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Rivals Without a Cause? Relative Performance Feedback Creates Destructive Competition Despite Aligned Incentives—Second Revision

Abstract

Whether people compete or cooperate with each other has consequences for their own performance and that of organizations. To explain why people compete or cooperate, previous research has focused on two main factors: situational outcome structures and personality types. Here, we propose that—above and beyond these two factors—situational cues, such as the format in which people receive feedback, strongly affect whether they act competitively, cooperatively, or individualistically. Results of a laboratory experiment support our theorizing: After receiving ranking feedback, both students and experienced managers treated group situations with cooperative outcome structures as competitive, and were in consequence willing to forgo guaranteed financial gains to pursue a—financially irrelevant—better rank. Conversely, in dilemma situations, feedback based on the joint group outcome led to more cooperation than ranking feedback. Our study contributes to research on competition, cooperation, interdependence theory, forced ranking and the design of information environments.

Keywords: Competition; Forced ranking; Feedback; Cooperation; Interdependence; Public goods game; Social comparison

WORDCOUNT: ≈9,900

"The man on the ladder just above me stirs me irresistibly."

– (Scott, 1912, p. 54)

"Your negative feedback can haunt you for all your days at Facebook."

– (Rodriguez, 2019, former Facebook employee in interview)

Introduction

Competition is deeply ingrained in society and in organizations. It is often seen as an inspiration to succeed, a motor to innovate, or a ubiquitous disposition that guides the invisible hand of the market. At the same time, some of the most remarkable organizational successes have been achieved through cooperation (Barnard, 1938; Jorde & Teece, 1989; Smith, Carroll, & Ashford, 1995).

What triggers people to compete, and what triggers them to cooperate with others? Prior research typically focused on two explanatory factors. The first factor is the objective outcome structure of a situation. If two people apply for the same job, then as soon one of them reaches this goal the other fails to do so, making the underlying outcome structure competitive. If, in contrast, a hardware and a software engineer want to launch a new product together, then one cannot achieve this goal without the other also doing so, making the underlying outcome structure cooperative.

The second factor often cited are more or less stable inter-individual differences, such as a person's social value orientation (De Dreu & Boles, 1998; Van Lange, 1999), inequity aversion (Fehr & Schmidt, 1999), or tendency to conditionally cooperate (Fischbacher, Gächter, & Fehr, 2001; Fischbacher & Gächter, 2010). Individuals' social value orientations—the relative valuations of their own and others' outcomes in interactions—are seen as dispositions that affect behavior across situations. From this perspective, some individuals focus only on their own outcomes (individualistic) whereas others are sensitive to the outcomes of others, placing either a positive (prosocial/cooperative) or a negative (competitive) value on them. A competitively oriented hardware engineer might prefer not to launch a product at all if a contributing software engineer is likely to earn relatively more recognition for its success. If the software engineer has an equally competitive disposition, a spiral of destructive

interference may be set in motion, ultimately delaying or preventing the product launch. The individual differences approach highlights that people's competitive dispositions need to be taken into account when selecting them into organizational roles in order to prevent such destructive competition.

Later developments in interdependence theory brought these two factors together. From this perspective, an individual selects competitive or cooperative actions following the transformation of the objective outcomes in a situation (i.e., all possible results of an interaction for the individuals involved) into subjectively evaluated outcomes. The objective outcome structure has been termed "'goal structure"' in goal interdependence theory (Barnes, Hollenbeck, Jundt, DeRue, & Harmon, 2011; Deutsch, 1949a, 1949b; Tjosvold, 1986; Tjosvold, Yu, & Hui, 2004). The subjective evaluation is seen as reflecting concerns for one's own fate and that of others (Kelley & Thibaut, 1978; Van Lange, 2000). This perspective allows for interindividual variation in responses to objective outcomes: Different individuals can apply different subjective transformation functions.

In this article, we propose that inconspicuous features of the situation, such as the structure of feedback (Herold & Greller, 1977; Moore & Klein, 2008), are a third factor that contributes to explaining when people compete and when they cooperate, above and beyond the objective outcome structure and individual dispositions. We thus expand on the more recent developments in interdependence theory, hypothesizing that individuals use situational cues such as feedback as a guide to make sense of a situation, and to decide which outcome they aim to achieve through their actions. In this process, feedback drives the selection of transformation functions, which transform objective into subjectively evaluated outcomes that in turn guide behavior. We propose that performance feedback that includes a relative ranking among peers prompts people to favor outcomes that make them better off relative to others, and thus to engage in competitive behaviors. Similarly, we hypothesize that performance feedback that highlights the overall efficiency of the group prompts people to apply transformation functions favoring outcomes that have benefits for all parties, and thus to engage in cooperative behaviors. Here, we investigate experimentally whether the type of feedback alone is sufficient to induce competitive behaviors—even among managers incentivized to cooperate. Finding

this would have important consequences for both individual and organizational performance, as. organizations frequently provide feedback to their employees (e.g., Ashford, 1993)—after completion of a project, for example, or in regular annual appraisals (Cederblom, 1982). We will discuss our results by re-evaluating feedback practices in organizations in the light of our results that rely on relative evaluations, such as "'forced ranking"' (R. C. Grote, 2005).

We make several contributions to the literature. First, whereas previous studies have emphasized the role of objectively competitive situations (e.g., Beersma et al., 2003) and of individuals with particularly competitive dispositions (Griffith & Rust, 1997; Houston, Harris, Howansky, & Houston, 2015), we show that neither is necessary to trigger destructive competitive behavior—even among experienced executives.

Second, our study illustrates how the type of feedback people receive affects whether they make sense of their situation as competitive or cooperative. Ranking feedback, which is often used in organizational settings, prompts managers to perceive even situations with cooperative goal structures as competitive and, in turn, to forgo guaranteed financial gains in order to pursue a financially irrelevant higher rank—even in an anonymous group free of any reputational concerns. Our finding that situational cues, such as the format of feedback, systematically affect the way recipients perceive objective outcome structure expands interdependence theory. Our study simultaneously advances the literature on the effects of feedback by demonstrating that how feedback is structured affects how people make sense of situations, independently of the information the feedback contains.

Third, our findings show that, rather than being an immutable and permanent driver of behavior, people's motivation to cooperate or compete responds to their subjective evaluation of the potential outcomes, which in turn depends on the feedback received. Building on interdependence theory (Deutsch, 2011; Kelley & Thibaut, 1978), we show that the (exogenously assigned) feedback type systematically leads participants to behave differently and that the motivation they report is in line with this (exogenously determined) behavior.

Theoretical Background and Hypotheses

Competition, Cooperation, and Organizational Outcomes

Scholars have long recognized that whether people engage in competitive or cooperative actions affects their performance in various tasks (Scott, 1912; Vaughn & Diserens, 1938), and thus the success of their teams and organizations (Barnard, 1938). On the one hand, cooperation is seen as beneficial for trust (Ferrin, Bligh, & Kohles, 2008) and information sharing (Tjosvold, 1986), which in turn boost performance (see D. W. Johnson & Johnson, 2009). On the other hand, the bulk of research building on tournament theory stresses that competitive payoff structures are often an efficient way of motivating self-interested people to exert continued effort (Nalebuff & Stiglitz, 1983) and to sort themselves into adequate organizational roles (Connelly, Tihanyi, Crook, & Gangloff, 2014).

Leaving aside the question of when people *should* engage in competitive and cooperative actions to optimize their own and their organization's performance (see for instance Tjosvold, 1988; Tjosvold, Johnson, Johnson, & Sun, 2003), we investigate factors affecting whether people *do* engage in competitive and cooperative actions. We therefore treat competitive (and cooperative) actions, situations, and motives as distinct, instead of conceptualizing them as different aspects of the broad constructs of competition and cooperation, as has often been done in the literature.

Goal Interdependence Theory

The keystone of goal interdependence theory is that competitive actions are rooted in situations with a competitive goal structure and cooperative actions in situations with a cooperative goal structure. Building on Mead (1937)[1], Deutsch (1949b) characterized the "cooperative social situation" as defined by a *promotively interdependent* goal structure: Each member of a group can reach his or her goal only if all other members of the group also reach their goals; goals are positively correlated. In contrast, the "competitive social situation" is

[1]Mead (1937) defined competition as "the act of seeking or endeavoring to gain what another is endeavoring to gain at the same time" and cooperation as the "act of working together to one end" (p. 8). She contrasted both terms with "individualistic behavior," in which "the individual strives toward his goal without reference to others" (p. 16)

characterized by negatively correlated goals and thus by a *contriently interdependent* goal structure: A group member can reach his or her goal only if other members of the group do not (fully) reach their goals.

Deutsch (1949b) distinguished between objective and perceived interdependence. Focusing on this distinction, Kelley and Thibaut (Kelley & Thibaut, 1978; Thibaut & Kelley, 1959) advanced their version of interdependence theory, proposing that an objective "given" situation is transformed by the individual into an "effective" situation. Objective "given" situations were defined by their underlying objective outcome structure, and people were assumed to transform the objective outcomes into subjectively evaluated outcomes, and to act to obtain the best possible transformed outcome (Kelley & Thibaut, 1978). Specifically, people were assumed to rely on transformation functions, such as summing up individual outcomes into joint outcomes or calculating relative differences (i.e., subtracting the other's outcome from one's own), and to seek to maximize the resulting transformed outcomes.

Separating objective from subjectively evaluated outcomes made it possible to explain the more flexible mapping observed between objective outcome structures and competitive or cooperative behaviors. Specifically, leaving the objective outcome structure constant, both situational characteristics (beyond the objective outcome structure) and dispositional differences between individuals could affect whether people act competitively or cooperatively. For instance, group-specific or relationship-specific transformation functions could develop (Folsom, 1931; Garcia, Tor, & Schiff, 2013; Kilduff, Elfenbein, & Staw, 2010; Mead, 1937), or individual differences in competitive and cooperative dispositions could also become manifest in the transformation functions people tend to employ (McClintock & Liebrand, 1988).

Individual Differences and Situational Factors Affecting Goal Transformation

Focusing on the idea that individual differences affect the selection of transformation functions, the concept of social value orientation (see also Liebrand & McClintock, 1988; Murphy & Ackermann, 2014; Van Lange, De Bruin, Otten, & Joireman, 1997) was developed. Individual differences in social value orientation have been found to affect individuals' selection of transformation functions across situations with different objective outcome structures (Kuhlman & Marshello, 1975; Van Lange, 2000). An individual tendency to select

one of the three major transformation functions specified in interdependence theory (maximize joint gains or *max joint*, maximize relative gains or *max rel*, and maximize own gains or *max own*) is seen as being driven by a dispositional "motivational orientation" towards cooperation, competition, or individualism, respectively.

Acknowledging the power of the situation to affect transformation functions, even proponents of individual difference approaches stress that these dispositions could be temporarily overwritten by situational forces (Murphy & Ackermann, 2014). This raises two questions. First, which elements of situations (other than the objective outcome structure) determine the selection of a transformation function? And second, how substantive is their effect, above and beyond the effect of objective outcome structures and individual differences in social value orientation? The literature provides a long list of potential answers to the first question, ranging from organizational culture (J. Martin, 2002), framing (Levin, Schneider, & Gaeth, 1998), social norms (Pillutla & Chen, 1999) to the shared history between the actors (Kilduff et al., 2010). One factor that appears inconsequential at first glance is the format of the feedback received.

Feedback

Feedback is a particularly important factor from a managerial perspective: Organizations frequently provide feedback to their employees (Aguinis, 2009; DeNisi & Kluger, 2000; Prue & Fairbank, 1981; Townley, 1993), and its format is largely under managerial control (Kuhnen & Tymula, 2011).

From a theoretical perspective, investigating the influence of feedback on competition and cooperation is not only relevant for the literature on the effects of feedback (Cederblom, 1982; Chun, Brockner, & De Cremer, 2018; Herold & Greller, 1977; Hollenbeck, Ilgen, LePine, Colquitt, & Hedlund, 1998), but also allows us to advance the literature on competition and cooperation in organizations by treating feedback as a representative showcase for those situational characteristics (beyond the objective outcome structure) that can influence whether people act competitively and cooperatively.

Feedback is not a mere transmission of objective information. Rather, it typically contains, either implicitly or explicitly, a frame of reference that serves as a comparison standard (Kluger

& DeNisi, 1996). Different frames of reference lead to different judgments about the appropriateness of past and present actions (Ilgen, Fisher, & Taylor, 1979); they can guide how people make sense of these situations. In the language of interdependence theory, the frame of reference contained in feedback entails a specific transformation function. Recipients of feedback use this inherent transformation function to transform the objective outcomes of the "given" situation into subjectively evaluated outcomes that characterize the "effective" situation from their perspective. In other words, our experimental design had the potential to allow for an expansion of interdependence theory: Feedback characterized by specific transformation functions inherent to it can prompt people's subsequent application of these transformation functions.

Feedback Formats and Transformation Functions

To investigate the influence of feedback formats on the selection of transformation functions and the ensuing actions, we contrast three prototypical classes of feedback format that correspond to three prototypical transformation functions (and, more generally, three prototypical social orientations). At the competitive end of the spectrum, there is feedback based on relative ranks, which corresponds to the *max rel* transformation function (Barnes et al., 2011). At the cooperative end of the spectrum, there is feedback centered on joint outcomes, which corresponds to the *max joint* transformation function (Nyberg, Maltarich, Abdulsalam, Essman, & Cragun, 2018). Whereas these two feedback formats take others' outcomes into consideration, the third feedback format, individualistic feedback, is based solely on one's own (absolute) individual outcome. It thus corresponds to a *max own* transformation function. We next develop hypotheses for each of the three feedback types.

Ranking feedback Ranking feedback highlights how people compare with their peers, and thereby plays into a general human tendency to make social comparisons (Blanes i Vidal and Nossol, 2011; Festinger, 1954; Kruglanski and Mayseless, 1990; Goodman, 2007). As a consequence of social comparisons, attention to absolute performance is reduced in favor of relative performance (Hoffman, Festinger, & Lawrence, 1954; Obloj & Zenger, 2017), consistent with the *max rel* transformation function. Comparison information can become more important than objective information (Buunk & Gibbons, 2007), which may retard learning

(Ron, Lipshitz, & Popper, 2006). Ranking has been shown to have the most pronounced effects for individuals in a position to reach the first or avoid the last place (Gill, Kissová, Lee, & Prowse, 2018; Vriend, Jordan, & Janssen, 2016). Communicated relative performance feedback can tip the balance towards increased risk-taking and change of strategies for those outperformed by relevant others. Relative feedback can result in increased (Azmat & Iriberri, 2010; Tran & Zeckhauser, 2012) and often competitive (Garcia et al., 2013) effort, lead to "competitive arousal" (Ku, Malhotra, & Murnighan, 2005) and a "desire to win" (Malhotra, 2010), but also generate envy (Fischer, Kastenmüller, Frey, & Peus, 2009) and lead to interpersonal harming (Lam, Van der Vegt, Walter, & Huang, 2011) and destructive competition (Charness, Masclet, & Villeval, 2013; Hafenbrädl & Woike, 2018).

In sum, ranking feedback plays into the tendency to engage in social comparison, and prompts people to make sense of situations and their underlying goal structures as consistent with the *max rel* transformation function. Stated formally:

Hypothesis 1a *Feedback emphasizing rankings increases individuals' reliance on the max rel transformation function and thus their tendency for competitive behavior.*

Joint outcome feedback Joint outcome feedback highlights how people fare as a group, and thus plays into individuals' pro-social, social-welfare, and efficiency concerns (see also Charness & Rabin, 2002), potentially prompting people to put concern for the group above concern for themselves. Framing a situation by stressing its social and interdependent nature (J. M. Martin, Gonzalez, Juvina, & Lebiere, 2014), emphasizing exchange relationships or the communality of resources (van Dijk & Wilke, 1997) has been found to increase cooperative behavior (Weber, Kopelman, & Messick, 2004), even when such behavior might not make them better off individually.

In sum, joint outcome feedback plays into people's prosocial motivations, which prompt them to make sense of situations as consistent with the *max joint* transformation function. Stated formally:

Hypothesis 1b *Feedback emphasizing joint outcomes increases individuals' reliance on the max joint transformation function and thus their tendency for cooperative behavior.*

Individualistic feedback Individualistic feedback provides a neutral comparison, consistent with the *max own* transformation function: It focuses on the individual outcome, without comparing it with other people's outcomes or putting it in the context of the overall outcome on a group or organizational level. Stated formally:

Hypothesis 1c *Feedback emphasizing individual outcomes increases individuals' reliance on the max own transformation function and thus their tendency for self-interested behavior.*

Transformation Functions and Motivations

If different feedback formats did *not* affect people's transformation functions, but merely motivated them to get positive feedback by doing well on the metric underlying the feedback, then the feedback format would affect people's actions, but not their social motivations. However, our theorizing makes additional, direct predictions about the underlying mechanism, namely the selection of a transformation function and the accompanying motivation. If different feedback formats indeed affect the transformation function selected and, in turn, the subjective evaluation of outcomes, then the different formats should affect not only whether people act competitively or cooperatively, but also whether their actions are motivated by competitive, cooperative or individualistic concerns. Stated formally:

Hypothesis 2 *Rank, joint-outcome or individualistic feedback not only leads individuals to act competitively, cooperatively or individualistically, but also prompts individuals to adopt a competitive, cooperative or individualistic motivation.*

Methods

Overview of our Experimental Paradigm

To test our hypotheses, we needed to observe unambiguously competitive or cooperative actions in situations with different objective outcome structures and different feedback formats. For instance, we can only conclude that participants' competitive behavior is produced by ranking feedback if we observe this behavior in an objective outcome structure favoring cooperative behavior. To exercise precise control over these variables, we conducted a fully incentivized laboratory experiment using a public goods game paradigm (Isaac & Walker,

1988). With the public goods game, we borrow a classic paradigm from behavioral economics previously used in hundreds of studies (as, for instance, by Nobel laureate Elinor Ostrom). By giving us control over the key variables used in our theorizing, its game structure offers excellent internal validity. Moreover, we present excerpts from several interviews with experienced executive in the SM (1.7), who were able to relate the structure of our game to professional instances of conflicts between cooperation and competition, underlining the ecological validity of our approach. In the public good game, we manipulated the feedback format as a between-subjects factor and the objective outcome structure as a within-subjects factor. Participants played a game for ten rounds, in groups of four people. Each round, they received an endowment that they could invest in an "'individual project"' yielding a return for themselves only or in a "'group project"' yielding returns for their group, themselves included.

Feedback Formats

Each participant group was randomly assigned to receive only one type of feedback across the entire experiment (see Fig. S1 in the SM for screenshots).

Individualistic feedback entailed information on how they had allocated the initial endowment, the sum of contributions to the group project across all group members, their personal returns on investments in group and individual project, their own round score, and their accumulated score. These elements of also formed the basis for the two other feedback formats.

Additionally, participants in the *ranking feedback* condition received feedback on other participants' individual contribution to the group project and on all other participants' round scores and accumulated scores including a graphic comparison of group members' accumulated scores. From the second round onwards, they saw their rank among the four players in the current and previous rounds, all members' round scores in previous rounds, and the comparison graph.

In addition to the information shown in the individualistic feedback condition, participants in the *joint outcome feedback* condition were shown a graph and an index (between 0 and 1) after each round locating the joint outcome on a scale ranging from the minimum to the maximum possible value. From the second round onwards, participants saw the graph for the

previous round and the index value for each previous round.

Game Parameters

Each participant played the game twice (in counterbalanced order), once with a contriently interdependent (competitive) outcome structure ("*comp* game") and once with a promotively interdependent (cooperative) outcome structure ("*coop* game")[2]. Observing participants' behavior across both outcome structures allowed us to classify their behavior as competitive, cooperative, or individualistic, and thus consistent with a *max rel*, *max joint*, or *max own* transformation function, respectively.

To implement a contriently interdependent outcome structure, we specified rates of return for the individual and the group project that represented a social dilemma (Barnes et al., 2011; Kugler, Rapoport, & Pazy, 2010): Investing resources in the individual project would yield higher returns for participants individually, making it a competitive or an individualistic action, and thus consistent with a *max rel* or a *max own* transformation function, respectively. Investing resources in the group project, in contrast, would yield higher joint returns, making it a cooperative action uniquely consistent with a *max joint* transformation function.

To implement a promotively interdependent outcome structure, we specified rates of return for the individual and the group project that did not represent a social dilemma: Investing resources in the group project would yield such high returns for everyone in the group that it was not only a cooperative action but also in each participants' individual self-interest, consistent with a *max joint* and a *max own* transformation function, respectively. Investing resources in the individual project, in contrast, would yield lower returns for participants individually, but even lower returns for all other participants, making it a competitive action uniquely consistent with a *max rel* transformation function.

Each game lasted ten rounds, and in each round, each participant received an initial endowment of 100 points. Points could be kept or any proportion of them invested in the individual project and/or the group project. Keeping points was equivalent to a rate of return of

[2]Note that we use "comp" and "coop" for the two games, respectively, while referring to their objective goal structure: By manipulating rates of return from the group project (see below), we create two situations in which contributing to the group vs. the individual project furthers one's own interests at the same time ("*coop* game"), or is in conflict with them ("*comp* game").

1:1 for the keeping player and no return for other group members. This "keep" option was dominated by investments in the individual project, which had a rate of return of 4:1 for the investing player and no return for other group members (see the SM for our motivation to include this option and specific analyses). The return on investment from the group project varied between the *comp* game and the *coop* game.

For the *comp* game, with a contriently interdependent outcome structure, the rate of return from the group project has to be larger than 1:1 (the rate of return from keeping points) and smaller than 4:1 (the rate of return from the individual project). We chose a rate of return of 2:1, which also ensures that the group of four participants jointly receives a return (for four members:4 x 2:1 on the investment = 8:1 on the investment) that is larger than the 4:1 rate received from individual projects. Investing in the group project thus maximizes the joint outcome for the group, and investing in the individual project maximizes the individual outcome of the investor and her rank in the group. Note that all outcomes were presented in a decomposed format (Brandts & Schram, 2001; Palfrey & Prisbey, 1997) to counteract potential calculation-related forms of confusion.

For the *coop* game, with a promotively interdependent outcome structure, the rate of return from the group project has to be larger than 4:1 (the rate of return from the individual project). We chose a rate of return of 5:1. Investing in the group project thus maximizes both the joint outcome for the group and the individual outcome of the investor. Investing in the individual project, in contrast, maximizes the relative outcome (and thus achieves the best possible rank in the group), while reducing both the investor's outcome and, to a larger extent, the group outcome.

[Insert Figure 1 here]

Figure 1 shows the cooperative, individualistic, and competitive transformation rules applied to the decomposed returns from investments in both games, with circles identifying the highest transformed outcome for each game. A different allocation scheme can be expected under application of each transformation rule: full contributions to the group project in both games after a *max joint* transformation, full contributions to the individual project after a *max rel* transformation, and a contribution conditional on game type after a *max own* transformation.

Participants

While we tested our full design with student participants invited into the laboratory (Study 1a), we included a sample of managers in the ranking condition to address questions of generalizability (Study 1b). Specifically, these managers, who had acquired a wealth of experience in competitive environments (Garcia & Tor, 2007; Malhotra, Ku, & Murnighan, 2008), might have learned to focus on the objective outcome structure of situations and to ignore conflicting situational cues. We decided to combine the data from both studies to test whether results in the ranking condition were comparable. After describing the two study samples separately, we continue with one common procedure and results section.

All participants were paid contingent on their performance according to the laboratory's standard rates of about 25 CHF/h on average (1 CHF was about 1.06 USD at the time of data collection). The experiments were approved by the ethics committee at *[masked for peer review]*, and written informed consent was obtained from all participants. Group members were distributed across several computer classrooms; participants did not know who else was in their group.

Study 1a Sample We recruited 112 students from various disciplines (M_{age}=21.2 years, 42% female) who had not participated in similar studies before. Forty participants were randomly assigned to the ranking feedback condition, 40 to the joint outcome feedback condition, and 32 to the individualistic feedback condition.

Study 1b Sample An executive MBA class with 29 managers (5 female and 24 male, $M_{age} = 38.1$ years) was invited to participate as part of a course on negotiation and decision making, and 28 decided to participate. The EMBA students had at least seven years of professional experience, 63 percent more than 10 years, and 30 percent more than 14 years. As explained above, we assigned all managers to the ranking feedback condition.

Experimental Procedure

For both games, the ten rounds were played with alternating decision and feedback phases and a final screen communicating participants' scores. The second game was introduced highlighting the changed return rate for the group project. Before each game began,

participants completed comprehension checks to ensure they understood the respective task (see the SM for instruction texts, screenshots and comprehension questions), and they were asked about their expectations about how participants would decide in the first round of each game.

Participants then completed a post-study questionnaire, measuring their cooperative/competitive motivation and also concentration, understanding, and general motivation (see the SM for the exact wording of all items) as well as numeracy. The remainder of the session was devoted to unrelated experimental games and measurement scales.

Results

We start by comparing the results for students (Study 1a) and managers (Study 1b) to test whether we can combine their data: The two groups' results were similar (see Figs. 2A, 2B). The difference between managers' and students' total contributions to the group project was not significant in either *coop* games ($U = 20$, $Z = 1.46$, $n_1 = 7$, $n_2 = 10$, $p = .16$, two-tailed exact Mann-Whitney U-test) or *comp* games ($U = 32$, $Z = .29$, $n_1 = 7$, $n_2 = 10$, $p = .81$). The individual-level behavior of managers was similar to that of students in the ranking condition. As a consequence, the two groups were collapsed for the following analyses (for all analyses, the pattern of results holds for both the combined sample and the students alone).

[Insert Figure 2 here]

In all cases, participants' expectations slightly underestimated actual contributions, but there were no systematic differences between conditions (see the SM). Thus, any differences between conditions cannot be attributed to anticipation of receiving feedback in a specific format (or differences in framing of the decision situation; Pillutla & Chen, 1999), but only to the feedback itself, which participants received only after making their first decision. Figure 2 can serve as a general overview, and summarizes both the experimental design and our main results.

Testing our Hypotheses 1a–c

[Insert Figure 3 here]

Figures 3A-C depict participants' average contributions to the group project in each round (see the SM for an analysis of individual round-wise decisions with similar results). Hypothesis 1a makes a specific prediction for the *coop* game, in which investing in the group project is consistent with both the *max joint* and the *max own* transformation function, but investing in the individual project is only consistent with the *max rel* transformation function. As feedback could have no influence on contributions in the first round, we analyzed and compared the sum of contributions to the group project for all rounds but the first. Because contributions could be influenced by the dynamics of the group, we used nonparametric tests to compare contributions on the group level. Supporting Hypothesis 1a, which states that ranking feedback increases the reliance on the *max rel* transformation function, we found that, in the *coop* game, participants in the ranking feedback condition invested significantly less in the group project than did participants in the individualistic feedback condition ($U = 8$, $n_1 = 8$, $n_2 = 17$, $Z = -3.50$, $p < .001$, two-tailed exact Mann–Whitney U-test) or participants in the joint outcome feedback condition ($U = 13$, $n_1 = 10$, $n_2 = 17$, $Z = -3.62$, $p < .001$); see Figure 3A. This pattern of results indicates that participants in the ranking feedback condition were willing to forgo significantly more guaranteed income to achieve higher ranks than were participants in the other conditions.

Hypothesis 1b makes a specific prediction for the *comp* game, in which investing in the group project is consistent with only the *max joint* transformation function, whereas investing in the individual project is consistent with both the *max rel* and the *max own* transformation function. Supporting Hypothesis 1b, which states that joint outcome feedback increases the reliance on the *max joint* transformation function, we found that, in the *comp* game, participants in the joint outcome feedback condition invested significantly more in the group project than did participants in the ranking feedback condition ($U = 33$, $n_1 = 10$, $n_2 = 17$, $Z = -2.6$, $p = .008$); see Figure 3B. They invested more, but not significantly more, than participants in the individualistic condition did ($U = 26$, $n_1 = 8$, $n_2 = 10$, $Z = -1.24$, $p = .36$).

Hypothesis 1c makes a specific prediction for participants in the individualistic feedback condition. In the *coop* game, only investing in the group project is consistent with the *max own* transformation function, whereas in the *comp* game, only investing in the individual project is

consistent with the *max own* transformation function. We found support for Hypothesis 1c: participants in the individualistic feedback condition invested significantly more in the group project in the *coop* game than in the *comp* game ($Z = 2.52$, $N = 8$, $p = .008$, Wilcoxon signed ranks test, exact two-tailed); see Figure 3C [3].

Testing Hypothesis 2

In line with the idea that motivation corresponds to the transformation function applied, we assumed that our manipulation of feedback format would produce differences in participant motivation, in line with observed differences in actions. To test whether participants' actions matched the assumed transformation functions and the corresponding motivations, we first needed to classify participants according to their actions.

We therefore classified participants based on their total contributions to the group project in the two games (following Saijo & Nakamura, 1995). Specifically, participants were either classified as competitive, consistent with a *max rel* transformation function (low contributions in both games), individualistic, consistent with a *max own* transformation function (high contributions in the *coop* game, low contributions in the *comp* game), cooperative, consistent with a *max joint* transformation function (high contributions in both games), or inconsistent (low contributions in the *coop* game, high contributions in the *comp* game). The cutoff for splitting the area was chosen to be 50 percent of possible contributions, with the cutoff point included in the lower category. Only one participant (in the manager sample) showed inconsistent contributions and was excluded from the following analysis. Scatter plots of total contributions to the group project in both games are shown in Figure 4.

[3] Our proposition about ranking feedback leads to expectations about differences between ranking feedback and the other two feedback formats in the *coop* game, and our proposition about joint outcome feedback to a specific expectation about differences between joint outcome feedback and the other two feedback formats in the *comp* game. At the same time, we would not expect differences between the joint outcome and the individualistic feedback condition in the *coop* game, in which both inherent transformation functions result in an ordering of investment options favoring cooperative behavior. Likewise, we would not expect differences between the ranking and the individualistic feedback condition in the *comp* game, in which both inherent transformation functions result in an ordering of investment options favoring competitive behavior. The analysis of differences for these condition pairs can therefore serve as a placebo test that can rule out the alternative explanation that a particular feedback format uniformly affects people's decisions, regardless of the objective goal structure. Indeed, consistent with our predictions, there were no significant differences in contributions to the group project between the joint outcome and individualistic feedback conditions in the *coop* game ($U = 35$, $n_1 = 8$, $n_2 = 10$, $Z = -.46$, $p = .70$) or between the ranking and individualistic feedback conditions in the *comp* game ($U = 63$, $n_1 = 8$, $n_2 = 17$, $Z = -.29$, $p = .80$).

[Insert Figure 4 here]

We found a statistically significant effect of feedback condition (ranking, joint outcome, individualistic) on classification ($\chi^2(4, N = 139) = 29.35, p < .001$, exact two-tailed test), with more competitive behavior in the ranking condition and more cooperative behavior in the joint outcome condition (see Fig. 3D). The groups also differed markedly in their responses to the post-study questionnaire items (see Fig. 5).

[Insert Figure 5 here]

There were no statistically significant differences in the desire for high absolute outcomes, which was strongly endorsed by all three groups. However, the group of players whose behavior was classified as competitive (*max rel* transformation) was the only group with a positive average for the question focusing on receiving more than others, which the cooperative group strongly rejected. At the same time, the competitive group was the only group that strongly endorsed the statement "I wanted to win.", while the cooperative group (*max joint* transformation) endorsed the items relating to responsibility for others, fair distribution and trust. In sum, we found support for Hypothesis 2: Participants' motivations corresponded to their actions, and both were driven by their randomly assigned feedback condition.

Another way of testing Hypothesis 2 is to investigate whether people's competitive/cooperative motivation mediates the effect of the feedback conditions on contribution decisions (the usual caveats for mediation analysis apply). As the mediator, we aggregated eight post-questionnaire items concerning people's competitive and cooperative motivation into a scale (Cronbach's $\alpha = .74$, see section 1.4 in the SM for details). We controlled for participant sample, motivational variables and understanding of the task to rule out potential alternative explanations (all results are robust to the exclusion of these control variables). First, we found support for Hypothesis 1a: ranking feedback increased competitive motivation (indirect effect: $a = .54$, $p = .036$), and thus the reliance on the max-rel transformation function, which ultimately led to lower contributions in the coop game than joint-outcome feedback ($b = -9.94$, $p < .001$; $a \times b = -5.40$, $SE = 3.53$, bias-corrected 95% $CI = [-10.23, -.17]$; $c' = -23.36$, $p = .001$).

Second, we found support for Hypothesis 1b: joint-outcome feedback increased cooperative motivation (indirect effect: $a = -.54$, $p = .036$), and thus the reliance on the max-joint transformation function, which ultimately led to higher contributions in the comp game than ranking feedback ($b = 7.09$, $p < .001$; $a \times b = -3.85$, $SE = 2.21$, bias-corrected 95% $CI = [-9.29, -.57]$; $c' = -16.24$, $p = .044$).

General Discussion

Previous research has focused on how competitive and cooperative behavior can result from two main explanatory factors: different outcome structures in different situations (e.g., Thibaut & Kelley, 1959) and different personality types (e.g., Luchner, Houston, Walker, & Houston, 2011). This study demonstrates that, above and beyond these factors, the format in which feedback is given strongly affects how people—and managers specifically—make sense of the situation they are in, and in turn whether they act competitively, cooperatively, or individualistically. Specifically, ranking feedback, which is often used in organizational settings, prompts people to perceive even situations with cooperative outcome structures as competitive. In turn, they forgo guaranteed financial gains in order to pursue a financially irrelevant higher rank. In other words, the mere presentation of ranking feedback led experienced managers to make costly mistakes.At the other end of the spectrum, in situations with competitive outcome structures, feedback based on the joint group outcome prompts people to behave more cooperatively than people who received ranking feedback.

These findings lend strong support to our theorizing, extending interdependence theory by illuminating the process of *how* transformation functions are selected: For instance, ranking feedback can prompt people to transform objectively cooperative outcome structures into subjectively competitive outcome structures. Moreover, people's reported motivations are consistent with their competitive or cooperative behavior, even when that behavior was driven by the randomly assigned feedback format. The type of feedback people receive thus systematically affects whether they make sense of their situation as competitive or cooperative. We were able to rule out alternative explanations based on uniform effects of feedback structures or based on confusion of participants.

Relative Feedback and Forced Ranking in Organizations

If feedback structure affects how recipients make sense of the situation and ultimately whether they act competitively or cooperatively, it has important consequences for both individual and organizational performance. Organizations frequently provide feedback to their employees (e.g., Ashford, 1993)—after completion of a project, for example, or in regular annual appraisals (Cederblom, 1982).

One widespread organizational practice is to present performance feedback in relative terms (Song, Tucker, Murrell, & Vinson, 2017), as a ranking among peers (Duffy & Webber, 1974). This institutionalizes social comparisons with other employees (Greenberg, Ashton-James, & Ashkanasy, 2007). Relative feedback is at the heart of one of the "most controversial management practices today": "forced ranking" (R. C. Grote, 2005) or "stack ranking" (Kantor & Streitfeld, 2015) as practiced by Facebook (Rodriguez, 2019). Forced ranking involves the sorting of employees into a small number of fixed-size ordinal categories based on their performance as judged by their supervisors on a yearly basis. Being classified in the bottom category has severe consequences—many of these employees are laid off (sometimes after a warning period), which explains the pejorative name for the procedure: "rank and yank." The practice was championed by Jack Welch as CEO of GE (Dominick, 2009) and motivated by the goals of raising the performance bar (D. Grote, 2002), avoiding inflation of positive evaluations and improving rating validity (Colvin, 2013; Goffin, Jelley, Powell, & Johnston, 2009), isolating evaluations from market conditions and seasonal effects (Wagner & Goffin, 1997) and cultivating "a climate of meritocracy" (Scullen, Bergey, & Aiman-Smith, 2005).

Although used at some point and in some form by many of the Fortune 500 companies, the practice remains controversial both among academics (R. C. Grote, 2005; Pfeffer & Sutton, 2006) and practitioners (Eichenwald, 2012; Hill, 2012; Welch, 2013). Commenting on the fact that Yahoo introduced the system (under the name "QPR", Carlson, 2015) at about the same time that Microsoft abandoned it (Feloni & Gillett, 2016; Yeh, 2015), Nisen (2015) concluded that "it looks like Microsoft is on the right side of history, and Yahoo is still in the stone age!" More generally, since the start of the millennium, companies have increasingly moved away

from forced ranking (Brustein, 2013; Buckingham & Goodall, 2015). Forced ranking has been found to undermine collaboration (Dominick, 2009) and to spread destructive competition within organizations. The environment created by forced ranking has been characterized as making teamwork impossible (Hazels & Sasse, 2008; Myers, 2002) while leading to defensive decision-making and avoidance of risk-taking (Hazels & Sasse, 2008), increased impression management (Huang, Zhao, Niu, Ashford, & Lee, 2013), "backstabbing" (Brustein, 2013), as well as fear and increased selfishness (Lawler, 2003). Organizations with a high degree of competitiveness suffer from negative impacts on organizational learning (Argyris, 1976; Rodriguez, 2019; Tjosvold et al., 2004) and productivity (Pfeffer & Sutton, 2006).

Unlike observations in companies, our paradigm allows to study the effect of feedback cleanly separated from potential confounds that alter the objective outcome structures (e.g., salaries and bonuses) and differences in ability. Our results are thus highly informative for the discussion on forced ranking, as we show that even in the absence of any change in the objective outcome structure, receiving ranking feedback prompts some people to value relative performance over absolute performance, and ultimately results in destructive competition.

Limitations and Future Research

Allowing participants to make costly investments into different projects is a stylized way to make participants' actions clearly competitive or cooperative, while excluding any ambiguity or uncertainty. Of course, in organizational contexts people can select among a wider variety of actions, and these actions often affect multiple and potentially contradictory goals at the same time (M. D. Johnson et al., 2006; Keller, Loewenstein, & Yan, 2017; Tjosvold, 1986). However, as situations and mappings between actions and outcomes increase in complexity, we would expect people to use feedback information to an even larger extent to make sense of these situations. In consequence, we see the effects emerging from our simple experimental paradigm as a conservative estimate of what could happen in more complex and ambiguous real-world situations. Nevertheless, future research using, for instance, field data on cooperative and competitive actions in different organizational contexts would further strengthen the generalizability of our theorizing.

Further, future research might benefit from diving deeper into investigating the dynamics

of interactions. Observed discrepancies between ones own and the groups behavior could lead to a shift in subjective transformation functions. This would go beyond the mere imitation of successful others (Apesteguia, Huck, & Oechssler, 2007; Burton-Chellew & West, 2013; Villena & Zecchetto, 2011, (masked for peer review)). Such future research might further examine, to which degree the observation of conditional cooperation (Charness & Rabin, 2002; Fischbacher et al., 2001; Fischbacher & Gächter, 2010) can be explained by a re-interpretation of the interdependence structure, and how feedback impacts those with strong and weak tendencies to reciprocate.

While we present evidence for shifts in stated motivations after the game, this does not imply that the games induced enduring changes in social value orientation and dispositional motives. We have focused on features of the situation, namely feedback variants, and their effect on behavior and motivation. Motivation and action are the product of an interaction between personal and situational variables (Heckhausen & Heckhausen, 2018), and different feedback formats might lead to different behaviors dependent on the dispositional motives of the feedback recipient. We present some evidence supporting this idea in the SM, by considering first-round behavior as a proxy for dispositional social motives. A more systematic way to investigate this interaction would require the independent measurement of dispositional social motives (e.g., social value orientation, Murphy & Ackermann, 2014) and a manipulation of group compositions in terms of the dispositional motives of its members.

Another opportunity for future research would be to combine feedback interventions with a framing manipulation of the decision situations. For example, both Andreoni (1995) and Willinger and Ziegelmeyer (1999) found in two different public good games that an emphasis on contributions to a public project as support for others increased contributions substantively from the first to the last round compared to a framing that emphasized the negative public consequences of investing in a private project. Brewer and Kramer (1986) found that framing the same game structure as a common resource dilemma increased restraint relative to a public-good framing with an added effect of emphasizing the group level versus the individual level. Our feedback conditions kept the description of the games constant; it would be interesting to explore whether and how different framings of the games would change

subjective transformations and the effect of feedback.

Conclusion

In this article, we examined the role of feedback format in driving competitive and cooperative actions. Feedback containing ranking information drove group members to sacrifice guaranteed financial gains in order to attain higher ranks, even when anonymity eliminated any reputational incentives. Thus, whereas previous research emphasized the role of objective situational outcome structures and individual dispositions in social motivations, we showed that the format of feedback alone can be sufficient to drive competitive and cooperative behavior. Our conclusion is that both managers in organizations and researchers in the laboratory should be mindful in their choice of feedback formats and consider what feedback formats implicitly communicate to the recipient.

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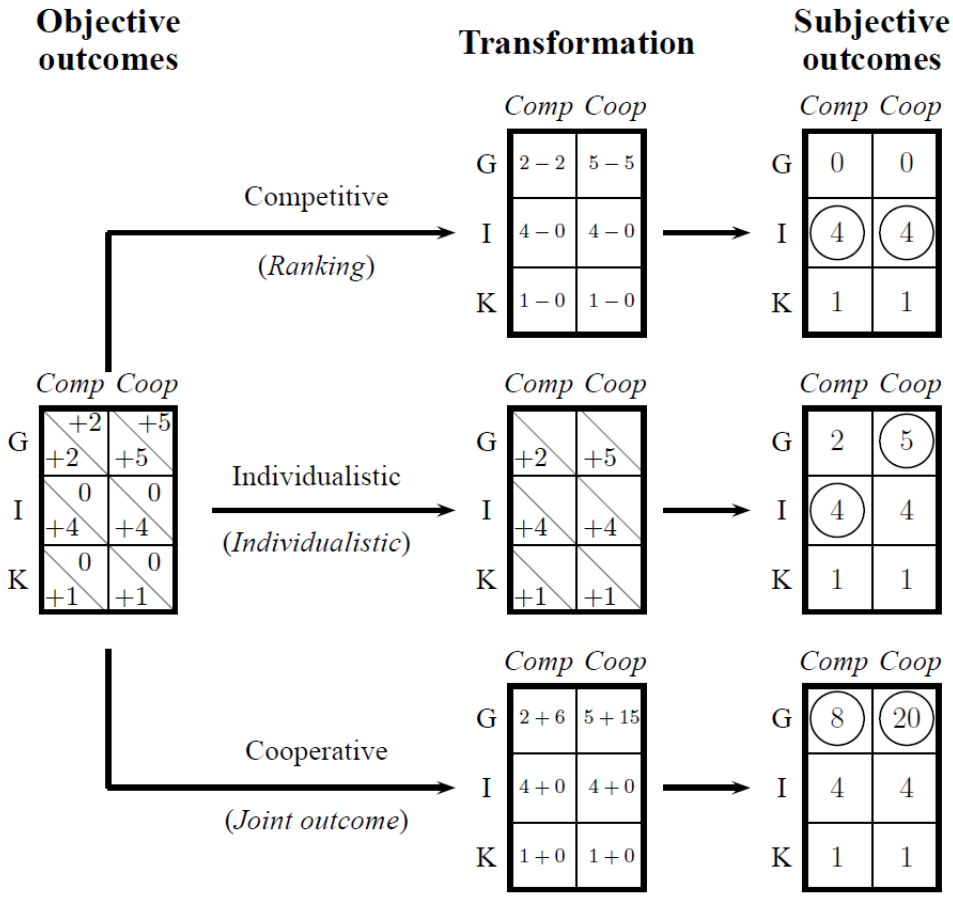
FIGURE 1

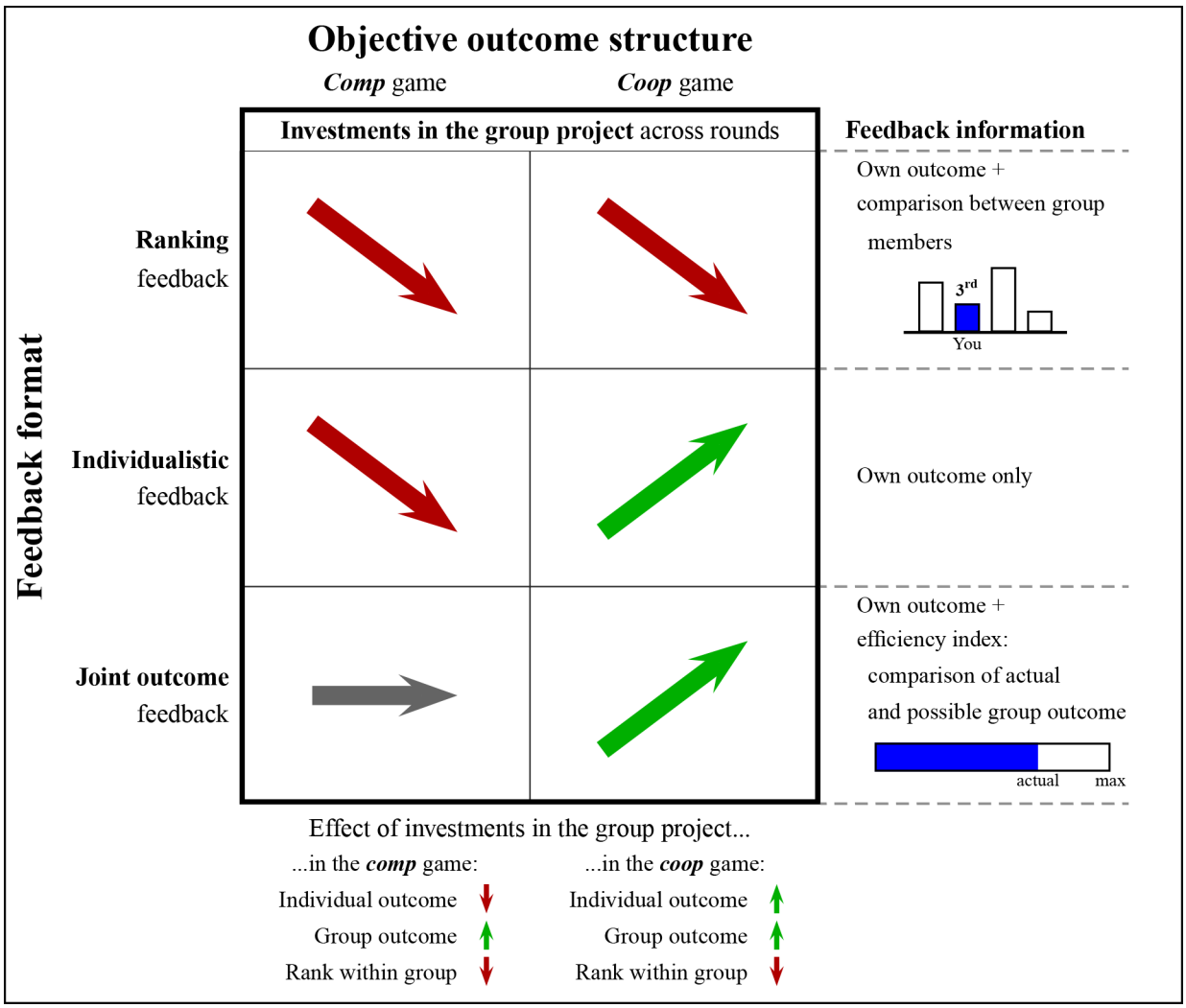
Objective and subjectively evaluated outcomes after different transformations



Note: Objective outcomes for the three investment options (G for group project, I for individual project, and K for keep) and subjectively evaluated outcomes after transformations corresponding to competitive orientation and ranking feedback (*max rel*), individualistic orientation and individualistic feedback (*max own*), and cooperative orientation and joint outcome feedback (*max joint*). The *max rel* transformation subtracts the average outcome of other group members from the personal outcome, the *max own* transformation ignores the group members' outcomes, and the *max joint* transformation adds them to the personal outcome (e.g., in the *coop* game: $5 + 3 \times 5 = 20$). The investments maximizing subjective outcomes after each transformation in the *comp* game and the *coop* game, respectively, are circled.

FIGURE 2

Summary of experimental design and result



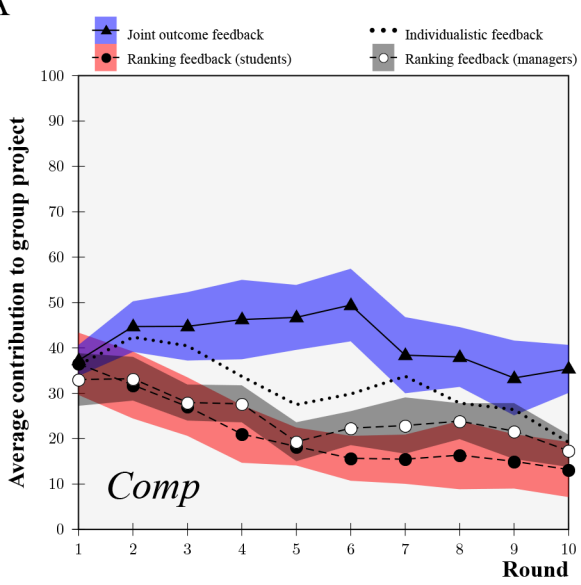
Note: Large arrows summarize the observed change in group investments across rounds in each of the two games in each of the three feedback conditions. Small arrows demonstrate the objective impact of investments in the group projects on individual outcomes, group outcomes and the investing group member's ranking within the group.

FIGURE 3

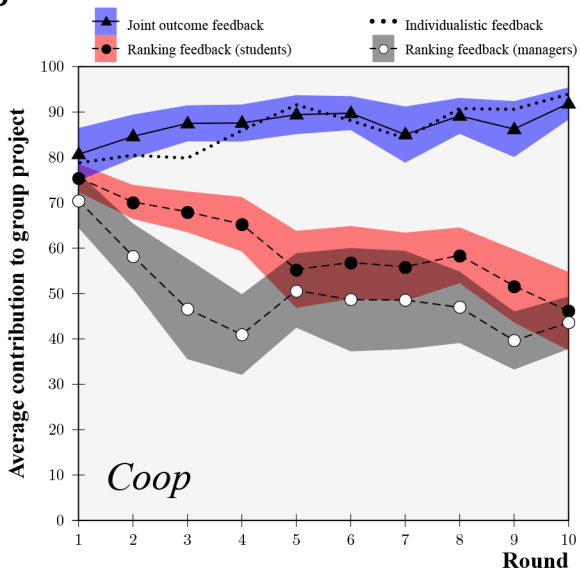
Contributions to the group project across rounds

Note: **(A)** Average contribution to the group project in *coop* games with ranking and joint outcome feedback for students ($n = 10$ groups per condition) and managers ($n = 7$ groups, ranking feedback only). The shaded areas (above and below the lines) represent one standard error (based on group means). **(B)** Average contributions to the group project in *comp* games with ranking and joint outcome feedback for students ($n = 10$ groups per condition) and managers ($n = 7$ groups, ranking feedback only). **(C)** Average contributions to the group project in *coop* and *comp* games with individualistic feedback ($n = 8$ groups). **(D)** Relative percentage of participants classified as cooperative (high contributions in both games) and competitive (low contributions in both games) across all conditions.

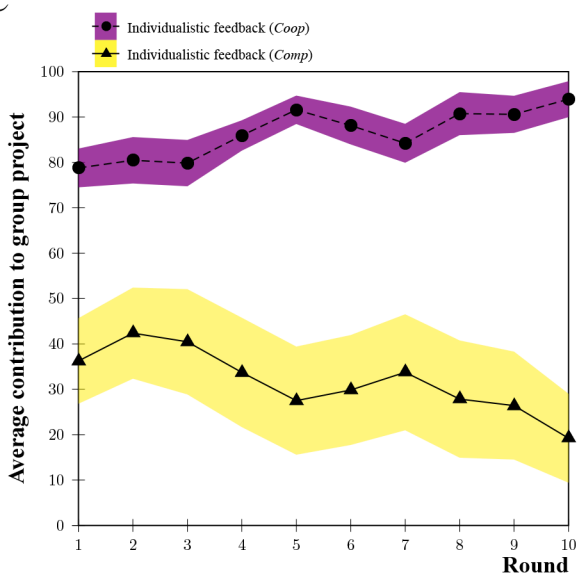
A


Joint outcome feedback
Individualistic feedback
Ranking feedback (students)
Ranking feedback (managers)
Average contribution to group project
Comp
Round

B


Joint outcome feedback
Individualistic feedback
Ranking feedback (students)
Ranking feedback (managers)
Average contribution to group project
Coop
Round

C


Individualistic feedback (Coop)
Individualistic feedback (Comp)
Average contribution to group project
Round

D

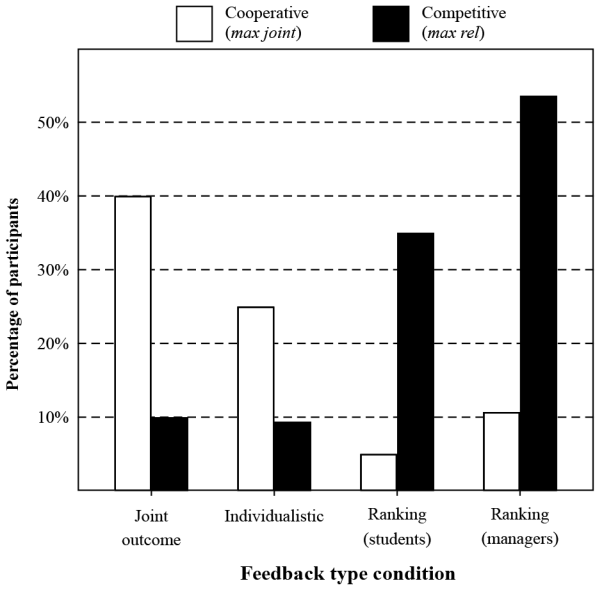
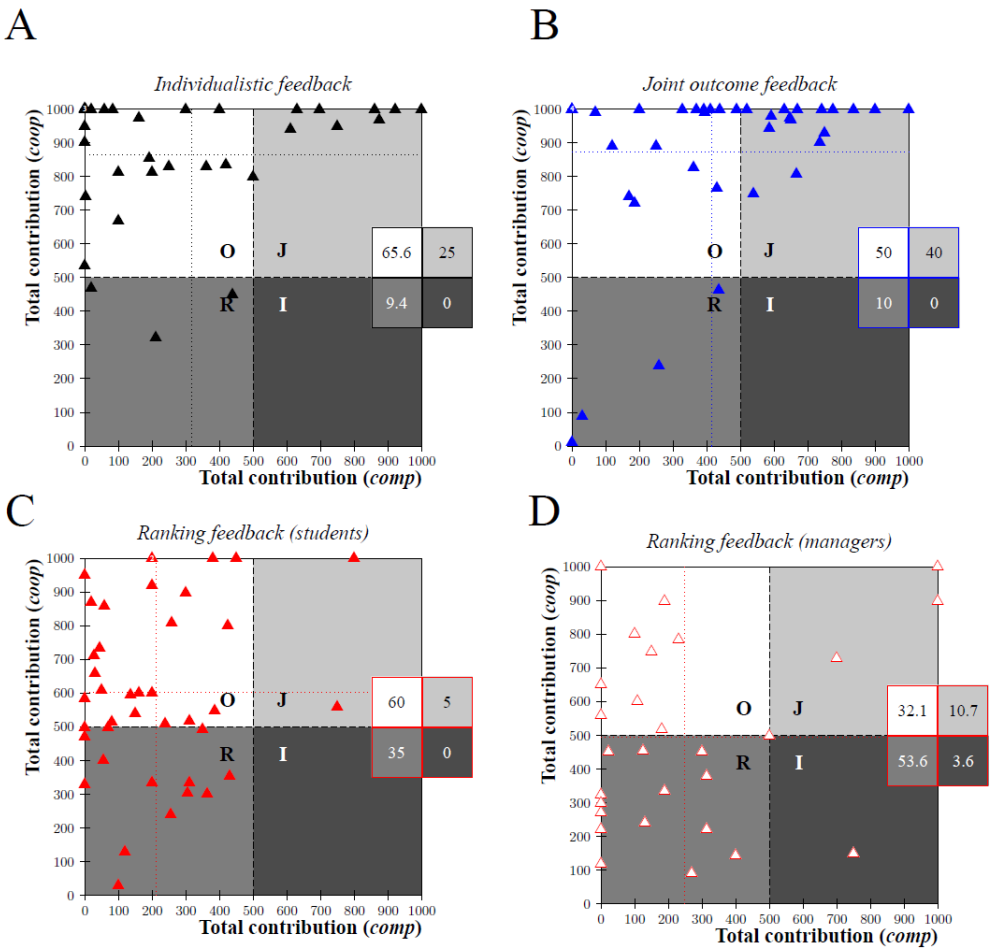

Cooperative (max joint)
Competitive (max rel)
Percentage of participants
Joint outcome
Individualistic
Ranking (students)
Ranking (managers)
Feedback type condition

FIGURE 4

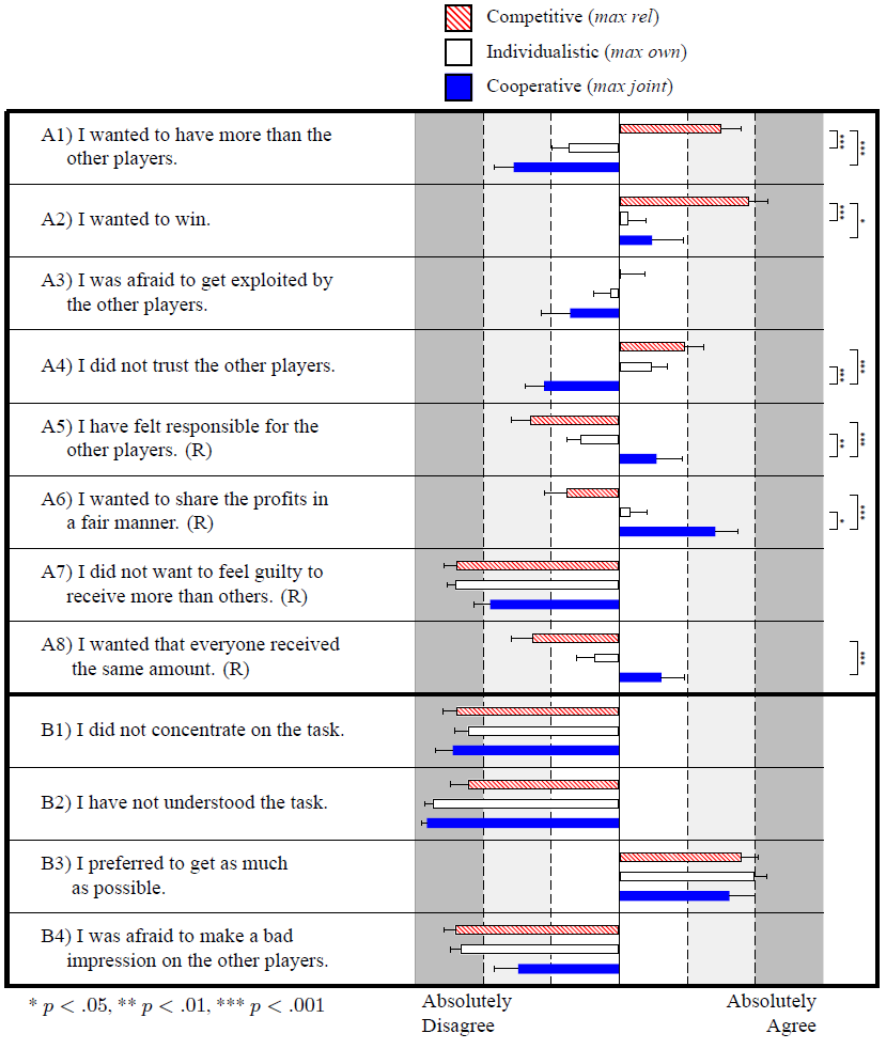
Total contributions to the group project



Note: Triangles in the scatter plots depict total contributions to the group project in *comp* games (x-axis) vs. *coop* games (y-axis) for each participant. Tables summarize the relative percentage of observations in the quadrants corresponding to transformation functions maximizing own outcomes (*O*, individualistic, upper left), joint outcomes (*J*, cooperative, upper right), relative outcomes (*R*, competitive, lower left), and inconsistent responses (*I*, lower right). Separate scatter plots are shown for (A) the individualistic feedback condition ($n = 32$), (B) the joint outcome feedback condition ($n = 40$), (C) the ranking feedback condition for students ($n = 40$), and (D) the ranking feedback condition for managers ($n = 28$).

FIGURE 5

Post-study questionnaire and comparison of the three behavioral groups' answers



Note: Bars correspond to mean item responses for the three behavioral groups, whiskers denote standard errors based on individuals. Pairwise significant differences (Bonferroni-corrected post hoc tests were conducted only for variables that exhibited significant main effects for feedback condition after Bonferroni correction for 12 tests) are marked by braces. Items A1 to A8 measure the degree of competitive motivation (A5 to A8 were reverse coded). Items B1 to B4 measure alternative explanatory variables.