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Feedback information type and team identity for reducing free-riding behaviours: An experimental study

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ABSTRACT

Within a work team, the type of feedback information can reduce free-riding behaviours due to framing effects. Regardless of whether aggregate feedback pushes a group frame, detailed feedback in which peer information is displayed can push an individual frame. Nevertheless, detailed feedback also facilitates a learning effect, which can influence an agentt's behaviour. The question is whether the effects of the type of feedback vary depending on team characteristics. We examined how team feedback information type interacts with team identity to influence free-riding behaviour, recognising that team identity reduces free-riding behaviours. In an iterated prisoners dilemma situation, two types of feedback were manipulated: aggregate feedback (no individual peer information displayed) and detailed feedback (peer contribution and earnings information displayed). Our results showed that when agents received aggregate feedback, free-riding behaviours decreased only in strong-identity teams. Detailed feedback is dangerous because free-riding behaviours increase due to greed responses in strong-identity teams. Moreover, when detailed feedback was displayed, fear grew not only in weak-identity teams but also in strong-identity teams. The type of feedback did not change the level of free-riding behaviour in weak-identity teams, which is important. The relationship between feedback type and team features, which affects free-riding behaviour, is highlighted in this study.

Tipo de información de retroalimentación e identidad del equipo para reducir comportamientos de polizón: Un estudio experimental

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RESUMEN

Dentro de un equipo de trabajo, el tipo de información de retroalimentación puede reducir los comportamientos de polizón debido a los efectos de encuadre. Independientemente de si la retroalimentación agregada promueve un encuadre grupal, la retroalimentación detallada en la que se muestra la información de los compañeros puede promover un encuadre individual. No obstante, la retroalimentación detallada también facilita un efecto de aprendizaje, lo que puede influir en el comportamiento de un agente. La pregunta es si los efectos del tipo de retroalimentación varían según las características del equipo. Este trabajo examina cómo el tipo de información de retroalimentación del equipo interactúa con la identidad del equipo para influir en el comportamiento de polizón, reconociendo que la identidad del equipo reduce estos comportamientos. En una situación de dilema del prisionero iterado, se manipularon dos tipos de retroalimentación: retroalimentación agregada (sin mostrar información individual de los compañeros) y retroalimentación detallada (se muestra la información de contribuciones y ganancias de los compañeros). Nuestros resultados mostraron que cuando los agentes recibieron retroalimentación agregada, los comportamientos de polizón disminuyeron solo en los equipos con identidad fuerte. La retroalimentación detallada es peligrosa porque los comportamientos de polizón aumentan debido a respuestas de codicia en los equipos con identidad fuerte. Además, cuando se mostró retroalimentación detallada, el miedo aumentó no solo en los equipos con identidad débil, sino también en los equipos con identidad fuerte. El tipo de retroalimentación no cambió el nivel de comportamiento de polizón en los equipos con identidad débil, lo cual es importante. Este estudio destaca la relación entre el tipo de retroalimentación y las características del equipo, que afecta el comportamiento de polizón.

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1. Introduction

Avoiding self-interested and free-riding behaviours is key for groups to function effectively in organisations over time. Free riding arises when work team members benefit from a team's output without contributing their own share of inputs (Kerr, 1983; Rowe, 2004). Team feedback information can reduce free-riding behaviours due to framing effects. Aggregate feedback pushes a group frame, while detailed feedback, where individual peer information is displayed, pushes an individual frame (Cookson, 2000; Rowe, 2004; Rowe et al., 2008). Detailed feedback that facilitates peer contribution information can also have a learning effect, as the agent can follow peer decisions (Nikiforakis, 2010; van Lange, Joireman, Parks, and van Dijk, 2013). The question is whether the strength of the type of feedback for reducing free-riding behaviours due to framing and learning effects depends on other teamwork factors (Rowe, 2004; Towry, 2003). A major factor that also contributes to reducing free-riding behaviours is team identity (Han, Bai, and Peng, 2022; Tajfel and Turner, 1986; van Dick, Tissington, and Hertel, 2009). However, the mechanisms that possibly interact with team identity have not been well documented (Benistant and Villeval, 2019; Dunne, 2018; van Dick et al., 2009). The objective of the present work was to determine whether the effectiveness of designing team-level feedback information for reducing free-riding behaviours depends on the level of team identity.

The type of information displayed in a feedback report could frame the team context in different ways (Brown, Fisher, Sooy, and Sprinkle, 2014; Nikiforakis, 2010). Some authors point out the benefits of presenting accounting information at the aggregate level, that is, "the absence of boundaries between individuals evokes a group frame ("we") and cooperative group interested behaviour" (Rowe, Birnberg, and Shields, 2008, p.168). In contrast, accounting information that displays "boundaries between individuals evoke an individual frame ("I") and competitive self-interested behaviour" (Rowe et al., 2008, p.168). By sharing information on team member contributions, detailed feedback can facilitate information or learning effects. Contribution information is expected to increase cooperation and decrease free-riding behaviour due to reciprocity effects. (For a review, see van Lange et al., 2013). In sum, it is suggested that feedback type—aggregate vs. detailed with individual information—can affect an agentt's behaviour and cooperation (Rowe, 2004; Rowe et al., 2008).

On the other hand, dynamic interaction processes predominate in teams within organisations (Coletti, Sedatole, and Towry, 2005). In fact, Towry (2003) demonstrated that the design of team-level compensation systems influences free-riding behaviours by interacting with team identity. The major role that team identity plays in how well teams and organisations function is supported by previous research (Blazovich, 2013; Han et al., 2022; Tajfel, 1978; Tajfel and Turner, 1986; van Dick et al., 2009). Currently, many companies are using different management tactics to create and sustain team identity (FLL, 2018; Pinciroli, 2019; Sajko, 2022); for example, "Many companies have also started using team nicknames to elevate their employer branding and encapture team spirit (e.g., Amazonians, Zappoians, Toasters, Tweeps, Pinloyees, Googlers, etc.)" (Sajko, 2022). Team identity is important for team functioning because it increases commitment, cooperation, and team spirit as well as reduces free-riding behaviours. Nevertheless, a specific line of research warns about the interconnection between management control tools and team identity for reducing free-riding behaviours (Hughes and Terrell, 2012; Towry, 2003; van Dick et al., 2009).

The question we addressed is whether the feedback type's effects on reducing free-riding behaviours depend on the level of team identity. We were also interested in understanding how the design of feedback information could alter team identity effects based on the studies by Simpson (2006) and Yamagishi and Mifune (2008). Similarly, Simpson (2006) found that team identity affects free-riding behaviour by reducing greed responses. However, team identity was not found to alter the fear component in a prisoner's dilemma game (PDG)[1,2].

Using an iterated prisoner's dilemma (IPD) context, we conducted a 2x2 (between-subjects) experiment through a task that encompassed 30 periods. The participants were randomly assigned to three-person teams. Each participant kept the same partners throughout the experimental session, and all participants remained anonymous. We manipulated the feedback information (detailed, where peer contribution and earnings information were displayed vs. aggregate, where no peer information was displayed) and the level of team identity (strong vs. weak). After deciding, participants received feedback over each period (either detailed or aggregate). We found that in comparison to detailed feedback, aggregate feedback decreases free-riding behaviours but only in strong-identity teams due to a decrease in greed responses. No effects of the type of feedback were found for weak-identity teams, except for fear responses. Despite reducing fear responses, free-riding behaviours were still present in weak-identity teams.

The present work makes several significant contributions. First, our research contributes to feedback research (Coletti et al., 2005; Kelly and Tan, 2010), raising awareness about counterproductive team-level effects. Information or learning effects can cause detailed feedback to reduce free-riding behaviours, but our findings suggest that the framing effect of aggregate feedback could be more powerful (Nikiforakis, 2010; Rowe, 2004). Second, our research emphasises the importance of examining the interplay between accounting and team characteristics (Rowe, 2004; Towry, 2003). Our results showed that free-riding behaviours do not differ within weak-identity teams due to feedback type. Nevertheless, the positive framing effect of aggregate feedback could be maintained in strong-identity teams. Organisations should be careful with detailed feedback from strong team-identity teams in the sense that the effects of team identity may lose strength (Benistant and Villeval, 2019; Dunne, 2018). Third, we contribute to the discussion on why team identity reduces free-riding behaviours. Although Simpson (2006) suggested that team identity affects free-riding behaviours only through reduced greed responses, our results showed that this is not always the case: it depends on the design of the feedback information. Detailed feedback affected greed and fear responses in strong-identity teams.

The remainder of this paper is organised as follows: the study hypotheses are set out in the next section; the third section outlines the design of the experiment; the results are presented in the fourth section; and finally, we finish with a discussion of the study findings and limitations.

[1]The PDG model captures two free-riding motivations: greed and fear (Thye and Lawler, 2009). The greed component represents the temptation to free ride on the cooperation of others, while the fear component corresponds to the temptation to free ride to avoid being exploited by a noncooperative other (Simpson, 2006; Thye and Lawler, 2009; Yamagishi and Mifune, 2008).

[2]The PDG represents the many relationships that exist within organisations, as well as among organisations, such as joint ventures (Arend, 2005).

2. Theoretical Background and Hypothesis Development

2.1. Theoretical Background

A teamwork context in which agents are rewarded based on team performance represents a social dilemma, that is, a situation in which "the rational pursuit of self-interest can result in collective disaster" (Kerr, 1983, p. 819). Free-riding is a mechanism that reduces cooperation in social dilemma situations since individuals obtain benefits from their team members' work and, therefore, rationally benefit from not contributing to the team's goals[3] (Kerr, 1983). Given the negative effects of free-riding behaviours on team functioning and performance, organisations are searching for mechanisms to override these kinds of behaviours.

Feedback is a type of management control tool that facilitates peer information. Previous studies have shown that the type of feedback has a significant impact on team behaviour and can create a team frame (Nikiforakis, 2010; Rowe et al., 2008). A framing effect appears when different ways of presenting the same information change people's choices, even though the underlying information and choice options remain essentially the same (Cookson, 2000). Therefore, based on framing theory, decision-making begins with a categorisation process (Bacharach, 1997; Cookson, 2000). Thus, the agent asks, "What kind of situation is this?" (March and Heath, 1994, p. 58). The study by Rowe (2004) focused on how management accounting information is designed to frame a teamwork context. Rowe (2004) analysed whether displaying (ex ante) individual-level accounting information in a social dilemma context increased agent contributions compared to group-level information. The group-level information aggregated the team members' information. Therefore, this study suggested that aggregating information at the group level, as opposed to the individual level, would push a group frame. The study by Rowe (2004) focused on the design of ex ante[4] information for influencing team members' behaviour, while the current study focused on ex post information.

Focusing on ex post information, feedback information can produce not only a frame effect but also an informational or learning effect. An agent can learn about a peer's behaviour if the feedback provides individual information[5]. In this vein, Nikiforakis (2010) found interesting results. Displaying detailed feedback information about peers' contributions increased team cooperation more than providing feedback about peers' contributions and earnings[6]. Nikiforakis (2010) suggested that earnings information (even combined with contribution information) makes individual benefits salient (Brown et al., 2014); that is, it produces an individual frame. Despite these results (focused on feedback at the team level but where different peer information was displayed), no previous studies have analysed whether aggregate feedback (which pushes a group frame) is more powerful than detailed feedback (which pushes an individual frame but also a learning effect) for decreasing free-riding behaviours over time.

The results of the study by Rowe (2004) are comparable to those of the current study. Although this study focused on ex ante information, the results failed to show that the design of accounting information (group vs. individual frame) affected agent decisions and was determined by the team context, i.e., by whether the agents worked in distributed or face-to-face teams. Rowe (2004) found that the design of management accounting information only had an impact on face-to-face teams. The findings of Rowe (2004) showed that the design of control information can be counterproductive in certain teamwork settings. "Some combinations of accounting and team structures convey mixed cues about the situation" (Rowe, 2004, p. 1159). An important feature of teamwork setting is the degree of team identity (Towry, 2003; Rowe, 2004). Team identity is a social identity[7] that reflects the extent to which individuals perceive a sense of oneness with a particular group (Huettermann, Doering, and Boerner, 2017; Somech, Desivilya, and Lidogoster, 2009; van Dick et al., 2009). Based on this rationale, a consensus has been reached on the negative effect of team identity on free-riding behaviours (i.e., a decrease in the level of free-riding), even in experimentally created groups (Haslam, 2001; Simpson, 2006). Importantly, previous research shows that the design of management control tools impacts team behaviour depending on the level of team identity (Rowe, 2004; Towry, 2003). Towry (2003) analysed how incentives and team identity interact in influencing agent decision-making. This author examined how two different compensation plans affected strong-identity teams differently. Although both plans presented the same economic equilibrium, one plan made the collaborative context salient (horizontal plan), while the other made the individual context salient (e.g., the plan rewarded team members for informing the employer about one another). The results showed that strong-identity teams lead to more free-riding behaviours under the vertical than under the horizontal plan.

In summary, previous research has set out two notable premises for the present study. First, feedback type can produce two effects at the team level a framing effect and a learning effect, and depending on the design, free-riding behaviour can be reduced or increased by both effects. Second, the design of feedback information can have an impact on agent decision-making by interacting with team identity.

2.2. Hypothesis Development

In the present study, we analyse how the design of team feedback information influences free-riding behaviours in an IPD context. Two types of feedback were compared: one emphasising a team frame (the aggregate feedback that displays only inseparable measures; see Rowe et al., 2008) and the other emphasising an individual frame (the detailed feedback; see Nikiforakis, 2010) (the framing effect). In this setting, the aggregate feedback information allows the agent to infer whether there is peer free-riding but not how many peers free ride; that is, detailed feedback provides more pre-

[3] Free riding is different from social loafing. Social loafing is a reduction in effort because no single person is responsible for the team outcome (Kerr, 1983).

[4] The terms ex ante and ex post refer to the information displayed before making the decision or performing the task, or after, respectively.

[5] Contribution information is expected to increase cooperation and decrease free-riding behaviour due to reciprocity effects. (For a review, see van Lange et al., 2013).

[6] Adding earnings information to the feedback report maintains the reciprocity effects constant because from this viewpoint, the information is equivalent for the agents (Nikiforakis, 2010).

[7] Free riding is influenced by a team members' identification with his or her team. The notion of the distinction between individual and social identity belong to self-categorisation theory (SCT) (Hogg and Turner, 1987; Turner and Reynolds, 2001). SCT posits that an agent's behaviour can be represented on a continuum from individual behaviour (i.e., deriving from the character and the motivations of the individual alone) to intergroup behaviour (i.e., deriving from the person's membership of a group). According to SCT, the agents' self-perception as "we" rather than "I", "(...) is a shared cognitive representation of a collective entity which exists reflexively in the minds of individual group members" (Turner and Reynolds, 2001, p. 136).

cise information than aggregate feedback (the learning effect).

We sought to understand whether the team frame of the aggregate feedback would be lost if the level of team identity was weak and whether the team frame would survive when the level of team identity was strong. We also sought to understand how the type of feedback would alter the effect of team identity on free-riding behaviours due to greed or fear responses (Simpson, 2006).

Framing effect

On the one hand, in cases where agents received aggregate feedback and strongly identified with the team category (i.e., in the case of strong-identity teams), we expected that agents avoid free riding, considering that both the feedback type and the group identity pushed a team frame (Huettermann et al., 2017; Somech et al., 2009; van Dick et al., 2009). In line with Simpson (2006), we also expected that this effect would be based on reduced greed responses. In a social dilemma situation, greed is the temptation to free ride when team members cooperate, while fear is the temptation to free ride to avoid being exploited by noncooperative peers (Simpson, 2006, Thye and Lawler, 2009; Yamagishi and Mifune, 2008). Simpson (2006) analysed whether social identity reduces greed or fear responses and showed that it only had an effect on the greed component of the social dilemma[8].

The question was whether receiving detailed feedback would alter this tendency in strong-identity teams. First, in the presence of detailed feedback, the individual frame would dominate the group frame, so the detailed and earnings information would act as a cue and frame the situation at the individual level. In such a case, team identity effects would be weaker due to the salience of the individual category as opposed to that of the team category (van Dick et al., 2009). Negative effects could be expected from detailed feedback if the individual frame was salient. Therefore, agents in strong-identity teams increase their greed responses, increasing free-riding behaviours.

On the other hand, we expected that agents who weakly identified with their teams (i.e., in the case of weak-identity teams) would tend to free ride rather than cooperate. Following Simpson (2006), we anticipated that free-riding behaviour in weak-identity teams would increase as a result of the greed responses of team members. Considering that this agent's rational tendency was already to free ride, we expected that aggregate feedback compared to detailed feedback would fail to alter the agent's behaviour. The team frame (pushed by the aggregate feedback) will be lost if the identity is weak (which activates an individual frame). The combination of contribution and earnings information at the individual level was evaluated as an individual frame; therefore, it did not alter team members' behaviour. Thus, the type of feedback could have a weaker, or null, effect on free-riding behaviours in weak-identity teams than in strong-identity teams.

The learning effect

In our setting, feedback information, either detailed or aggregated, allowed the agent to infer whether there were free-riding behaviours on their team. However, detailed feedback is more informative than aggregate feedback because the agent is aware of how many peers are free-riding. Team members' behaviour changes over time compared to when peers receive aggregate feedback if detailed feedback facilitates information about how many peers are free-riding (i.e., we predicted a form of contagion). Moreover, we argue below that this effect would expand over time and remain more dangerous in strong-identity than in weak-identity teams because of unmet expectations (Dunne, 2018).

Unmet expectations occur when "there is a discrepancy between what an individual expects to encounter and how an encounter is actually experienced" (Dunne, 2018, p. 598). At an organisational level, when an organisation fails to meet employee expectations, it negatively influences employee attitudes and, therefore, employee behaviour (e.g., low satisfaction, low trust, low commitment, higher turnover rate). At the team level, when a peer fails to meet an agentt's expectations, the agent will be less satisfied with and less committed to the violator (i.e., the peer who violates the group norm) and is more likely to leave the relationship. Therefore, not meeting expectations influences the attitudes and behaviours expressed towards individuals who fail to meet expectations.

Based on unmet expectations, we believe that because of team identification, strong-identity team members have more positive expectations regarding peer behaviour than do weak-identity team members. In such cases, consistent with Dunne (2018), we also suggested that over given periods, unmet expectations relating to peer behaviour would have a greater negative impact on strong-identity than on weak-identity teams. The results of Dunne (2018) showed that attitudes towards ingroup members who violated group norms were more negative than attitudes towards outgroup members who violated group norms.

In line with the above rationale, we advance two arguments. First, an unmet expectation in a group context is a situation where peers decide to free ride rather than cooperate. The rational response in this situation was to also free ride to avoid being exploited by peers, i.e., out of fear (Simpson 2006; van Lange et al., 2013). Therefore, we anticipated that detailed feedback would lead to an increase in fear responses compared to aggregate feedback, as it would facilitate the sharing of information about the number of free-riding peers. Second, considering that detailed feedback represents an individual frame that dominates the group frame and that expectations are greater in strong-identity than in weak-identity teams, we expected those negative, fear-based responses to differ according to the level of team identity. In sum, based on the arguments of the framing effect and the learning effects, we propose the following hypothesis:

> ***H1:*** *Aggregate feedback – as opposed to detailed feedback – will decrease free-riding behaviours more in strong-identity than in weak-identity teams.*

3. Experimental Design[9]

3.1. Experimental Procedures and Task Description

To test our hypotheses, we designed a 2 x 2 experiment (between-subjects) in which the feedback information type and the level of team identity were the independent variables. The task encompassed 30 periods, and each period was a within-subjects factor. A total of 144 graduate students par-

[8] Assuming the fact that "when social identity is salient, ego is motivated by two goals: maximisation of group outcomes and minimisation of ingroup inequalities" (Simpson, 2006, p. 451), it is only cooperation in the greed component of a social dilemma that drives the agent to achieve both goals.

[9] The experiment was approved by the Research Ethics Committee of the University.

ticipated in the experiment: 45.83 percent were male and 54.17 percent female. A total of 48 teams participated in the task[10]. Participants were assigned to a three-person team. Each participant kept the same partners throughout the experimental session[11], and all participants remained anonymous. Peers could not communicate with each other during the task and sat in distinct areas.

Experimental sessions were conducted in a laboratory and lasted approximately 60 minutes. Separate sessions were conducted in the different conditions. Instructions were read aloud to all participants and then distributed individually to each. The same written instructions were used in all four experimental conditions in order to avoid any framing effects of ex-ante information. Participants were required to score 100 percent on a computerised pre-experiment quiz before beginning the actual experiment (see Appendix A). The task was a prisoner's dilemma game and was adapted to three-person teams. The experimental task was designed using Z-Tree software (Fischbacher, 2007).

In the IPD, three participants assumed the role of unit-manager of the same company. The company asked them to work together on a team project and to achieve the highest level of team performance[12]. Team performance was an increasing function of the unit-managert's contribution to the team project. Managers had only two options: to invest a small amount of resources (with a cost of 0 points), or to invest a large amount of resources (with a cost of 15 points). Team performance was an increased function of the contributed units and was equally shared among managers. If the three managers invested a small amount of resources, the team's performance was 15 points (low team performance) (5 points per manager). If the three managers invested a large amount of resources, the team performance was 75 points (high team performance) (10 points per manager: 75/3 minus 15 of costs). For any other option, the team performance was 45 points (medium team performance) (this means that the manager who had chosen a small amount of resources would receive 15 points: 45/3 minus 0 of costs; and the manager who had chosen a large amount of resources would receive 0 points: 45/3 minus 15 of costs). All participants had this information both on screen and in their written instructions. The computerised pre-experiment quiz (see Appendix A) helped us to ensure that all participants understood the relationship between team performance and their contributions and the costs of each decision. Table 1 represents the managers' payoff matrix[13].

Table 1. Individual payoff matrix (points)

Focal individual contribution*	Sum of contributions of the other two managers*		
	0	1	2
0	5	15	15
1	0	0	10

* A small amount of resources is represented by a "0" contribution; a large amount of resources is represented by a "1" contribution.

Table 1 shows the one-shot prisoner's dilemma situation, where rational behaviour would lead to a Nash equilibrium (in an IPD where agents also know the number of times they will play the game (Gold and Sugden, 2007)). The participantst' payoff depended on the individual payoff over each period (1 euro for every 50 points of earned profit). The total 30 periods were paid at the end of the task. The average total payoff was 4.76 euros.

3.2. Manipulation and Measurement

The two types of feedback context were manipulated as follows: in the "aggregate feedback" condition, participants were provided, after each period, with information about their team performance during that period (e.g., the team performance was 45 points) but individual information was nonexplicit, even though each participant knew his or her individual decision[14]. In the "detailed feedback" condition, participants were given information about each peer's contributions and earnings over the period that had just ended (e.g., the team performance was 45 points; participant 1 chose a large amount of resources, with a cost of 15 points and a payoff of 0 points; and the same type of information for participants 2 and 3). We combined two procedures to manipulate the team identity: coloured T-shirts and competition between teams (Towry, 2003). First, the use of colour increased the group's salience because it encouraged self-categorisation. In the strong-identity condition, each team wore the same colour T-shirts; in the weak-identity condition, participants wore their own clothes with different colours. Second, participants in the strong-identity condition were informed that the companies they represented were competitors, although this competition did not change team incentives across the conditions. In the weak-identity condition, participants were not informed of any market share competition between companies.

The dependent variable was free-riding behaviours: When an agent chose a small amount of resources over a period, the variable was coded "0"; conversely, when this agent chose a large amount of resources, the variable was coded "1". We created the *free-riding ratio* as the difference between 30 (the total number of periods) and the sum of the resources chosen by each agent over the 30 periods (range 0-30), transformed into a ratio (0 = 0 percent of free-riding to 30 = 100 percent of free-riding). Therefore, the *free-riding ratio* variable was based on one observation per participant[15].

We also calculated free-riding responses to the social dilemma *greed* and *fear* components. The *greed ratio* was measured combining two measures. First, when the three team members cooperated, we coded "1" (*greed option*), while any other situation was coded "0". Second, we measured whether the participants chose a small amount of resources (i.e. free rode) in the following period (*greed response*). If the agent chose a small amount of resources over a period, the variable was coded "1" (i.e., the agent was free riding, and trying to take advantage of their peers' previous decision, and was therefore trying to maximise his/her payoff at the expense of his/her peers); conversely, when this agent chose a large amount of resources, the variable was coded "0". We created a *greed ratio* per participant. The numerator was the number of *greed responses* and the denominator the number of *greed options* the agents had faced over the 29 periods[16].

[10] In this experiment, the effect sizes derived from previous related studies (Coletti et al., 2005; Nikiforakis, 2010).

[11] A necessary condition, for the learning effect to appear.

[12] The instructions said: "The company believes that the participation of all three R&D divisions will generate greater income. The company wishes to produce as much income as possible. The company CEO wishes to highlight that this new project is important and will allow increasing the company's market share".

[13] This matrix was not displayed in the instructions.

[14] In the 'aggregate feedback' condition, each participant could calculate his or her own profit over each period. For example: if the joint income was 45 points and he or she invested a large amount of resources, the profit was: 45/3 - 15 = 0.

[15] We also used the dichotomous variable to perform a logit analysis in the Results Section. For this analysis, we used 30 observations per participant.

[16] As greed responses and fear responses began to be measured in the second period, so there were only 29 observations per participant instead of

The *fear ratio* was measured combining two measures as well. First, cases where the participant chose a large amount of resources (i.e. cooperated), while the two peers free rode were coded "1" (*fear situation*). Second, we coded "1" when the participant chose a small amount of resources (i.e., free rode) in the following period (*fear responses*). Conversely, when this agent chose a large amount of resources (i.e. cooperated), the variable was coded "0". Then, we created the *fear ratio* per participant. The numerator was the number of *fear responses* and the denominator the number of *fear situations* the participant had faced over the 29 periods. *Fear* and *greed ratios* are explained in more detail in the Results section.

At the end of the task, participants responded to a questionnaire to verify the manipulation of the variables, their understanding of the procedures, and to measure other control variables, such as gender (see Appendix B).

4. Results

4.1. Descriptive Statistics

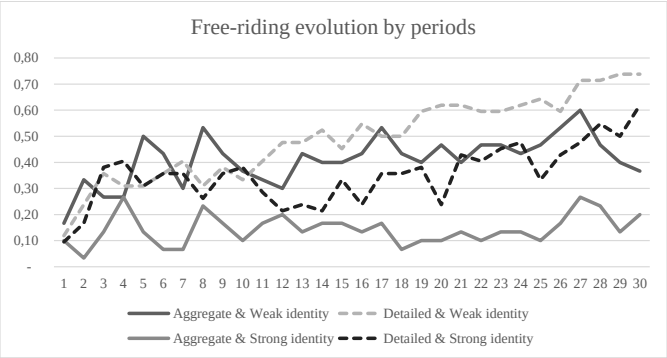
Table 2 shows the descriptive statistics of the dependent variable *free-riding ratio*. Figure 1 shows the evolution of free-riding decisions over periods, in all four conditions.

Table 2. Descriptive statistic: Mean, SD (N=144)

	Aggregate feedback		Detailed feedback	
	Level of team identity		Level of team identity	
	Weak (N=30)	Strong (N=30)	Weak (N=42)	Strong (N=42)
Free-riding ratio[a]	0.411 {0.300}	0.143 {0.159}	0.493 {0.285}	0.353 {0.281}

[a] Free-riding ratio: difference between 30 (the total number of periods) and the sum of the resources chosen by each agent over the 30 periods (range 0-30), transformed into a ratio (0 = 0 percent of free-riding to 30 = 100 percent of free-riding)

Figure 1. Free-riding decisions over periods, in all four conditions (N=144)



The lowest level of free-riding ratio was found in the aggregate feedback condition and strong-identity teams (M = 0.143, SD = 0.159), followed by the detailed feedback condition and strong-identity teams (M = 0.353, SD = 0.281). The highest level of free-riding was found in the detailed feedback condition and weak-identity teams (M = 0.493; SD = 0.285), followed by the aggregate feedback condition and weak-identity teams (M = 0.411; SD = 0.300).

30.

4.2. Hypothesis testing

Our hypothesis stated that when agents receive aggregate feedback - as opposed to when they do receive peer information, i.e., detailed information -, free-riding behaviours decreased more in strong-identity teams than in weak-identity teams.

We ran an ANOVA model in which the conditions were the independent variable, and the free-riding ratio, the dependent variable. The model was significant (F= 10.492; p-value< 0.001) (see Table 3, Panel A). We also ran pairwise comparisons between team identity conditions with the free-riding ratio (see Table 3, Panel B, T-test analysis)[17]. We did not find statistically significant differences for the free-riding ratio (t = 1.164, $p = .249$) among weak-identity teams between the two feedback conditions. We found statistically significant differences for the free-riding ratio (t = 3.682, $p < .001$) among strong-identity teams. We also ran a Regression Logit analysis, at individual level, considering that the current data is a structure of multiple periods. The dependent variable is a dummy variable (0 free-riding, 1 cooperation). In this analysis, we did not use the average mean (that is, the free-riding ratio). We ran the model considering a period-fixed effect, and results also support our hypothesis (see Table 3, Panel C). Therefore, the three types of analysis supported hypothesis 1[18].

Table 3. Results of the ANOVA, T-tests and Regression Random effects Logit.

Panel A: ANOVA (N=144). Dependent variable: free-riding ratio					
Source of variation	SS	Df	MS	F	p-value
Free-riding ratio	2.229	3	0.743	10,492	<.001***
Panel B: T-test (N=144). Dependent variable: free-riding ratio					
	Means				
	Aggregate feedback	Detailed feedback	Df	T-Stat	p-Value
Weak-identity teams (N=72)	0.411	0.493	60.641	1.164	.249
Strong-identity teams (N=72)	0.143	0.353	70.000	3.682	<.001***
Panel C: Regression Logit analysis (random effects) (N=144). Dependent variable: free-riding					
	Coef.	Std.err.	Z	p-value	
Feedback	-1.038	0.343	-3.03	.002***	
Team identity	-1.453	0.338	-4.30	<.000***	
Dummies of periods included					

*, **, *** are significant at 10%, 5%, and 1% respectively (two-tailed).

The T-test analysis was based on the assumption that each agent represents an independent observation that is unrelated to the information provided by other individuals in the sample. In our sample, we needed to check whether statistical dependency could result from nested data (team level). Multilevel regression models allow the inclusion of group fea-

[17] We ran a General Linear Model (GLM), with the two independent variables, team identity and feedback type, and the dependent variable free-riding ratio. The two direct effect of feedback type and team identity were statistically significant (F=10.504; p-value< .001; F=20.511; p-value< .001); nor the interaction (F=2.027; p-value= .157). In the Supplemental analysis subsection, we ran the same GLM for testing whether the interaction effect was present in the early periods, and disappeared over time, considering free-riding ratio between periods 1-10, periods 11-20 and periods 21-30.

[18] We also controlled for gender differences, and we found that the model was not significant (F=0.097; *p*-value= .757). We replicated the ANOVA model removing the last three periods (to avoid any possible interference caused by the end-game effect), and the model was also significant (F=9.667; *p*-value <.001).

tures in statistical models of individual outcomes (O'Dwyer and Parker, 2014). We ran a multilevel analysis, and the results were in line with the T-test analysis. First, there were no significant differences between the two feedback conditions for the free-riding ratio variable among weak-identity teams (t=0.890, p=0.383), but there were significant differences among strong-identity teams (t=2.628; p=0.015). We also ran the Regression Logit analysis, at team level, and results are in line with the previous multilevel regression model results. Feedback (z=-2.09; p=.037) and team identity (z=-2.59; p=.010) influence free-riding behaviour. The analysis results at team level are in accordance with the results at individual level.

4.3. Supplemental analysis

In this section, we performed various supplemental analyses. First, validation of the framing effect and the significance of time for the interaction effect was achieved through new analyses. In a second step, we performed additional analyses to support the learning effect. Finally, the analysis of greed and fear variables were developed to support our arguments.

4.3.1. The framing effect and the importance of time

Considering our previous results, where the General Linear Model (GLM) did not support an interaction effect between the team identity and feedback type variables (see footnote n. 17), we analysed whether this effect is present only in early periods. This question is of interest because Nikiforakis (2010) found that feedback type did not influence agent behaviour in early periods, but his study did not control for team identity. We were looking for evidence that the work environment (i.e. the feedback type associated with the framing effect) had a rapid and significant impact on determining team identity effects. We created the *early free-riding ratio*, measured as the difference between 10 and the sum of the resources chosen by each agent over the first 10 periods (range 0-10), transformed into a ratio. The same process was followed for creating *middle free-riding ratio* (periods 11-20) and *late free-riding ratio* (periods 21-30).

The results of the GLM for the *early free-riding* ratio showed that the interaction effect between team identity and feedback type was significant (F= 7.121; p = .009). However, the interaction effect disappeared for *middle free-riding ratio* (F= 0.229; p = .633) and *late free-riding ratio* (F= 0.962; p = .328). Therefore, these results highlighted the kick impact of the framing effect among different team-identity teams.

To give greater support, Table 4 presents the results of the T-test analysis for the *early free-riding* ratio. The independent variable is the feedback type. In line with Nikiforakis (2010), the results showed no statistically significant differences among weak-identity teams (t = -0.728, p = .469), but did suggest statistically significant differences among strong-identity teams (t = 3.439, p = .001)[19]. Therefore, we found that feedback information type influenced agent behaviour as of the earlier periods in strong-identity teams. Moreover, our findings also showed that the interaction effect disappeared over time (see Figure 2).

Finally, we investigated whether team identity influenced the level of team identification, and whether the type of feedback (aggregate or detailed), in accordance with our arguments, also influenced the level of team identification due to the framing effect. We ran a GLM model, where team identity and feedback type were the independent variables, and we created a *team frame* variable with four items of the post questionnaire (see Appendix B, item 6, item 7, item 8 and item 16)[20]. The direct effect of team identity variable and of feedback type were significant (F=7.842, p-value= .021; F=5.425, p-value= .006) (see also Figure 3). The interaction effect was not significant (F=0.987, p-value= .322). The result was consistent with previous ones, where the interaction was lost over time, considering that the items were measured at the end of the experiment.

[19]The ANOVA model was also significant (F= 5.025; p-value= 0.002).

Table 4. Results of the T-tests. Dependent variable: early free-riding ratio . Pairwise comparisons

	Means				
	Aggregate feedback	Detailed feedback	Df	T-Stat	p-Value
Weak-identity teams (N=72)	0.360	0.312	65.043	-0.728	.469
Strong-identity teams (N=72)	0.130	0.307	70.000	3.439	.001**

*, **, *** are significant at 10%, 5%, and 1% respectively (two-tailed).

Figure 2. Early, Middle and Late free-riding, under all four conditions (N=144)

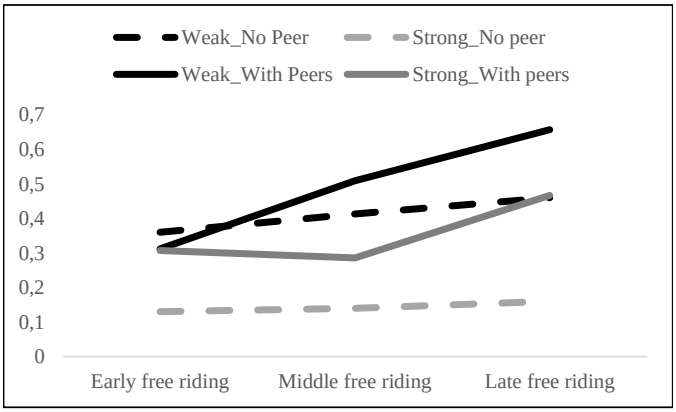
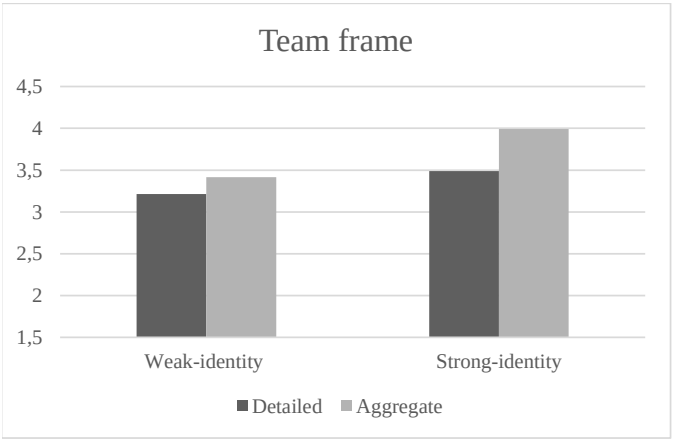


Figure 3. *Team frame* under all four conditions (N=144)



[20]We ran a factorial analysis, using a principal component analysis and varimax rotation. The Kaiser-Meyer-Olkin measure indicated the appropriateness of the data for factor analysis (0.75). The Barlett's test of Sphericity was significant (p-value< .001). All the communalities were equal to or greater than 0.50 (item 6, 0.86; item 7, 0.78; item 8, 0.50; item 16; 0.55). The results of the factor analysis showed that the four items load in one factor.

4.3.2. The learning effect

We checked whether the type of feedback facilitated a learning effect, as detailed feedback allowed the participants to learn whether one or two peers were free riding when medium performance was achieved (i.e., performance was 45 points). This learning effect was not possible in the aggregate condition. We called this situation (where agents faced a medium performance situation) the *ambiguous situation*. The *learning effect ratio* was measured combining two measures. First, cases where the participant faced an ambiguous situation were coded "1" (i.e., team performance was 45 points), and any other performance situation was coded "0". Second, we coded as "1" the cases where the participant chose a small amount of resources (i.e., free rode) in the following period (*learning responses*). Conversely, when this agent chose a large amount of resources, the variable was coded "0". We then created the *learning effect ratio* per participant. The numerator was the number of *learning responses* and the denominator the number of *ambiguous situations* the participant had faced over the 29[21] periods.

We ran a GLM model, where team identity and feedback type were the independent variables. The direct effect of feedback type was significant, in order with our arguments (F=16.532, *p*-value< .001). The direct effect of team identity was also significant (F=8.715, *p*-value= .004). The interaction effect was not significant (F=0.257, *p*-value= .613). It was surprising that these results did not align with the arguments we used for the learning effect, as we had anticipated a stronger effect on strong-identity teams than weak-identity teams, due to unmet expectations.

4.3.3. Greed and fear analysis

Table 5 (Panel A and B) shows the descriptive statistics of the two explanatory variables: *greed ratio* (Table 5, Panel A) and *fear ratio* (Table 5, Panel B). The highest greed ratio was found in the aggregate feedback condition and weak-identity teams (M = 0.303, SD = 0.353), followed by the detailed feedback condition and weak-identity teams (M = 0.247, SD = 0.402), and the detailed feedback condition and strong-identity teams (M = 0.215, SD = 0.273). The lowest level of the greed ratio was found in the aggregate feedback and strong-identity team conditions (M = 0.111; SD = 0.151). The lowest level of the fear ratio was found in the aggregate feedback condition and strong-identity teams (M = 0.189; SD = 0.234). The highest level of the fear ratio was found in the detailed feedback condition and weak-identity teams (M = 0.637; SD = 0.314). Similar levels of the fear variable were found in the detailed feedback and strong-identity team conditions (M = 0.468, SD = 0.323), and the aggregate feedback and weak-identity teams conditions (M = 0.404, SD = 0.309).

We anticipated that the feedback type would increase the greed responses in strong-identity teams, but not in weak-identity teams where the greed responses were expected due to the individual frame. We developed a T-test analysis[22] for the greed variable (see Table 6) for weak-identity teams and strong-identity teams separately. First, we did not find statistically significant differences for the greed variable (t = -0.601, p = .275) among weak-identity teams between the two feedback conditions. Second, we found statistically significant differences for the greed variable (t = 1.884, p =0.032) among strong-identity teams. Therefore, the results support our arguments. Figure 4 shows levels of greed responses in all four conditions.

Table 5. Descriptive statistic: Mean, SD

Panel A (N=138)	Aggregate feedback		Detailed feedback	
	Level of team identity		Level of team identity	
	Weak (N=27)	Strong (N=30)	Weak (N=39)	Strong (N=42)
Greed[a]	0.303 {0.353}	0.111 {0.151}	0.247 {0.402}	0.215 {0.273}
Panel B (N=128)	**Aggregate feedback**		**Detailed feedback**	
	Level of team identity		Level of team identity	
	Weak (N=28)	Strong (N=25)	Weak (N=39)	Strong (N=36)
Fear[b]	0.404 {0.309}	0.189 {0.234}	0.637 {0.314}	0.468 {0.323}

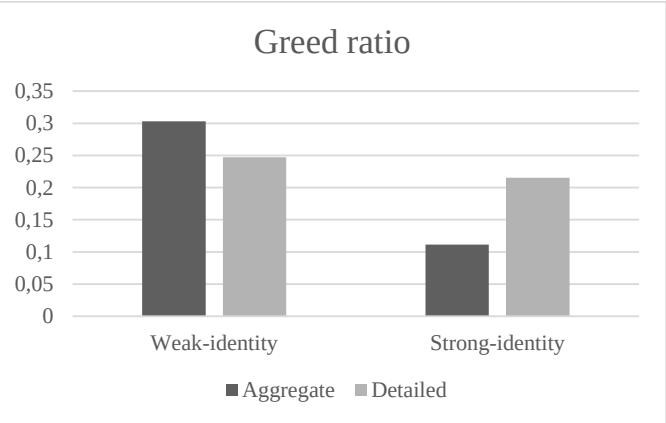
[f] Greed: the denominator is the total number of times an agent faces a situation in which the three peers cooperated in the previous round. The numerator is equal to the number of times the agent chose to free ride in the following round (therefore, there maximum number of observations per participant is 29). This variable used one observation per participant.
[g] Fear: the denominator is the total number of times agents face a situation where two peers free rode in the previous round while they cooperated. The numerator is equal to the number of times the agents chose to free ride in the following round (therefore, there maximum number of observations per participant is 29). This variable was based on one observation per participant.

Table 6. Results of the T-tests. Dependent variable: greed ratio .

	Means				
	Aggregate	Detailed	Df	T-Stat	p-Value
Weak-identity teams (N=66)	0.303	0.247	60.339	-0.601	.275
Strong-identity teams (N=72)	0.111	0.215	70.000	1.884	.032**

*, **, *** are significant at 10%, 5%, and 1% respectively (two-tailed).

Figure 4. Greed ratio in all four conditions (N=144)



Our expectation was that fear responses would increase due to the type of feedback, but we predicted that strong-identity teams would have higher levels of fear responses than weak-identity teams due to unmet expectations. We ran pairwise comparisons between conditions (T-test analysis)[23]

[21] The learnging responses began to be measured in the second period, so there were only 29 observations per participant instead of 30

[22] We developed an ANOVA analysis for the greed ratio, with conditions as factor, but the model was not significant (F=1.941; p-value=.126). We ran a repeated measures ANOVA model for the greed responses (no greed ratio), including periods as a continuous variable, and the conditions as factor. Our results supported the effect of periods (F=2.145; *p*-value=.005), and the interaction effect between periods and factor (the conditions) (F=1.735; *p*-value<.001).

[23] We developed an ANOVA analysis for the fear ratio with conditions as factor, and the model was significant (F=11.472; p-value<.001). We ran a repeated measures ANOVA model for the fear responses (no fear ratio), including periods as continuous variable, and the conditions as factor. Our

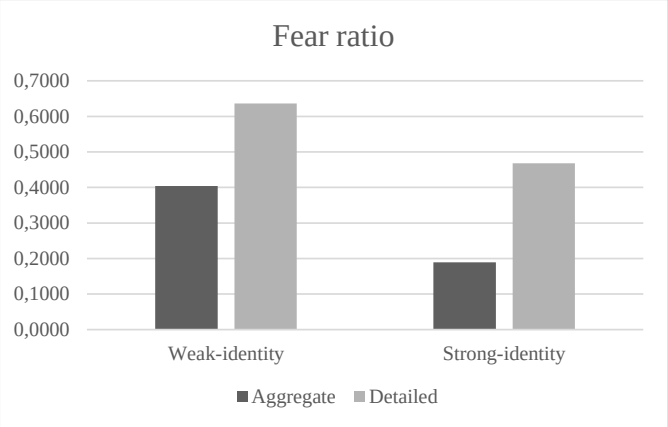
for the fear ratio (see Table 7). We found significant differences regarding fear in both strong-identity teams and weak-identity teams. According to the learning effect analysis, we did not obtain the expected results regarding the effect's strength. Both weak-identity and strong-identity teams experience an impact on fear responses based on the feedback type[24] (see also Figure 5).

Table 7. Results of the T-tests. Dependent variables: fear ratio. Pairwise comparisons.

	Means				
	Aggregate	Detailed	Df	T-Stat	p-Value
Weak-identity teams (N=67)	0.404	0.637	58.912	3.016	.002**
Strong-identity teams (N=61)	0.189	0.468	58.864	3.909	<.001***

*, **, *** are significant at 10%, 5%, and 1%, respectively (two-tailed).

Figure 5. Fear ratio in all four conditions (N=128)



5. Conclusions

In this work, we examined whether the effects of the design of team-level feedback information depend on team identity levels for reducing free-riding behaviours.

The use of aggregate feedback in strong-identity teams resulted in a decrease in free-riding behaviour, as demonstrated by our results. However, information about peer contributions and earnings (i.e., detailed feedback) is more dangerous in strong-identity than in weak-identity teams. When receiving information on peer contributions and earnings, agents belonging to strong-identity teams increased their free-riding responses due to greed more than when they received feedback, showing a measure of aggregate team performance. This difference, however, was not found for weak-identity teams. In accordance with van Dick et al. (2009), this paper highlights the key role of the work context in the effects of team identity, suggesting that context has an impact on team category salience.

The study's findings have a number of implications for both academics and practitioners. Our study highlights the importance of designing feedback information at the team level (Sánchez-Expósito and Naranjo-Gil, 2020; Nikiforakis, 2010). Given that organisations are increasing their level of disclosure of different kinds of employee information, this study warns against the negative learning effect of providing peer earnings information, even when this information is combined with information on contributions (Brown et al., 2014; Nikiforakis, 2010). Our work extends prior research by including a scenario of groups with different levels of team identity. Indeed, combining contribution and earnings information is also risky for strong-identity teams. The stronger the team identity is, the greater the negative effect of providing such information. Second, we have contributed to the literature on the importance of analysing accounting and team structure combinations (Rowe, 2004; Towry, 2003). Today, organisations are investing resources in team identity building (e.g., team building tasks with Lego tools; FLL, 2018; Han et al., 2022; Sajko 2022) due to their expected positive effects on employee behaviour. Nevertheless, it is more important to know how to maintain team identity over time than to build team identity in the first place (Hughes and Terrell, 2012). We also contribute to the discussion about whether team identity affects responses to the greed or fear component of social dilemmas. Our results support those of Simpson (2006), as we found that team identity affects responses to greed and not to fear, but only when nonexplicit peer information is facilitated (i.e., aggregate feedback). When strong-identity teams are presented with peer feedback information, greed responses increase. Therefore, this feedback type is more dangerous to group behaviour in strong-identity than in weak-identity teams. Nevertheless, and unexpectedly, the fear responses were equally strong for strong-identity and weak-identity teams. Finally, we found that free-riding behaviours did not differ among weak-identity teams due to feedback type. This result is surprising. Indeed, when analysing contributions and earnings feedback, Nikiforakis (2010) encountered more free-riding behaviours. That said, in Nikiforakiss study (2010), the rational behaviour was cooperative, and the mixed frame led to free-riding behaviours. In our study, the rational behaviour was free riding, and the mixed frame did not alter this behaviour. Hence, future studies could analyse whether the power of mixed frames depends on the starting point, that is, whether the initial rational behaviour is cooperation or free riding.

This work has certain limitations affecting the generalisability of the results. First, the study was conducted in a laboratory, so caution should be taken when generalising its results to organisational contexts. In our experiment, team members could not interact or communicate, which is not necessarily a realistic work characteristic. Second, we analysed the effects of information on peer contributions and earnings in a decisional task setting. However, depending on the type of team task, other peer information types could be present, which could also alter agent behaviour, such as agent knowledge or abilities (Román, 2009). Finally, we examined a situation in which teammates received feedback information over each period, but frequent information reporting can harm team cooperation (Nikias, Schwartz, Spires, Wollscheid, and Young, 2010).

We suggest that future studies replicate our predictions in applied contexts that include other organisational variables (e.g., communication among peers). Moreover, Román (2009) found that when agents are given information on peer abilities, better performers help others whose lower perform-

results did not support the effect of periods (F=0.785; *p*-value=.782), nor the interaction effect between periods and factor (the conditions) (F=0.941; *p*-value=.631).

[24] We investigated whether the framing effect is only present in early periods for the fear variable, taking into account the findings of section 4.3.1 and the significance of time. We created three fear variables (*early fear* periods 2-10, *middle fear* periods 11-29, and *late fear* periods 21-30). We ran a GLM, and, as we expected, the interaction effect disappeared over periods. The interaction effect was present in the *early and middle fear* variable (F=5.321, *p*-value=. 024; F=5.576, *p*-value=. 021, respectively) (*p*-value=. 624, *late fear)*.

ance is due to their skills, not to free riding (e.g., voluntary contributions or effort). Therefore, future works could test whether the type of team task (e.g., decision vs. effort task) moderates the negative effects of detailed information on a team's functioning. An agent's poorer performance in a team task due to lower skills or knowledge will lead to a different assessment compared to when poorer performance is explained by a voluntary reduction in effort. We also suggest extending this study to further feedback scenarios that present other peer information elements (such as knowledge and output quality). Finally, due to the negative effect of too-frequent feedback (Nikias et al., 2010), future research could focus on the relationship between the mode and frequency of feedback sharing among team members.

Author contributions

All authors contributed to the study conception. Material preparation, data collection and analysis were performed by L. Gomez-Ruiz. The first draft of the manuscript was written by L. Gomez-Ruiz and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Conflicts of interest

We confirm that this work is an original one and has not been published elsewhere, nor is it currently under consideration for publication elsewhere.

The authors declare that they have no conflicts of interest.

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Appendix

Appendix A: Pre-questionnaire to check whether the instructions were understood

In order to ensure that participants understood the guidelines for the activity, they had to answer the following questions:

1. If you choose to invest a high level of resources in the joint project over a period, the cost for your division is:
    - 15 points
    - 0 points
    - 30 points
2. If the three unit-managers choose a low level of resources for the joint project over a period, the income of the joint project is:
    - 0 points
    - 45 points
    - 15 points
3. If the three unit-managers choose a high level of resources for the joint project over a period, the proportional share of the income of the joint project for every division is:
    - 25 points
    - 75 points
    - 45 points
4. If you have chosen to invest a high level of resources, but the other unit-manager(s) has(have) chosen a low level of resources, the income of the joint project is:
    - 25 points
    - 75 points
    - 45 points

Appendix B: Post-questionnaire containing the manipulation checks

Participants had to answer the items on a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree):

1. I have worked seriously on this task.
2. I was highly motivated to take part in this task.
3. Taking part in this task was fun.
4. The reward I receive from this task depends only on my decisions.
5. The common project's income depends on the decisions of every member in the team.
6. When taking part in the task, I felt that the three R&D managers set up a team.
7. I was committed to my team during the task I performed.
8. My personal interests were not as important as the common interest of the team.
9. In any period of the task, the three team members could discuss our decisions.
10. During the activity I could know who the members of my team were.
11. I could meet the members of my team before the start of the task.
12. I could meet the members of my team while I performed the task.
13. After every decision, I knew the income of the common project.
14. After every decision, I knew the reward of my own division.
15. After every decision, I knew the reward of the two other divisions.
16. Choose from the two figures below the one that best represents your feelings towards your team during the time that you have been participating in the study.

1 2 3 4 5