MAGKS

Joint Discussion Paper
Series in Economics

by the Universities of

Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen

ISSN 1867-3678

No. 03-2020

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A Comparison of Individual and Group Behavior in a Competition with Cheating Opportunities

January 2020

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Abstract

While it is well established that individuals and groups make different economic decisions, the reasons for the behavioral differences are still not fully understood. We experimentally compare individual and group behavior in a competitive setting where cheating can be used to outperform the competitor. Our design allows us to exogenously control for the type of the decision maker, the type of the competitor, and expectations about the competitor's performance. The results show that there is much more cheating in inter-group competition than inter-individual competition which is in line with findings from other interactive games. We show furthermore that this difference is not caused by a higher propensity to cheat of groups per se, but instead by expectations about the competitor. Once we control for the type of the competitor and the decision makers' expectations, we no longer find differences between individuals and groups.

Keywords: individual behavior; group behavior; lying; honesty; competition

JEL Classification: C91, D63, H26

1. Introduction

Economics has recently devoted more attention to whether groups make different decisions than individuals. The reason for the growing interest is that groups have been found to behave systematically differently than individuals and insights from observed individual decision making cannot be readily transferred to settings in which groups make decisions. Recent reviews of this research have concluded that groups learn more quickly, make more sophisticated and payoff-oriented decisions, and are less influenced by cognitive limitations, behavioral biases, and social considerations (Charness and Sutter, 2012; Kugler et al., 2012). While it is well established by now that there are systematic differences between individual decision making and group decision making, the reasons for the differences are still not fully understood. In particular, in an interactive context, where interactions between individuals are compared with interactions between groups, there are multiple complementary explanations of why groups may behave differently. First, subjects do not decide alone but within a group (actor effect). It has long been known in social psychology that anonymity and diffusion of responsibility within groups lead to less restrained and more impulsive and aggressive behavior (Festinger et al., 1952; Zimbardo, 1969). Furthermore, pressure within the group to benefit the own group over others and social support within the group facilitate selfish decisions (Wildschut et al., 2003; Wildschut et al., 2007). Second, the interaction partner in inter-group interactions is not an individual but a group (opponent effect). This effect has usually been explained by different expectations about groups. Playing against a group rather than an individual changes behavior because one expects a group to act differently than an individual. However, playing against a group may change behavior independently of expectations. It is conceivable that groups trigger different behavioral responses than individuals because, for example, one feels less guilty or responsible towards a group. Research on pro-social behavior has shown that an individual victim elicits greater empathy, emotions, and help than a group of victims under the same circumstances (Small and Loewenstein, 2003; Kogut and Ritov, 2005). The third factor then is that groups have different expectations about the interaction than individuals (expectation effect). On the one hand, expectations are different because the opponent is a group and as such may act differently than an individual. On the other hand, expectations may differ because members of a group may think more carefully about what could be expected from the interaction partner than individuals. It is not trivial to isolate the different effects because changing the actor or the opponent also changes expectations.

In this paper, we study experimentally how individuals and groups behave in a competitive setting where cheating can be used to outperform the competitor. While experiments always raise the issue of external validity, they allow for the highest possible control over the decision context.[1] Our experimental design allows us to test how the type of the actor and the type of the competitor affect behavior and at the same time control for expectations. The setting involves a common real-world trade-off between morally correct behavior (being honest) and payoff-maximizing behavior (lying). While competition is typically seen as desirable in economic theory as it improves the functioning of markets, fosters effort and innovation, and ensures the efficient allocation of resources, it can also create incentives for unethical behavior, especially in situations where actions

[1] Potters and Stoop (2016) find a significant correlation between subjects' cheating in the lab and in the field, which speaks to the lab-field generalizability of cheating behavior.

or outcomes are not fully observable (Rick and Loewenstein, 2008; Carpenter et al., 2010; Schwieren and Weichselbaumer, 2010; Conrads et al., 2014). Examples involving individual decision making and group decision making can be found in many different contexts such as sports, politics, business, or academia. The Volkswagen emission scandal and the Russian doping scandal are examples where cheating occurred in highly competitive environments.[2]

To compare individual and group decision making under competition, we use a modified version of the dice rolling task developed by Fischbacher and Föllmi-Heusi (2013). Participants in this task privately roll a dice and then report the rolled number, knowing that the reported number will determine their earnings. In our modified competitive version, two parties privately roll a dice and then the reported rolled numbers of two parties are compared and the one with the higher number receives a prize while the other one gets nothing. In case of a tie, the winner is determined randomly. Unlike in the original game, lying under competition only increases the chances of winning but does not ensure a certain payoff. The expected returns to lying thus depend to a large extent on the subjects' beliefs about the opponent's behavior. The parties in our experiment are either individuals or groups of three persons who decide together. Importantly, we do not only consider how individuals compete with each other and how groups compete with each other, we also study how individuals behave when they compete with groups and how groups behave when they compete with individuals. This allows us to test not only how the type of the decision maker affects behavior but also how the type of the competitor affects behavior. We furthermore distinguish whether the competitor is able to cheat or not. In one condition, the competitor will throw the dice and report the number just like the decision maker. In another condition, the experimenter will throw the dice for the competitor and report the rolled number truthfully. In this case, the competitor is unable to cheat which allows us to compare individuals and groups when beliefs about the competitor are exogenously fixed.

With our design we will address the following research questions:

1. Does inter-group competition produce more cheating than inter-individual competition?
2. Do groups cheat more than individuals when they compete against the same type of competitor?
3. Do groups cheat more than individuals when they compete against the same type of competitor and have the same expectations about the competitor (pure actor effect)?
4. Do individuals and groups cheat more when they compete against a group than when they compete against an individual?
5. Do individuals and groups cheat more when they compete against a group than when they compete against an individual and have the same expectations about the competitor (pure opponent effect)?

[2] Even though there is speculation about the details of the conspiracies and who exactly was involved, it is clear that this kind of organized and methodical cheating could only be done by a coordinated group of people and not by an individual alone. Volkswagen designed and implemented a software to circumvent legal emission standards, falsely showing that the vehicles were emitting lower levels than they actually were when driven on the road (Cavico and Mujtaba, 2016). The Russian government and sports authorities developed and organized an infrastructure to manipulate the doping control processes at Olympic Games and other international competitions, allowing the athletes to take banned performance-enhancing drugs and evade the tests (McLaren, 2016a; 2016b).

The third comparison will show if there is a pure actor effect, i.e. a difference between individuals and groups when they play against the same type of competitor and have the same expectations. Likewise, the fifth comparison will show if there is a pure opponent effect, i.e. a difference in behavior towards an individual competitor and a group competitor when expectations are the same. Once we know the pure actor effect and the pure observer effect, we can also establish how important the expectation effect is by relating the third comparison to the second one and the fifth comparison to the fourth one.

The dice rolling task is particularly suitable for our research questions. While cheating in this task cannot be detected at the level of an individual or a group, it can be analyzed at the aggregate level as the underlying distribution of dice numbers under full honesty is known. The costs of this approach is high because one needs many more observations to detect cheating, but the important advantage over other games is that it reduces experimenter demand effects which can confound the differences between individuals and groups. It is very plausible that individuals are more prone to experimenter demand effects than groups.[3] Furthermore, the task allows us to abstract from confounding effects of ability and effort on cheating behavior as the performance depends solely on luck. Due to the simplicity of the task, we can exclude explanations that assume that groups are better at solving complex economic problems and have better strategic and cognitive abilities. The competition forces the decision maker to think about how the competitor may behave and the corresponding implications for the own choice. We can therefore assume that both types of actors, individuals and groups, will think about the competitor even if they come to different conclusions.

Previous comparisons of inter-individual interactions and inter-group interactions have shown that group behavior tends to be closer to standard game theoretical predictions than individual behavior. For instance, groups have been shown to send less money in the trust game (Kugler et al., 2007), to make and accept smaller offers in the ultimatum game (Bornstein and Yaniv, 1998), and to be less cooperative in prisoners' dilemma games (Insko and Schopler, 1998; Wildschut et al., 2003). Some studies have also considered interactions between individuals and groups (see the next section for details). They provide evidence that individual behavior and group behavior still differ when they play against the same type of opponent (Winquist and Larson, 2004; Wildschut et al., 2007). They also show that both individuals and groups discriminate between an individual opponent and a group opponent (Winquist and Larson, 2004; Meier and Hinsz, 2004; Wildschut et al., 2007; McGlynn et al., 2009; Insko et al., 2013). Acknowledging the role of expectations, some studies have also collected data on the expectations that subjects have about their opponent. The results are mixed (see the next section). In some cases, expectations can help to explain why being in a group and playing with a group lead to different behavior. In other cases, expectations cannot help to explain the differences. Either way, using elicited expectations is not without problems, even when the elicitation is incentivized. Expectations about the opponent's behavior are typically elicited after subjects have made their own decisions. It is possible therefore that people report expectations to justify their past choices or that their expectations are biased by their own learning experience during the game. An endogeneity problem arises if people with different expectations differ in other unobservable dimensions that also affect their decisions in the game. Hence, even if

[3] Christens et al. (2019), for instance, show that individuals react more sensitively to identification in a public goods game than groups.

expectations and behavior are correlated, this does not imply that the measured expectations exert a causal effect on behavior. Establishing a causal effect between expectations and behavior requires exogenous manipulation of expectations, which is included in our experiment.

In our experiment, we observe much more cheating in the inter-group competition than in the inter-individual competition, which is in line with the findings from other interactive games. In the inter-individual competition, 41 percent of individuals report the payoff-maximizing dice roll number (five), whereas a large majority of 87 percent of groups report this number in the inter-group competition. In case of full honesty, this proportion should be 16.7 percent. More detailed analyses show that this difference is not due to groups' higher propensity to cheat per se, but is caused by the competitor type and the expectations about the competitor. Once we control for the type of the competitor and the decision makers' expectations, we do no longer find significant differences between individuals and groups.

The remainder of the paper is structured as follows. Section 2 provides an overview of the previous literature on cheating behavior, the effects of competition, and the differences between individual and group decision making. Section 3 describes our experimental design and Section 4 presents the main results. Less important results are presented in the Appendix. Section 5 summarizes the results and concludes.

2. Background

Cheating behavior and the effects of competition

Our experimental design is based on the dice roll task developed by Fischbacher and Föllmi-Heusi (2013). In their experiment, 20 percent of subjects lied to the fullest extent possible, 39 percent were fully honest, and the remaining subjects lied partially, i.e. they lied but they did not lie maximally. This can be explained by people's desire not to appear as a liar as their actions differ from what a "true liar" would do. This attempt to uphold a favorable self-image, despite an ethically questionable action, has also been observed in other honesty experiments (Ariely, 2012; see Rosenbaum et al., 2014 for an overview). People appear to face a psychological cost of lying that is higher the closer one is to what a true liar would do (Gneezy, 2005; Mazar et al., 2008; Abeler et al., 2014; Gneezy et al., 2013). Explanations for the psychological cost include a genuine preference for truth telling (Sánchez-Pagés and Vorsatz, 2007; Vanberg, 2008; Kartik, 2009), guilt aversion (Dufwenberg and Gneezy, 2000), or a concern of how others or they themselves will judge their morality (Bénabou and Tirole, 2003; Ellingsen and Johannesson, 2004).

An important feature of our experiment is that cheating is used to outperform a competitor in a competition. A number of experimental studies have shown that competition can increase cheating behavior, especially among poor performers (Schwieren and Weichselbaumer, 2010) and when the incentives to win are high (Harbring and Irlenbusch, 2005; 2011; Falk et al., 2008; Cartwright and Menezes, 2014; Conrads et al., 2014). Men tend to cheat more under competition than women (Dato and Nieken, 2014). Faravelli et al. (2015) find that dishonest individuals are more likely to enter the competition when there is a choice. Carpenter et al. (2010) show that, while a tournament-based incentive scheme increases productivity compared to a piece rate, a tournament with a sabotage possibility decreases productivity, because of the occurring sabotage and the subjects who anticipate sabotage scale back their efforts. Klimm (2019) studies third parties' willingness to reduce payoff inequality between two competitors depending on whether the competition allows for cheating or not. He finds that third parties, who generally support redistribution policies, become even less tolerant of inequality when it may be the result of cheating.

Differences between individuals and groups[4]

Conrads et al. (2013) employ the dice roll task by Fischbacher and Föllmi-Heusi (2013) to compare cheating behavior under an individual compensation scheme and a team compensation scheme where two individuals privately report the outcome of their dice roll and then share their pooled revenues. They find that lying is more pronounced under team incentives which can be explained by the diffusion of responsibility within teams. Muehlheusser et al. (2015) find that, when two teammates jointly do the dice roll and reporting, overall their behavior does not significantly differ from individual behavior. However, taking gender into account, the following ranking of honesty emerges: female groups are the most honest, then female individuals, closely followed by male individuals, then mixed groups, and male groups are the most dishonest. The tendency of women to lie less than men is thus amplified in groups. Kocher et al. (2018) use a computerized version of the dice roll task to test if and how individuals change their behavior when they are moved to a group setup. Groups consist of three anonymous persons who communicate via a computer chat. The three group members see the same number rolled on their screen and, depending on treatment, they either have to report the same number and earn the same payoffs or they report their number and earn their payoffs independently of each other. The results show that groups lie significantly more than individuals, irrespective of whether the members share a common payoff or not. In both treatments, communication lets groups coordinate towards dishonest reporting. This is also true for groups consisting of previously honest individuals. Furthermore, communication within the group decreased beliefs about honest behavior of other participants in a reference experiment. All this, together with the content analysis of the chat protocols, indicates that groups establish a new norm regarding dishonesty. Sutter (2009) compares cheating behavior between individuals and groups using the cheap talk sender-receiver game developed by Gneezy (2005).[5] Although groups in the experiment lie less than individuals, this is not "true honesty". Instead, groups engage in strategic truth telling as most of these groups do not expect the message to be believed. Cohen et al. (2009) extended the study by Sutter (2009) by adding a treatment in which it is clear that lying will give a higher payoff than honesty. The results show that groups lie less than individuals when it is unclear if lying is profitable but they lie significantly more when lying is certain to be profitable, providing further evidence that groups deceive strategically. Nikolova et al. (2018) compare the willingness to cheat between individuals and dyads in a series of (mostly hypothetical) tasks. They find that

[4] Some of the psychological experiments involved deception or hypothetical tasks. For example, subjects in the experiment by Winquist and Larson (2004) were not paid. The interaction partners in the experiments by Meier and Hinsz (2004) and Wildschut et al. (2007) did not actually exist but were instead played by the experimenter.

[5] In this game, there are two players, a sender and a receiver, and there are two options with one option being favorable for the sender and the other one being favorable for the receiver. Only the sender is informed about the payoff consequences of the two options. The sender then chooses one of two messages, telling the receiver which option will earn him more money, and, based on this message, the receiver chooses between the two options.

dyads who have no prior relationship are more likely to cheat than individuals while there is no significant difference between individuals and dyads who already have a relationship. Participants in the study also expect dyads to cheat more than individuals and that the "partnering-in-crime" would make the cheating dyad partners feel closer to each other.

A particularly relevant study is Amir et al. (2016) which tests if people cheat groups more than individuals. Subjects in this study predict twenty times the outcome of private coin flips. They are rewarded for each reported correct prediction and the reward is taken from the account of another individual or a group of four individuals. The results show that people indeed cheat groups more than individuals. This tendency is stronger when people are only informed about the harm done to the whole group and not about the harm done to each member.

To the best of our knowledge, no study has compared the inclinations to cheat of individuals and groups in a competitive environment. A number of related studies compare groups and individuals in other interactive games. Using a beauty contest game, Kocher and Sutter (2005) find that groups choose lower numbers than individuals. A possible explanation is that groups not only think more deeply through the game but also expect other groups to think more deeply than individuals. When groups and individuals compete directly with each other, groups win the beauty contest game significantly more often than individuals. Kocher et al. (2006) allow subjects to choose their preferred way of decision making in a beauty contest game. About 60 percent of them choose to play the game in a team and they win the game significantly more often than the individuals.

Also non-zero-sum games have shown that group behavior is closer to standard game theoretical predictions than individual behavior. For instance, groups have been shown to send or return less money in the trust game (Cox 2002; Kugler et al., 2007), to make and accept smaller offers in the ultimatum game (Bornstein and Yaniv, 1998), and to be less cooperative in prisoners' dilemma games (Insko and Schopler, 1998; Wildschut et al., 2003). A lot of research has been done on behavior in the prisoners' dilemma game which shows that both being in a group and playing against a group have a negative effect on cooperation. Schopler et al. (1993) let individuals and groups play a modified version of the prisoners' dilemma that has an additional option to withdraw. If a player expects the other side to defect, this withdraw option gives a higher payoff than the other two options, defect or cooperate. If a player expects the other side to cooperate then defection is the most profitable response. The results show that groups withdraw more often than individuals, indicating the groups distrust other groups more than individuals distrust other individuals. Groups also defect more often, showing that they have a higher propensity to exploit others than individuals. Schopler et al. (1993) also show that, when groups are made to believe that they play with a cooperative group and one of the group members, a confederate, suggests either to cooperate or to defect, groups tend to follow the suggestion, confirming the role of social support within groups. However, when groups are made to believe that they play with an uncooperative group, groups do not follow the confederate's suggestion but mostly choose to defect. Schopler et al. (1995) provide evidence that diffusion of responsibility within groups reduces cooperation. In their experiment, members of groups are more likely to defect when their individual choices are kept private than when they are made public. Insko et al. (1998) compare individuals and groups in a sequential prisoners' dilemma where the second player is informed about the decision of the first player before making the own decision. They find that, while groups still cooperate less than individuals in the sequential game, the difference is smaller than in the simultaneous game.

Some studies have also considered interactions between individuals and groups. Using a modified prisoners' dilemma, Winquist and Larson (2004) find that both individuals and groups behave more competitively when they play against a group than when they play against an individual. They also find that, regardless of the interaction partner, groups compete more than individuals. Using responses from an ex-post questionnaire, the authors show that, while both individuals and groups expect more competitive behavior from groups than from individuals, groups have lower expectations and they discriminate more between individual and group opponents than individuals. Similar results are provided by Morgan and Tindale (2002) and Wildschut et al. (2007) who also find that both being in a group and playing against a group reduce cooperation. McGlynn et al. (2009) and Insko et al. (2013) find that individuals cooperate significantly more when they play a prisoners' dilemma with another individual than when they play with a group. McGlynn et al. (2009) additionally show that this is independent of the size of the group. Kugler et al. (2007) let individuals and groups interact in a trust game. They find that individual senders do not discriminate between individual and group responders while group senders are more likely to send nothing when the responder is a group rather than an individual. This difference does not seem to be driven by different expectations as groups do not expect different returns from group responders than from individual responders. Meier and Hinsz (2004) compare individuals and groups when they have to determine how much hot sauce other people have to consume. Subjects are first told that an individual or a group has allocated a certain amount of hot sauce to them and then they have to decide, alone or in a group, how much sauce they would like to allocate back to that individual or group. The decision can perhaps best be interpreted as revenge after having received a provocation. Irrespective of the type of receiver, groups allocate more hot sauce than individuals. The authors explain this result with increased aggressiveness and diffused responsibility in groups. Both individuals and groups allocate more hot sauce to group receivers than to individual receivers and there is no significant difference in how individuals and groups discriminate between individual and group receivers.

In short, there is evidence that being in a group, playing against a group, and expectations all play a role and contribute to the difference between inter-individual and inter-group interactions. However, most studies do not precisely identify and distinguish between the actor effect, the opponent effect, and the expectations effect. We contribute to this literature by providing a more precise comparison where we do not only control for the actor and the opponent but also for the actor's expectations about the opponent. Previous studies have measured actors' expectations but, as explained before, even if there is a correlation between expectations and own decisions, this does not imply a causal relationship. Sequential games, where the second player is informed about the decision of the first player before making the own decision, eliminate the role of expectations. But sequential games do not allow for a clean comparison either, because of the differences in the behavior of the first player. We manipulate expectations exogenously in a way that individuals and groups must have the same expectation about the opponent, regardless of whether the opponent is an individual or a group.

3. Experimental design

Overall, 760 undergraduate students participated in the experiment which was conducted in multiple sessions as a pen-and-paper experiment at the University of Magdeburg, Germany. Since the dice rolling task does not take long, and to minimize suspicion on the side of the participants, we added the experiment to other unrelated experiments.[6] Subjects were told that the short experiment had nothing to do with the previous experiment and that they would not interact with any of the previous interaction partners again (which was true). Care was taken that each student took part only once and in one treatment only. Participants in all treatments were asked to roll a dice and to report the number they rolled the first time.[7] Subjects knew that dice number reported would determine their score in a two-player competition. To ensure private choices, they were asked to mark the number on a sheet of paper, fold the sheet twice, and put it into a locked box. In the treatments with individual decisions, individuals rolled the dice and marked the number privately in a cabin concealed from view. In the treatments with group decisions, groups of three subjects were brought to a place where they could discuss face-to-face, roll the dice, and mark the number without being heard or seen by others, including the experimenters. The groups were requested to perform the task by mutual consent and to select one member who would roll the dice for the group. They were informed that the dice number reported would determine the competition score of the group.

Table 1 provides an overview over all treatments. The treatment called *"1-1"* involved a competition between two anonymous individuals who had no contact with each other. Both individuals privately rolled a dice and they received a score of 1, 2, 3, 4, or 5 points for the corresponding dice number reported and a score of zero for a reported 6. The person with the higher score won the competition and earned 5 euros and the loser earned zero. The winner was randomly selected when there was a tie. This treatment replicates the two-player competition studied by Conrads et al. (2014) with the highest prize gap between the winner and the loser. The treatment *"3-3"* involved a competition between two groups consisting of three subjects each. The two groups had no contact with each other. Both groups privately rolled a dice and they received a score of 1, 2, 3, 4, or 5 points for the corresponding dice number reported and zero for a 6. The group with the higher score won the competition and each group member earned 5 euros. The members of the other group earned zero. In case of a tie, the winner group was randomly selected. In the next treatment, we established a competition between an individual and a group with the same scoring rule; each party privately rolled a dice and received a score of 1, 2, 3, 4, or 5 points for the corresponding dice number reported and zero for a 6. If the individual had the higher score than the group, this person earned 5 euros and the group earned nothing. If the group had the higher

[6] The preceding experiments consisted of a series of public goods games. To counteract potential spill-over effects we balanced our treatments over the different public goods games. The recruitment process was done for the preceding experiment using the software hroot (Bock et al., 2014). An important advantage of conducting the experiment as an add-on was that subjects received their overall earnings from both experiments at the very end, concealing the exact amount of earnings from the dice roll task. A similar approach was used by Fischbacher and Föllmi-Heusi (2013) and Conrads et al. (2014).

[7] As in the experiment by Fischbacher and Föllmi-Heusi (2013), subjects were explicitly asked to roll the dice more than once to check whether it was fair, but to keep in mind the first throw as this was the relevant throw for the score. This procedure arguably made it easier for subjects to lie as they had the possibility to report the dice number rolled in one of the later throws.

score, each member earned 5 euros and the individual earned nothing. From the perspective of the individual, we call this treatment *"1-3"* while we call it *"3-1"* from the perspective of the group. All these treatments involved two parties competing with each other where both parties were able to cheat by reporting a different number than they actually rolled.

The next four treatments established a competition between the same types of competitors (individuals competing with individuals, groups competing with groups, and individuals competing with groups) but eliminated the ability to cheat for one of the two parties. The treatment labels take this into account by putting the passive party that is unable to cheat into brackets. The treatment *"1-(3)"* thus describes a situation in which an active individual who is able to cheat competes with a passive group that is not able to cheat. Subjects in these treatments were informed that the passive party would not roll the dice itself but instead the experimenter would roll the dice and report the number truthfully. The active party rolled the dice and was free to report the rolled number itself. We used the strategy method for these four treatments so that all individuals and groups made an active decision, knowing that at the end of the experiment a random draw would determine who will be the active party and who will be the passive party. The use of the strategy method allowed us to collect more observations, which was important given the overall size of the experiment. But even more importantly, it prevented the active individuals and groups from feeling more powerful than the passive party because at the time of the decision, they did not yet know whether they would be the active party or the passive party.[8]

Table 1. Overview of treatments

Treatment	Decision	Competitor	No. of subjects	No. of observations
1-1	Individual	Active individual	46	46
3-3	Group	Active group	138	46
1-3	Individual	Active group	45	45
3-1	Group	Active individual	135	45
1-(1)	Individual	Passive individual	50	50
3-(3)	Group	Passive group	162	54
1-(3)	Individual	Passive group	49	49
3-(1)	Group	Passive individual	135	45

In the treatments in which both parties were able to cheat, we were also interested in the subjects' beliefs about the competitor's behavior. The first sessions (about one-third) were conducted without elicitation of beliefs. These initial sessions were used as the basis for eliciting subjects' beliefs in the subsequent sessions. In those later sessions, after subjects had submitted their dice number (alone or in a group), they were individually asked to guess the distribution of reported numbers in the initial sessions. Specifically, after being informed about the total number of decisions, they guessed how many of them had reported the numbers 1, 2, 3, 4, 5, and 6. Subjects made only guesses about their own treatment, i.e. the subjects in treatment *1-1* made guesses about behavior in the initial sessions for treatment *1-1* and the subjects in treatment *3-3* made guesses

[8] We run some additional sessions for the 3-(3) treatment without strategy method, where the groups knew whether they were the active or the passive group. The comparison of these additional data based on 84 subjects and 28 groups shows no significant differences with the data collected with the strategy method.

about behavior in the initial sessions for treatment *3-3*. The subjects in the treatment with mixed competition (individuals versus groups) made guesses about both the behavior of the own type and the competitor's type, but we are mainly interested in the guesses about the competitor. All guesses were incentivized: subjects received a payoff of 4 euros when they guessed the actual distribution correctly and the payoff was reduced by 0.10 euro for each deviation (by one individual or group) from the actual distribution.[9]

Finally, all sessions included two short questionnaires, one before subjects knew about the dice roll task and another one after they had finished the task.[10] In the ex-ante questionnaire, subjects were asked to provide self-assessments with regards to their risk preferences, general ambition, and competitiveness. In the ex-post questionnaire, they were asked about their personal background including field of study, gender, age, final school grade, number of siblings, religiousness, political orientation, and the Big Five personality traits. After the final questionnaire was completed, subjects were privately paid their earnings in cash and left the lab one by one.

4. Results

Figure 1 provides an overview of the reported dice numbers for each treatment. Of particular importance in these graphs are the proportions of 5s, the number translating to the highest score in the competition. We observe some amount of cheating in all eight treatments. The proportion of 5s is well above the 16.67% line in all of the eight treatments. A possible reason for this relatively high amount of cheating is that even maximal cheating does not necessarily harm the competitor as this depends on the actions of both sides, and the winner is chosen randomly in case of a tie.[11]

Let's first look at the treatments in which both parties in the competition are able to cheat. The left part of Table 2 presents comparisons of the average reported dice roll and the proportion of reported 5s between treatments and the corresponding statistical significance levels. The statistical tests confirm the impression one gets by looking at Figure 1. Groups cheat significantly more than individuals under both conditions, when competing with an individual and when competing with a group.

Considering the competitor's type, we find that individuals behave similarly when they compete with another individual and when they compete with a group. There are no significant differences between *1-1* and *1-3*. Groups, in contrast, cheat significantly more when they compete with another group than when they compete with an individual. This difference in the behavior depending on the competitor's type is remarkable, especially as in our design of the individual-versus-group competition efficiency favors the win of the group. Efficiency does not favor a particular outcome in the inter-group competitions where we find an exceptionally high level of cheating, with 87 percent of groups reporting a 5.

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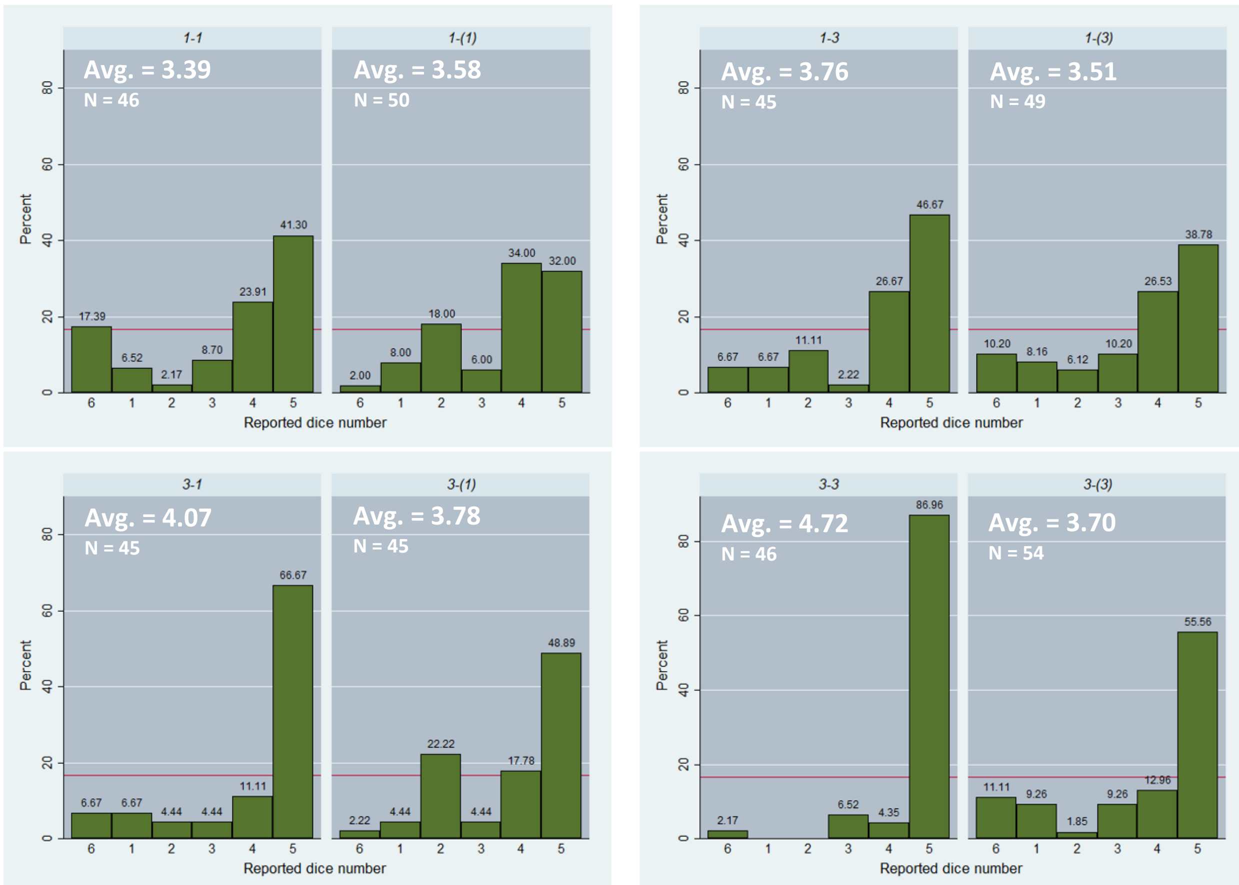
[9] De facto the penalty per unit deviation was 0.20 euro as a deviation for one dice number automatically led to a second deviation for another dice number. For instance, if a subject guessed that ten parties had reported a 5, when actually nine parties had reported a 5, this subject must have made at least one more mistake for one of the other dice numbers.

[10] The elicitation of beliefs and the questionnaires were done with computer and not pen-and-paper.

[11] Dugar et. al. (2019) show in a sender-receiver game, that even when one's cheating behavior with certainty hurts the opposing party, cheating rates are further elevated when the magnitude of the damage is uncertain.

Figure 1. Distribution of reported dice roll numbers by treatment



Note: The figure presents the percentage of reported dice roll numbers by treatment. The averages shown in the top left corner of each panel are calculated with taking the number 6 as zero. The horizontal red lines indicate the honesty level of 16.67%, given the presumed equal distribution of dice roll numbers across the six dice sides.

The right part of Table 2 presents comparisons of expectations about the competitor between treatments. Both the expected average of reported numbers and the expected proportion of reported 5s are considered. Comparing individuals and groups, we find that they have on average similar expectations about the competitor when the competitor is an individual. Nevertheless, groups cheat significantly more in this situation. When the competitor is a group, then groups expect significantly more cheating than individuals and they also cheat significantly more.

Individuals have similar expectations about the competitor when they compete with an individual and when they compete with a group. There are no significant differences in expectations between *1-1* and *1-3*. This can help to explain why the amount of cheating is not significantly different either. Groups, on the other hand, expect more cheating from the competitor when they compete with another group than when they compete with an individual. The differences in expectations between *3-1* and *3-3* are highly significant and can help to explain why groups increase the level of cheating when they are in inter-group competition.

Table 2. Treatment comparisons of actual cheating behavior (left) and expected cheating behavior (right) when both parties are able to cheat

Question	Treatment comparisons Average reported dice roll Proportion of reported 5s			Significance	Question	Treatment comparisons Average expected reported dice roll Proportion of expected reported 5s			Significance
Do groups behave differently than individuals?	***1-1***		***3-1***		Do groups have different expectations about the competitor than individuals?	***1-1***		***3-1***	
	3.39	&	4.07	**		4.09	&	3.98	
	41.30%		66.67%	**		57.50%		59.39%	
	1-3		***3-3***			***1-3***		***3-3***	
	3.76	&	4.72	***		4.03	&	4.36	**
	46.67%		86.96%	***		52.60%		72.79%	***
Does the competitor type matter for cheating?	***1-1***		***1-3***		Does the competitor type matter for expectations about the competitor?	***1-1***		***1-3***	
	3.39	&	3.76			4.09	&	4.03	
	41.30%		46.67%			57.50%		52.60%	
	3-3		***3-1***			***3-3***		***3-1***	
	4.72	&	4.07	**		4.36	&	3.98	***
	86.96%		66.67%	**		72.79%		59.39%	***

Note: Black stars indicate p-values from two-sided Mann-Whitney-Wilcoxon tests for comparisons of average reported dice roll numbers or expectations. Red stars indicate p-values from two-sided Fisher's exact tests for comparisons of proportion of reported 5s or expected 5s. Levels of significances are denoted by *** / *** $p < 0.01$, ** / ** $p < 0.05$, * / * $p < 0.1$.

Taken together, the results show that inter-group competition produces much more cheating than inter-individual competition. Irrespective of the type of competitor, groups cheat more than individuals. Individuals do not discriminate between individual competitors and group competitors. Groups cheat significantly more when the competitor is another group than when the competitor is an individual. The measured beliefs indicate that these effects can at least partly be explained by different expectations about the competitor. We also find that there is a positive correlation between subjects' beliefs and their own reported number. The correlations are statistically significant in all treatments (Pearson correlation test, $P < 0.05$ each), except of *1-1* ($P = 0.12$).

Our belief-elicitation task was well incentivized. Subjects could earn additional €4 if they correctly guessed the behavior of previous subjects in the initial sessions. Considering that expected payoff from the dice roll task was €2.50, the opportunity of additionally earning €4 should have motivated subjects to report their true beliefs. Nevertheless, it is possible that the reported beliefs were influenced by subjects' learning experience of their own behavior in the game, that beliefs were reported to justify the own decision, or that a third variable had an effect on both own behavior and beliefs about others. It can thus be questioned whether the reported beliefs had a causal effect on behavior. For this reason, we included additional treatments in which beliefs are exogenously fixed by eliminating the opponent's ability to cheat. We now turn to these treatments.

The left part of Table 3 provides comparisons of treatments in which the competitor is unable to cheat and thus has an expected dice roll of 2.5. Comparing groups and individuals, we find that groups cheat slightly more than individuals in both conditions, when they compete with a passive individual and when they compete with a passive group. The differences, however, are much smaller than in the situation where both parties are active (see left side of Table 2), and they are not statistically significant.

Considering the competitor's type, we find that individuals behave similarly when they compete with a passive individual and when they compete with a passive group. There are no significant differences between *1-(1)* and *1-(3)*. Also groups behave similarly in both conditions. The proportion of 5s is slightly higher when the passive competitor is a group rather than an individual, but this difference is not statistically significant. The average reported dice rolls are very similar in both conditions.

Table 3. Treatment comparisons of cheating behavior conditional on whether only one or both parties are able to cheat

Question	Treatment comparisons / Average reported dice roll / Proportion of reported 5s			Significance	Question	Treatment comparisons / Average reported dice roll / Proportion of reported 5s			Significance
When the competitor is *passive*, do groups behave differently than individuals?	***1-(1)***		***3-(1)***		Do individuals behave differently when the competitor changes from active to passive?	***1-1***	&	***1-(1)***	
	3.58	&	3.78			3.39		3.58	
	32.00%		48.89%			41.30%		32.00%	
	1-(3)		***3-(3)***			***1-3***	&	***1-(3)***	
	3.51	&	3.70			3.76		3.51	
	38.78%		55.56%			46.67%		38.78%	
When the competitor is *passive*, does the competitor type matter for cheating?	***1-(1)***		***1-(3)***		Do groups behave differently when the competitor changes from active to passive?	***3-1***	&	***3-(1)***	
	3.58	&	3.51			4.07		3.78	
	32.00%		38.78%			66.67%		48.89%	
	3-(3)		***3-(1)***			***3-3***	&	***3-(3)***	***
	3.70	&	3.78			4.72		3.70	*** (red)
	55.56%		48.89%			86.96%		55.56%	

Note: Black stars indicate p-values from two-sided Mann-Whitney-Wilcoxon tests for comparisons of the average reported dice roll numbers. Red stars indicate p-values from two-sided Fisher's exact tests for comparisons of proportion of reported 5s. Levels of significances are denoted by *** / *** $p < 0.01$, ** / ** $p < 0.05$, * / * $p < 0.1$.

The right part in Table 3 compares the treatments where both parties are active with the treatments where only one party is active. Individuals are somewhat more likely to report a 5 when the competitor is active rather than passive. The difference, however, is not significant. The average reported dice roll is even lower when the competitor is active, but this difference is not significant either. There are also no significant differences in individuals' behavior when competing with active groups and passive groups. Groups cheat more when the competitor is active rather than passive. The differences are not significant when the competitor is an individual but they are highly significant when the competitor is another group.

The statistical tests considered so far tell us whether a difference between two treatments is significant or not. However, the tests do not tell us if the reaction by groups to a change in the competitor's type is significantly stronger than the reaction by individuals. More generally, the statistical tests do not tell us whether the difference between two treatments is significantly larger than the difference between two other treatments. To say more about the different reactions by groups and individuals, we use regressions with interaction terms. The results are shown in Table 4.

Table 4. Linear regression results on average reported dice roll

	(1)	(2)		(3)	(4)
Variables	Competitor is active	Competitor is passive	Variables	Competitor is an individual	Competitor is a group
Decision maker is a group	0.675**	0.198	Decision maker is a group	0.198	0.193
	(0.326)	(0.333)		(0.332)	(0.309)
Competitor is a group	0.364	-0.007	Competitor is active	-0.189	0.245
	(0.326)	(0.326)		(0.330)	(0.323)
Interaction term	0.286	-0.004	Interaction term	0.478	0.768*
	(0.461)	(0.462)		(0.474)	(0.450)
Constant	3.391***	3.580***	Constant	3.580***	3.510***
	(0.229)	(0.229)		(0.228)	(0.224)
Observations	182	198	Observations	186	194

Note: Numbers show discrete effects from ordinary least squares regressions; standard errors in parentheses. Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. For the dependent variable *reported dice roll*, reports of number 6 are treated as zeros. All explanatory variables are dummy variables.

The first regression in Table 4 shows results for the active treatments *1-1*, *3-3*, *1-3*, and *3-1*. All explanatory variables are dummy variables. The variable *Decision maker is a group* takes the value one for the treatments *3-3* and *3-1* and zero for the treatments *1-1* and *1-3*. The variable *Competitor is a group* takes the value one for the treatments *3-3* and *1-3* and zero for the treatments *1-1* and *3-1*. The interaction term is constructed by combining these two variables; it takes the value one for the treatment *3-3* and zero for all others. The results show that, holding the competitor constant, groups cheat significantly more than individuals. This confirms the results of the statistical tests presented before. The interaction term is not significant which means that the increase in cheating due to a change in the competitor type from an active individual to an active group is not significantly greater for groups than for individuals. Regression (2) makes the same comparisons for the passive treatments *1-(1)*, *3-(3)*, *1-(3)*, and *3-(1)*. This regression does not find that groups cheat significantly more than individuals when the competitor is held constant. The interaction term is insignificant again, showing that the change in behavior due to change in the competitor type from a passive individual to a passive group is not significantly different between groups and individuals.

The third regression includes all treatments in which the competitor is an individual *1-1*, *1-(1)*, *3-1*, and *3-(1)*. The variable *Decision maker is a group* takes the value one for *3-1* and *3-(1)* and zero for *1-1* and *1-(1)*. The variable *Competitor is active* is set to one for *1-1* and *3-1* and zero for *1-(1)* and *3-(1)*. The interaction term takes the value one for *3-1* and zero for all other treatments. None of these variables has a significant effect on cheating behavior. Regression (4) provides the same comparisons for the treatments in which the competitor is a group *1-3*, *1-(3)*, *3-3*, *3-(3)*. Here the interaction term shows a weakly significant effect, meaning that the increase in cheating due to a change in the competitor type from a passive group to an active group is significantly greater for groups than for individuals.

In the Appendix we show additional regression results separated for the treatments in which the decision maker is an individual and the treatments in which the decision maker is a group. These regressions show that the increase in the level of cheating by groups due to change in the competitor type from individual to group is significantly greater when the competitor is active than when the competitor is passive. This effect does not exist for individuals.

Finally, our analyses of gender, religion, self-reported competitiveness, and other socio-demographic and attitudinal characteristics show no significant effects on cheating behavior in the experiment, neither for individuals nor for groups. The analyses include both linear regressions for the reported dice roll numbers and probit regressions for the likelihood of reporting a five. The results are shown in the Appendix.[12]

5. Discussion and conclusion

Our results can be summarized as follows. Inter-group competition produces a much higher level of cheating than inter-individual competition. The average reported dice roll number in the inter-group competition is 4.7 and thus very close to the payoff-maximizing number 5. In the inter-individual competition, the average reported number is 3.4 which is closer to the full honesty level of 2.5 than the payoff-maximizing level. When we control for the type of competitor, we still find a significantly lower cheating level for individuals than for groups (3.4 versus 4.1 when the competitor is an individual and 3.8 versus 4.7 when the competitor is a group). However, when we control for both the type of competitor and expectations about the competitor, the differences between individual and group behavior are no longer significant (3.6 versus 3.8 when the competitor is a passive individual and 3.5 versus 3.7 when the competitor is a passive group). This suggests that the pure actor effect in this setting is small and statistically insignificant. This result is in contrast to the studies which report that being in a group per se leads to more cheating. Kocher et al. (2018), for example, find that groups cheat significantly more than individuals in a non-competitive environment. Possible explanations for the different results are that, in their experiment, the victim of the cheating was the experimenter, and not other participants, and that experimenter demand effects played a larger role because cheating was observable not only in the aggregate but at the level of the individual or group.

The results furthermore show that both individuals and groups discriminate between an individual competitor and a group competitor (3.4 versus 3.8 for individuals and 4.1 versus 4.7 for groups). While groups seem to discriminate slightly more, the difference in how individuals and groups discriminate between an individual competitor and a group competitor is not significant. However,

[12] When considering decisions by groups, binary explanatory variables, such as gender and religiousness, are defined by the majority rule: female groups consist of at least two female members and religious groups consist of at least two members who consider themselves religious. For the remaining continuous explanatory variables, we take the average value of the three individual responses by the group members.

when we control for expectations about the competitor, we no longer find discrimination between an individual competitor and a group competitor, neither for individuals (3.6 versus 3.5) nor for groups (3.8 versus 3.7). These results show that there is no pure opponent effect in this setting. Again, this seems to be in contrast to other studies which find discrimination between individual and group opponents, even when they are not able to take any action. For example, Amir et al. (2016) find that people cheat more when the victim of the cheating is a group rather than an individual. However, the differences are not very large and become even smaller when the harm to each group member is shown (as it was done in our experiment).

Our experiment contributes to the efforts to understand why groups behave differently than individuals. In our setting, the pure actor effect and the pure opponent effect are small or nonexistent and the main driver of the differences between inter-individual and inter-group competition appears to be expectations. One may argue that the large difference in how groups behave towards an active group competitor and a passive group competitor is not caused by expectations but rather by power. While two active groups are equally powerful, an active group is more powerful than a passive group. We believe, however, that power is unlikely to be an important factor. First, as we used the strategy method for the active-passive competition, subjects did not know whether they will be the active or the passive party when they made their decision. Second, if power was an important factor, we would also expect a difference in how groups behave towards an active individual competitor and a passive individual competitor, but this difference is very small and statistically insignificant. Third, when we compare the measured beliefs across treatments, we find that the by far highest degree of cheating is indeed expected in the inter-group competition.

The two examples mentioned in the introduction, the Volkswagen emission scandal and the Russian doping scandal, have given the impression that inter-group competition is particularly prone to unethical behavior. Our experiment provides evidence for this impression, showing that the by far highest level of cheating occurs when active groups compete with each other. In terms of political implications, our findings suggest that cheating can be effectively reduced by manipulating the expectations. Monitoring of actors in the competition certainly helps, ideally of all involved actors, but our results suggest that even partial monitoring could be helpful by reducing the cheating possibilities of some actors and thereby affecting the expectations of all.

Acknowledgements. The work was financially supported by the European Union (EU) Horizon 2020 program, action ERC-2014-STG, Project HUCO, grant number 636746.

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Appendix

A Comparison of Individual and Group Behavior in a Competition with Cheating Opportunities

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Supplementary data analyses

Table A.1. Linear regression results on average reported dice roll

	(1)	(2)
Variables	Decision maker is an individual	Decision maker is a group
Competitor is a group	-0.007	-0.074
	(0.335)	(0.304)
Competitor is active	-0.189	0.289
	(0.341)	(0.317)
Interaction term	0.434	0.725*
	(0.485)	(0.438)
Constant	3.580***	3.778***
	(0.236)	(0.224)
N	190	190

Note: Numbers show marginal effects from ordinary least squares regression, standard errors in parentheses. Levels of significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. For the dependent variable *reported dice roll*, reports of number 6 are treated as zeros.

The first regression in Table A.1 includes all treatments in which the decision maker is an individual *1-1*, *1-(1)*, *1-3*, *1-(3)*. The variable *Competitor is a group* takes the value one for *1-3* and *1-(3)* and zero for *1-1* and *1-(1)*. The variable *Competitor is active* is set to one for *1-1* and *1-3* and zero for *1-(1)* and *1-(3)*. The interaction term takes the value one for *1-3* and zero for all the other treatments.

The second regression in Table A.1 includes all treatments in which the decision maker is a group *3-1*, *3-(1)*, *3-3*, *3-(3)*. The variable *Competitor is a group* takes the value one for *3-3* and *3-(3)* and zero for *3-1* and *3-(1)*. The variable *Competitor is active* is set to one for *3-1* and *3-3* and zero for *3-(1)* and *3-(3)*. The interaction term takes the value one for *3-3* and zero for all the other treatments.

Table A.2. Analysis of gender, religion, self-reported competitiveness and other socio-demographic and attitudinal characteristics: (1) Ordinary least squares regression of average reported dice roll in the individual treatments, (2) Probit regression of reporting a five in the individual treatments, (3) Ordinary least squares regression of average reported dice roll in the group treatments, (4) Probit regression of reporting a five in the group treatments.

	Individual treatments			**Group treatments**	
	(1)	(2)		(3)	(4)
	OLS for dice roll	Probit for reported five		OLS for dice roll	Probit for reported five
Treatments			*Treatments*		
1-3	0.412	0.167	*3-1*	-0.669**	-0.784**
	(0.347)	(0.275)		(0.324)	(0.317)
1-(1)	0.396	-0.182	*3-(3)*	-0.994***	-0.926***
	(0.345)	(0.278)		(0.318)	(0.307)
1-(3)	0.301	0.001	*3-(1)*	-0.954***	-1.180***
	(0.349)	(0.280)		(0.331)	(0.316)
Controls					
Individual *female*	-0.371	0.018	Group majority *female*	0.087	-0.062
	(0.275)	(0.223)		(0.252)	(0.224)
Individual *religious*	-0.081	-0.057	Group majority *religious*	0.233	0.005
	(0.283)	(0.229)		(0.301)	(0.265)
Risk self-perception	-0.027	-0.041	-//- group average	-0.016	0.026
	(0.071)	(0.057)		(0.101)	(0.089)
Believes about helpfulness of others	-0.052	0.001	-//- group average	0.025	0.043
	(0.064)	(0.052)		(0.103)	(0.092)
Ambitiousness self-perception	0.016	0.009	-//- group average	0.063	0.118
	(0.093)	(0.078)		(0.136)	(0.119)
Liking competition self-perception	0.002	0.057	-//- group average	0.166	0.125
	(0.077)	(0.063)		(0.128)	(0.115)
Motivated by competition self-perception	0.116	0.066	-//- group average	-0.025	0.010
	(0.079)	(0.065)		(0.140)	(0.123)
Controls (contd.: Big Five)					
Extraversion	0.289**	0.192*	-//- group average	0.112	0.063
	(0.140)	(0.113)		(0.247)	(0.217)
Agreeableness	-0.131	-0.036	-//- group average	0.198	0.104
	(0.137)	(0.110)		(0.287)	(0.250)
Conscientiousness	-0.050	-0.122	-//- group average	-0.153	-0.033
	(0.161)	(0.131)		(0.259)	(0.226)
Neuroticism	-0.167	-0.130	-//- group average	0.063	-0.053
	(0.123)	(0.100)		(0.243)	(0.214)
Openness	-0.056	-0.076	-//- group average	0.259	0.117
	(0.138)	(0.112)		(0.216)	(0.190)
Constant	3.173	-0.486	-//- group average	1.648	-1.644
	(0.523)	(0.434)		(2.162)	(1.867)
N	190	190		190	190

Note: Standard errors in parentheses. Levels of significances are denoted by *** p < 0.01, ** p < 0.05, * p < 0.1. For the dependent variable *reported dice roll*, reports of number 6 are treated as zeros. When comparing treatments, *1-1* is the baseline treatment among the Individual treatments, and *3-3* is the baseline treatment among the Group treatments.

Experimental instructions

In the following, we provide the experimental instructions for the treatments *3-3* and *3-(3)*, translated from the original in German language. The instructions for the *3-(3)* treatment refer to the version where we used the strategy method. (We also ran some sessions for *3-(3)* where we did not use the strategy method to test for potential differences). The instructions for the remaining treatments are very similar and available upon request.

Instructions for the *3-3* treatment

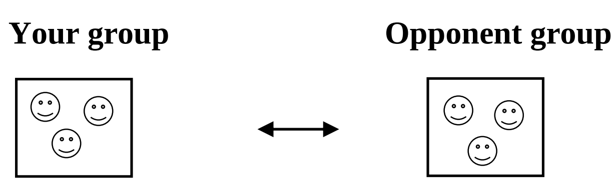
Now we will play the second and the last experiment. At the very end, you will receive your earnings from the two experiments as a sum. After completing the second experiment, we will ask you to complete a questionnaire on the computer. In the meantime, we will calculate your earnings from the two experiments and prepare the payments. The payments are made individually for each participant.

Please read these instructions thoroughly and *completely,* before you begin.

Once you have completed the task below, please fold this sheet twice and put it in the box that we will pass around. Note that the task involves a dice roll.

You will complete this task in a group with two other people. The groups are formed at random.

In this experiment, your group will play against another randomly selected group. It is ensured that you have *not* already played with the players in your group or the players of the opponent group in the first experiment. Your group should do the following task *together* and do so by mutual agreement. The same applies to your opponent group.



Since the task involves a dice roll, the group should select the player who will roll the dice.

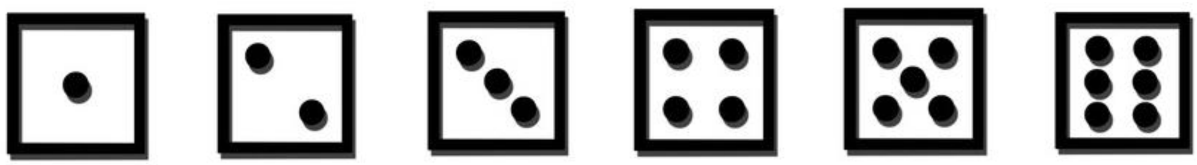
Your task: Please roll the dice (respectively, the selected player) as often as you wish, so as to check that the dice works properly. Please remember the *first* number you have rolled. This number determines your score according to the following table.

Score Table

Rolled number	6	1	2	3	4	5
Score	0	1	2	3	4	5

Your score will be compared to the score of the opponent group. The group with the higher score wins the game. The members of the winning group will receive € 5 *each* and the members of the losing group will receive nothing. If both groups have the same score, the winning group will be determined at random.

All players together: Please cross the number that the selected player has rolled *first*.



Did your group already know each other before this experiment?

☐ **None of us knew each other before**

☐ **Some of us knew each other before**

☐ **All of us knew each other before**

Instructions for the *3-(3)* treatment

Now we will play the second and the last experiment. At the very end, you will receive your earnings from the two experiments as a sum. After completing the second experiment, we will ask you to complete a questionnaire on the computer. In the meantime, we will calculate your earnings from the two experiments and prepare the payments. The payments are made individually for each participant.

Please read these instructions thoroughly and *completely*, before you begin.

Once you have completed the task below, please fold this sheet twice and put it in the box that we will pass around. Note that the task involves a dice roll.

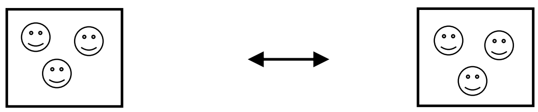
You will complete this task in a group with two other people. The groups are formed at random.

In this experiment, your group will play against another randomly selected group. It is ensured that you have *not* already played with the players in your group or the players of the opponent group in the first experiment. Your group should do the following task *together* and do so by mutual agreement. The same applies to your opponent group.

Importantly, one of the groups is an active group and will make a decision, the other is a passive group and will not make a decision. Whether your group or the opponent group is

the active, respectively the passive group, will be determined at random and communicated to you at the end of the experiment. Now we wish to know how you decide, if your group is the active group and your opponent group is the passive group.

Your group – active **Opponent group – passive**



Since the task involves a dice roll, the group should select the player who will roll the dice.

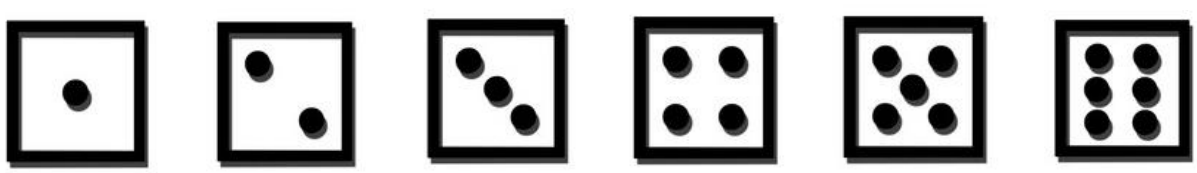
Your task: Please roll the dice (respectively, the selected player) as often as you wish, so as to check that the dice works properly. Please remember the *first* number you have rolled. This number determines your score according to the following table.

Score Table

Rolled number	6	1	2	3	4	5
Score	0	1	2	3	4	5

Your score will be compared to the score of the opponent group. Important: Your opponent group does not roll the dice to determine the score, but one of the experimenters will roll the dice and with that dice roll determine your opponent group's score. The same score table will be used for this. The group with the higher score wins the game. The members of the winning group will receive € 5 *each* and the members of the losing group will receive nothing. If both groups have the same score, the winning group will be determined at random.

All players together: Please cross the number that the selected player has rolled *first*.



This number determines the score of your group, if your group is drawn as the active group. If your group is drawn as the passive group, the score of your group will be determined by the dice roll of an experimenter.

When you receive your payment at the end, we will inform you which role your group had and whether your group has won or not.

Did your group already know each other before this experiment?

- ☐ **None of us knew each other before**
- ☐ **Some of us knew each other before**
- ☐ **All of us knew each other before**