an 'A' token, Group A receives the reward. If it is a 'B' token, Group B receives the reward. A computer program performs this blind draw. Number of a group's tokens = Member 1's allocation + Member 2's allocation + Member 3's allocation.

$$A\ group's\ chance\ of\ receiving\ the\ reward\ = \frac{Own\ group\ token}{Own\ group\ tokens + Other\ group\ tokens}$$

Individual Earnings:

60 – Allocation + 60 (reward) ECU, if the group receives the reward.
60 – Allocation ECU, if the group does not receive the reward.

Click 'Continue' to see a hypothetical example illustrating the entire process.

Example

Group A	Initial ECU	Allocation	Group B	Initial ECU	Allocation
Member 1	60	30	Member 1	60	35
Member 2	60	18	Member 2	60	5
Member 3	60	42	Member 3	60	0
Total Allocation		90	Total Allocation		40

Number of A tokens = Total allocation in Group A's account = 90
Number of B tokens = Total allocation in Group B's account = 40
Total number of tokens in the box = 90 + 40 = 130
Suppose an 'A' token has been drawn. Group A receives the reward. The earnings of the two group's members will be as follows.

Group A	Final earnings ECU	Group B	Final Earnings
Member 1	60 – 30 + 60 = 90 ECU	Member 1	60 – 35 + 0 = 25 ECU
Member 2	60 – 18 + 60 = 102 ECU	Member 2	60 – 5 + 0 = 55 ECU
Member 3	60 – 42 + 60 = 78 ECU	Member 3	60 – 0 + 0 = 60 ECU

Part II General Quiz:

1) How many members are there in each group? (Answer: 3)

2) If, in some period, member 1 of Group A allocates 50 ECU and each of the other two members allocates 10 ECU each, who will have the highest earnings in Group A in that period?

   a) Member 1

   b) Member 2 or Member 3

   c) Member 2 and Member 3 (Answer)

3) What is the maximum amount one can allocate to their group account? (Answer: 60 ECU)

4) If, in some period, total allocation in Group A's account is 40 ECU and total allocation in Group B's account is 60 ECU, what chances does Group B have of receiving the reward?

   a) 40 out of 100

   b) 20 out of 100

   c) 60 out of 100 (Answer)

Your Task: Phase I

Other people have previously participated in the decision-making task described above. These previous participants were matched into 3-member groups and each group was matched with another 3-member group as explained before. They had decided their allocations to their respective group accounts, the draw was performed and rewards were allocated.

All participants were paid and the rewards were allocated.

In this session, you will take part in a similar decision-making task, but without any other participants either in your group or in the other group (the group that your group is matched with).

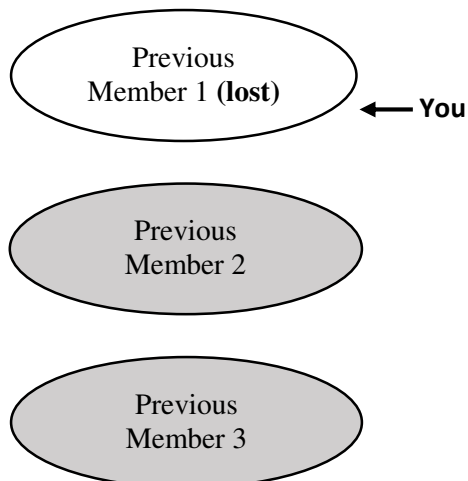**Then what does my group and the other group mean?**

Note that any matched pair of groups in the previous sessions had 6 participants – 3 members in each group. However, for some matched pair of groups, the computer can recall only 2 members' allocations in one group's account and all 3 member's allocations in the other group's account. The computer will place you in the missing person's position for one such pair of groups.
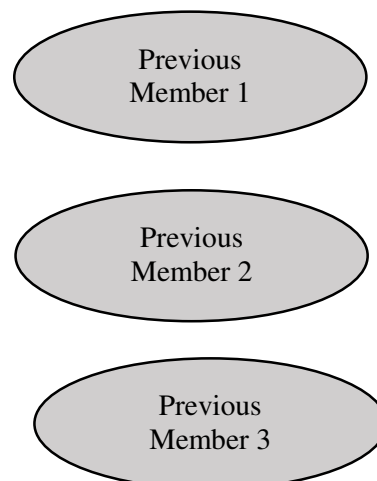
How does it work exactly?

Every group is named with a letter of the English alphabet. Think of two groups that were matched in a previous session, say Group A and Group B. The computer can recall the allocation decisions of all members in the two groups except Member 1 in Group A. You will replace that member for the present draw and decide your allocation to the group account.

The following picture demonstrates this.

Previous Group A (your group)   **Previous Group B (other group)**

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Your allocation will be added to the pre-existing allocations of the two members of Group A to determine total allocation in your group account. The allocation in Group B's account remains as it was.

Then the two group's allocations are used for the blind draw. There will be as many 'A' tokens as the total allocation in your group account and as many 'B' tokens as was the total allocation in the previously active Group B's account. If an 'A' token is drawn, you will receive a 60 ECU reward in your individual account. If a 'B' token is drawn, you will not receiv any extra money. Your earnings in a period will be

60 – Allocation + 60 (reward) ECU, if one of your group's tokens is drawn.

60 – Allocation ECU, if one of the other group's tokens is drawn.

Since none of the other members in your group or the other group are participating at present and have already been paid for their previous participation, they will not gain or lose anything due to the outcomes in this session.

Phase I quiz:

Suppose, members 2 and 3 in the previously active Group A had allocated 20 and 30 ECU to the Group account. You become member 1 in this group. Total allocation in the previuously active Group B's account was 40 ECU. If you allocate 10 ECU,

1) How many ECU will there be in your group account? (Answer: 60)

2) What chance will you have of receiving the reward?

      a) 10 out of 50.

      b) 10 out of 60.

      c) 60 out of 100. (Answer)

      d) 10 out of 40.

3) How much will member 3 in your group earn if your group receives the reward?

      a) 60 – 30 + 60 = 90 ECU.
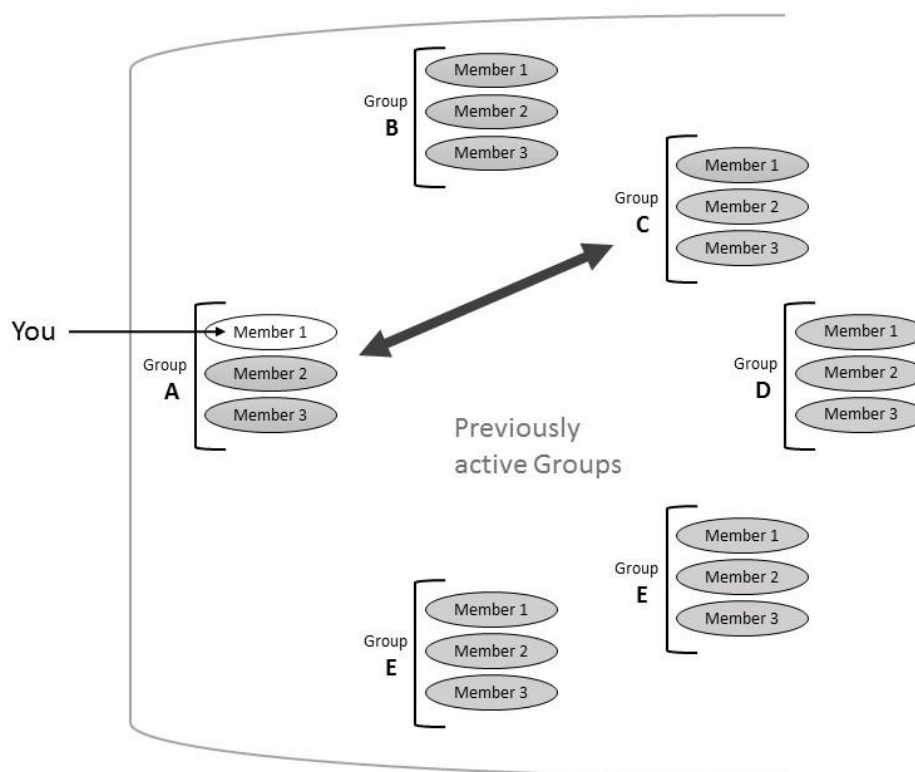
      b) 60 – 20 + 60 = 100 ECU.

      c) Will not earn anything. (Answer)

Your task: Phase II

You will participate in the same decision-making task for another 20 periods, though you will be paid for only 4 periods. Those 4 periods will be randomly decided at the end of the experiment. Therefore, each of the 20 decision making periods are equally important.

The previous participants also made their decisions for 20 consecutive periods. Composition of each group remained the same for all 20 periods. Each group was randomly matched with one of five other groups in different periods. The following image shows, for example, how Group A was randomly matched with one of five other groups in different periods.

Suppose, the computer has lost the decisions of Member 1 in the previously active Group A. Your allocation decision will replace that lost decision in every period.

In each period, the pre-existing allocation decisions from member 2 and 3 of Group A will be added to your allocation to determine total allocation in your group account. Allocation in the other group's account will stay as it was in the corresponding period of that session. You will make your allocation decisions without knowing the previous participants' decisions and you may not be told which other group your group was matched with in any period.

Your earnings in phase II:

At the end of the experiment, a random participant will be asked to pick up 4 balls from a sack containing 20 balls numbered from 1 to 20. The numbers of those balls will determine the 4 periods that will be considered for actual payment. Your period earnings in ECU for those 4 periods will be added to your earnings from Phase I of your task and converted to cash at the end of the session.

Phase II quiz:

Suppose, following are the total allocations from 5 groups (B, C, D, E and F) in 3 periods in the previous session. The last column gives the total allocation from the two members of Group A, whose decisions the computer can recall. You are placed in this group.

Groups	B	C	D	E	F	Group A (member 2 and 3 total)
Period 1	20	60	5	100	70	10
Period 2	40	60	30	50	50	20
Period 3	50	40	45	30	0	0

Suppose in the previous session, Group A was matched with Group D, F, and B in periods 1,2, and 3, respectively. Please answer the following questions.

1) If you allocate 10 ECU to the group account in period 1, what will be the total allocation in your group account? (Answer: 20)

2) How many tokens will belong to the other group in period 3? (Answer: 50)

3) Suppose your allocation to the group account in period 2 was such that your chance of receiving the reward was 50-50. How many ECU did you allocate? (Answer: 30)

This is a hypothetical scenario. In the actual task, you cannot observe the pre-existing allocations before making your own decisions.

Appendix B: Group Satisfaction Index (GI)

The group satisfaction questionnaire asked the following questions

- GI-1: I am glad to belong to this group.
- GI-2: I feel held back by this group.
- GI-3: I think this group worked well together.
- GI-4: I saw myself as an important part of this group.
- GI-5: I didn't consider the group to be important.
- GI-6: I think the other members of this group acted as if we were (a) one group (b) separate individuals.

Question 1-5 were adapted from Hinkle et al. (1989) and 6 was adapted from Insko et al (2013). GI-4 exhibited a lower correlation with the other items; the overall reliability improved considerably when GI4 was excluded (Overall Cronbach α was 0.74 with and 0.81 without GI-4). Also, it was negatively correlated with the scale while Hinkle et al. (1989) considered it to be a positive item. That's because in our experiment, the more ECUs one spent the more important one thought oneself to be, but that corresponded to relatively lower effort from the other members. This explains the negative correlation between GI-4 and the overall GI scale.

The Cronbach α reliability of the individual items were as follows

	Std. α	Std. r	r.cor	r.drop	Mean	Non-missing response frequency				
						1	2	3	4	5
GI-1	0.60	0.84	0.84	0.75	3.3	0.07	0.13	0.38	0.29	0.13
GI-2 (-)	0.70	0.68	0.58	0.51	3.3	0.12	0.37	0.36	0.18	0.08
GI-3	0.66	0.80	0.78	0.67	3.1	0.10	0.21	0.29	0.31	0.09
GI-4 (-)	0.82	0.17	0.00	-0.60	2.7	0.09	0.15	0.25	0.36	0.16
GI-5 (-)	0.80	0.27	0.11	0.04	3.4	0.16	0.35	0.25	0.16	0.08
GI-6a	0.65	0.82	0.84	0.71	2.8	0.14	0.29	0.22	0.30	0.05
GI-6b (-)	0.65	0.81	0.82	0.72	2.6	0.03	0.22	0.23	0.36	0.16

Std.α is the standardized measure calculated from the inter-item correlations and indicate the overall reliability of the scale if the corresponding item is dropped. The sign/noise ratio for all the items above are 1 but highest for GI-4 followed by GI-5. Raw α (omitted) for each item is exactly one percentage point less that the standardized α. *Std.r* is the item correlation with the entire scale if each item were standardized, *r.cor* corrects for any item overlap by subtracting the item variance and then replacing this with the best estimate of common variance, and *r.drop* is the correlation of the item with the scale composed by the remaining items. We decided to drop GI-4 as this was negatively correlated with the overall scale, even after reversal.