Cooperation as collective goal:
Examining the extent to what people's choices to cooperate are motivated by a collective goal

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Abstract

Despite the fact that cooperation is essential to our society, our selfish inclinations regularly take the upper hand. The purpose of the present study was to investigate to what extent people's choices to cooperate are motivated by a collective goal. Previous research on goal-directed behaviour has shown that action-outcome learning can facilitate goal-directed behaviour through the presence and the right timing of a positive signal. The current study extends these researches by also focussing on the persistency of cooperation as a known characteristic of goal-directed behaviour. A laboratory experiment was conducted with 76 participants. The participants started with a joint action task, in which action-outcome learning and reward learning was integrated. Depending on the condition they were randomly assigned in, participants received a reward or not, before or after the joint action. The joint action task was followed by a repeated prisoner's dilemma wherewith the cooperative decision-making behaviour and its persistency was measured. The results showed no significant differences between the participants in their cooperative behaviour, indicating that the action-outcome learning as used in previous studies had no effect. The motivation to cooperate declined at the end of the repeated decision task, showing an endgame effect and no persistency. Implications and limitations are discussed.

Keywords: cooperation, decision-making, goal-directed behaviour, action-outcome learning, persistency, joint action, social value orientation

Abstract (Dutch)

Ondanks dat samenwerking van essentieel belang is voor onze samenleving, nemen onze egoïstische neigingen regelmatig de over hand. Het doel van de huidige studie was om te onderzoeken in hoeverre de keuzes van mensen om samen te werken worden gemotiveerd door een gezamenlijk doel. Eerder onderzoek naar doelgericht gedrag heeft uitgewezen dat *action-outcome learning*, door de aanwezigheid en de juiste timing van een positief signaal, doelgericht gedrag kan faciliteren. De huidige studie breidt eerdere onderzoeken uit door ook te focussen op persistentie van coöperatief gedrag, een welbekend karakteristiek van doelgericht gedrag. Een laboratorium experiment is uitgevoerd met 76 participanten. De participanten begonnen met een joint action taak, waarin *action-outcome learning* en *reward learning* waren geïntegreerd. Afhankelijk van de conditie waarin ze willekeurig waren ingedeeld, ontvingen de participanten wel of geen beloning, voor of na de joint action. De joint action taak werd gevolgd door een herhaald gevangenendilemma, waarmee de

persistentie van het samenwerkingsgedrag werd gemeten. De resultaten tonen geen significante verschillen tussen het samenwerkingsgedrag van de participanten, wat indiceert dat *action-outcome learning* - zoals gebruikt in eerdere studies - geen effect had. De motivatie om samen te werken nam af tijdens de laatste gevangenendilemma's, wat duidt op een endgame effect en niet op persistentie. Implicaties en beperkingen worden besproken.

Keywords: cooperation, decision-making, goal-directed behaviour, action-outcome learning, persistency, joint action, social value orientation

Although in many situations cooperation is more beneficial in our daily lives, our competitive goals and selfish inclinations regularly take the upper hand. How do individuals make these choices to cooperate (or not) and which factors may encourage individuals to choose cooperation over more egoistic behaviour? There is relatively little known about the cognitive processes behind cooperative decision-making. Rand et al., (2014) presented the *social heuristics hypothesis* (SHH), distinguishing intuitive and deliberative decision-making. Where intuitive decision-making favours cooperation since it is typically advantageous in our daily lives and therefore leads to the formation of generalized cooperative intuitions, deliberation leads to more selfish decision-making according to the SHH. However, a substantial part of human behaviour is more deliberate and specifically aimed at obtaining a desired outcome; also known as goal-directed behaviour (Marien, Aarts & Custers, 2015). Since it is possible to shape goal-directed behaviour through action-outcome learning (Marien, Aarts & Custers, 2013, 2015), can a decision to cooperate also be goal-directed, motivated by a collective goal?

Social heuristics hypothesis (SHH): intuition favours cooperation

The SHH is based on a dual-process framework which conceptualizes cooperative decisions as resulting from the interaction between more intuitive versus reflective processes (Rand et al, 2014). The SHH states that social norms concerning cooperation are internalized and that these norms vary by culture. People internalize strategies that are typically advantageous and successful in daily interactions and they apply these automatic, intuitive responses to atypical situations. More reflective and deliberate processes can override these intuitive responses, causing a shift in behaviour (Rand et al, 2014). Rand et al (2014) tested the hypothesis by using time constraints and economic cooperation games. Time constraints provide a widely used method for inducing participants to rely more on intuition (through time pressure) or reflection (through time delay). One of the cooperation measurements they have used was a social dilemma. A social dilemma is a frequently used method to measure cooperation. Social dilemmas represent interdependence situations in which group members independently decide to cooperate or not and where personal and collective interests are at odds (De Cremer, van Knippenberg, van Dijk & van Leeuwen, 2008). A prisoner's dilemma is an example of a frequently used social dilemma in scientific studies. In its simplest form, a prisoner's dilemma consists of two participants who independently decide to cooperate with the other participant or not (van de Ven, 2010). They can choose a cooperative or an opportunistic way of playing. In terms of collective rewards both participants are better off when they both choose to be cooperative, but research shows that participants choose to play opportunistic more often (van de Ven, 2010). A prisoner's dilemma is a well-known method

in the cooperation research because it is a simple and effective way to measure and understand cooperative behaviour.

According to the SHH, intuition favours cooperation while deliberation favours more selfish decision-making. To investigate if the decision to cooperate can also be more deliberate, the present study is focussed on examining if cooperation can be goal-directed. Goal-directed action is aimed at obtaining positive or desired outcomes and believed to be a result form the brain's capacity to predict future events that result from actions (Marien, Aarts & Custers, 2015).

Research on human goal-directed behaviour

Research on human goal-directed behaviour and goal pursuit aims to understand how people represent their actions in terms of producing outcomes and when and how outcome representations gain control over behaviour and become activated (Marien, Aarts & Custers, 2013). A well-known approach which conceptualizes how people learn to act in a goal-directed manner, is the ideomotor approach (Marien, Aarts & Custers, 2015). According to the ideomotor theory, the link between an action and an effect is formed when the consequence of a motor movement is observed. When this action-outcome link occurs consistently, the link gets more strengthened. The link between the action and its effect is assumed to be bidirectional, therefore this link can be used to produce a specific outcome (Marien, Aarts & Custers, 2013). When people think of a desired outcome, the related actions will be selected to accomplish the outcome. The ideomotor approach provides a framework to understand how individuals acquire action-effect knowledge and how representations of outcomes are used in the selection of action. However, this approach does not include ideas about when and how outcome representations gain control over human behaviour and become activated. Thus, what induces and motivates individuals to act in a goal-directed manner? More specifically, what induces and motivates individuals to act *cooperative* in a goal-directed manner?

While the motivation and control of goal-directed behaviour is traditionally thought to be associated with conscious intent, scientists thought of goal pursuit as a conscious process, recent research shows that goal-directed behaviour also arises from unconscious processes (Kleinman & Hassin, 2011). Bargh, Gollwitzer, Lee-Chai, Barndollar and Trötschell (2001) focussed on nonconscious goal pursuit through priming. They primed participants with cooperation related words. Comparing the traditional conscious and nonconscious activation of goal their results showed that goal priming was, similar to the conscious-goal manipulation, successful in producing cooperative behaviour. Thus, priming can produce

cooperative behaviour, but do participants really experience cooperation as a goal?

Building on the ideomotor approach, Marien, Aarts and Custers (2013) have demonstrated that people are implicitly motivated to control their goal-directed behaviour when the representation of an outcome is attached to a positive affective tag. They argue that goal-directed behaviour can be induced by an interaction between action-outcome learning, as described by the ideomotor theory, and reward learning. During reward learning, the motivational strength of a behavioural response increases because, the response is followed by a positive event or reward (Marien, Aarts & Custers, 2015). Marien, Aarts and Custers (2015) investigated whether objects that were presented as outcomes of action were able to induce motivated goal-directed behaviour when accompanied with positive signals. Results showed that the motivation to obtain an object was only enhanced when the object represented an outcome of an action *and* was presented with a positive signal.

Goal-directed behaviour during joint action

All of the abovementioned studies on goal-directed behaviour have focussed on an individual level where individuals create individual goals. However, beside individual performances, human lives are full of joint action (Knoblich, Butterfill & Sebanz, 2011). We shake hands when we meet, we carry heavy objects together because we cannot carry it by ourselves, we make music together; joint action is part of our daily lives. Joint action is a form of social interaction where two or more people coordinate their actions in space and time to accomplish a change in the environment (Sebanz, Bekkering & Knoblich, 2006). When individuals are performing joint actions, they coordinate their individual actions with each other to achieve a shared goal (Loehr & Vesper, 2016).

Loehr and Vesper (2016) investigated the mental representations of shared goals. Their study provides evidence that novices form representations of the shared goal of a joint action (e.g., playing a musical duet together) when they learn to perform joint actions for the first time (e.g., learning to perform simple melodies on the piano). Their findings also suggest that representations of individual actions are different when they have learned them in the context of joint performance compared to individual performance, indicating that people's mental representations of actions go beyond their individual action goals when they cooperate with a partner to achieve a shared goal.

As mentioned before, Marien, Aarts and Custers (2013, 2015) provided evidence for the shaping of individual goals with a combination of action-outcome learning and reward learning. To examine the shaping of shared goals, Marien and Greene (in prep) continued this line of research by studying the interaction between action-outcome learning and reward

learning in a context of joint action. Participants started with a joint action task on the computer presenting them with a double closed door. They had to open one of the doors and the other door could only be opened by another participant whom they were randomly matched with. The task could only be accomplished in a joint action. Depending on the condition they were randomly assigned in, the participants received a reward (or not) and this reward was handed to them before or after the joint action. After the joint action task, the participants were confronted with a social dilemma, more specifically a prisoner's dilemma. Marien and Greene (in prep.) found that people who received a reward after a joint action task, would more frequently choose for cooperation during a following prisoner's dilemma than people who got the reward before the joint action task or no reward at all. Thus, the timing of the reward is important. If the participants receive a reward directly after a joint action task, they connect the two events because it appears as an outcome of the action. The results showed an interaction between action-outcome learning and reward learning in the context of joint action.

An important variable that influences this effect is the social value orientation of the participants (Marien & Greene, in prep). Social valuable orientations are stable preferences for a certain patterns of outcomes for oneself and others (Van Lange, de Bruin, Otten & Joireman, 1997). Marien and Greene (in prep) distinguished two types of social value orientations: pro-selfs and pro-socials. Pro-selfs are people who are focussed on maximizing their own outcomes with little or no regard for outcomes of others, whereas pro-socials focus on maximizing the collective outcomes (Van Lange, de Bruin, Otten & Joireman, 1997). Marien and Greene (in prep.) examined the influence of the social value orientation on the interaction between action-outcome learning and reward learning in the context of joint action. Their findings showed that pro-selfs cooperated more in the condition where they received a reward directly after the joint action compared to pro-socials in the same condition, indicating that pro-selfs are more influenced by the manipulation than pro-socials. Thus, people's social value orientation is an important factor to take into account when investigating cooperative behaviour.

The present study

The study of Marien and Greene (in prep.) found an interaction between action-outcome learning and reward learning in a context of joint action. However, their findings did not include conclusive evidence of characteristics of goal-directed behaviour (e.g., persistency, Locke, Shaw, Saari, & Latham, 1981). Therefore, the present study will investigate to what extent people's choices to cooperate are motivated by a collective goal.

The current study will elaborate on the study of Marien and Greene (in prep.) by integrating action-outcome learning and reward learning in a joint action setting (using the same joint action task) with a special focus on a characteristic of goal-directed behaviour: persistency. To test the persistency of the cooperative behaviour of participants, the present study will use a repeated prisoner's dilemma instead of an one-shot prisoner's dilemma, because an one-shot dilemma as used in the study of Marien and Greene (in prep.) does not give conclusive evidence of the extent in which individuals behaviour is goal-directed. Using a repeated prisoner's dilemma adds another interesting aspect to the present study: reciprocity. Compared to an one-shot prisoner's dilemma, a repeated prisoner's dilemma triggers reciprocity since individuals have to make several decisions with the same person and they make their choices based on the actions of the other. As reciprocity is mostly present during the first rounds of the repeated prisoner's dilemma compared to the last rounds, perhaps a collective goal must be activated to keep on cooperating until the last round. The study of Normann and Wallace (2011) shows that, when participants know the amount of prisoner's dilemmas they have to fulfil, there is a visible decrease of cooperation at the end of the experiment. This is called *the end-game effect.* It is expected that when the choices of the participants are goal-directed, this end game effect will occur less or not at all, because the collective goal persists over time, even when the personal interests decrease during the last phase of the game.

The central question of the present study is: *To what extent influences a joint action outcome, paired to a positive signal, ones persistency to continue to cooperate?* Based on the existing literature, the following hypothesis have been formulated.

Hypothesis 1: Participants who repeatedly received a *reward after* the joint action task, will cooperate more during the following repeated decision task, compared to the participants in the other three conditions of the 2x2 interaction, where they received no reward, or a reward before the joint action task.

Hypothesis 2: The manipulation (*reward after*) during the joint action task has a larger impact on the motivation to cooperate for pro-selfs than for pro-socials (as measured with the SVO).

Hypothesis 3: There will be less cooperative decisions during the last five rounds of the repeated decision task compared to the first five rounds, based on the endgame theory of Normann and Wallace (2011).

Hypothesis 4: For the participants who received a *reward after* the joint action task the endgame effect will be less present.

Method

Participants and design

Prior to the collection of data, a power analysis was conducted in order to determine the desired number of participants. The power analysis determined that a minimum of 96 participants was needed (effectsize d = .25, α = .05, power = 0.95, number of groups = 8, number of measurements = 2). Because of time constraints only seventy six participants (47 females; 29 males) participated in the experiment. The mean age of the participants was 23.30 (*SD* = 5.167, *Min* = 18, *Max* = 51) and their educational background was psychology (N = 7), economics (N = 25) and other (N = 44). In the present study, a 2 (*timing reward*: reward after joint action vs. reward before joint action) x 2 (*reward*: receiving a reward vs. not receiving a reward) x 2 (*SVO:* pro-self vs. pro-social) x 2 (*endgame:* first five rounds vs. last five rounds) mixed factorial design was used, with the *timing reward, reward* and *SVO* as between subject factors and *endgame* as within subject factor. Table 1 gives a schematic overview of the number of participants in every between subject design element.

Table 1

Schematic representation of the participants (N)

		Pro-self	Pro-social	**Total**
Before	Reward	8	14	22
	No reward	8	6	14
After	Reward	11	11	22
	No reward	10	8	18
Total		37	39	**76**

Materials

Joint action task. The joint action task started with a short explanation of the task, already explained during the welcome instructions. After pressing the 'OK' button the joint action task started. The participants were randomly matched with another participant by the z-Tree software. In the two *before* conditions, the participants were first presented with the reward information (0 points when they were in the *no reward* condition and 10 points when they were in the *reward* condition) before the joint action act. Thereafter, two closed doors appeared on the screen. One of the two participants was shown an 'OPEN' button to press on,

whereas the other saw the text ‘OTHERS TURN’. Once the first person pressed the ‘OPEN’ button the text ‘OTHERS TURN’ appeared, and the second participant was presented with the ‘OPEN’ button. In the two *after* conditions, the reward information (0 or 10, depending on their reward condition) came after the joint action act. So when the second participant pressed the ‘OPEN’ button, the reward information appeared on the screen. For the visualisation of the task, see figure 1. Who was opening the first door or second door was determined at random by the computer. In total, the couples performed 40 trials of the joint action task. In this task, the participants were endowed with monetary rewards, which they needed to share with their fellow participant. Every point presenting by the computer (0 or 10, depending on their condition) was representing €0.01. The extra earnings of the reaction time task was €0.00 or €2.00, depending on the condition the participants were randomly assigned in.

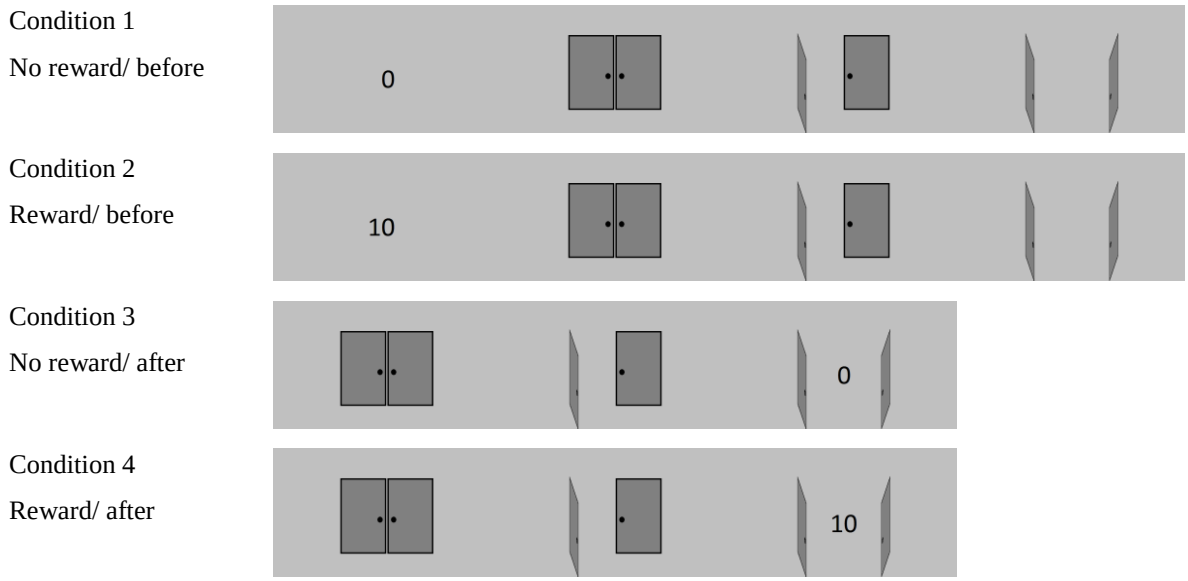

Figure 1. Visualisation of the joint action task: Depending on the condition, the reward (0 or 10 points), was shown before or after the joint action task.

Repeated decision task. Before the repeated decision task started, a short explanation of the task was presented. After pressing the ‘OK’ button, the task started. The participants were again randomly matched with another participant by the z-Tree software[1]. After the group matching by z-Tree, a chart appeared on the screen of the participants

[1] After the data gathering, a programming error has been detected. Where the participants were told that during the decision-making task they would be matched with one other participant for all the ten decisions, this appeared to be programmed wrong resulting in a randomization error. The program made subgroups and in these subgroups all participants were matched with the first person of the subgroup while the first person was only matched with the second person of the group. Thus, all the participants in the subgroup were presented with the decisions of the first person and made their choices based on this persons actions. However, the first person based his decisions only on the action of second person of the group.

representing a prisoner's dilemma (see figure 2). The chart presented the options that the participants could choose; namely option A or option B. By choosing option A, the participant chose to cooperate, while by choosing option B the participant chose not to cooperate and favour their personal interest. Their choice had immediately effect on the amount of money they could earn. If the two matched participants both chose to cooperate, they received 40 per person. If they both chose not to cooperate, they received 20 points per person. If one of them had chosen to cooperate and the other didn't, the one who cooperated received 10 point while the other participants received 50 points. This information about the consequences of the choices of participants was also presented. In total the participants made ten decisions, each time together with the same participant. After every decision, the participants were shown what the other participant had chosen and what their payoff for that round was. Before the next task started, the participants were asked to write down their reasoning behind their decision-making in a textbox on their computer. The extra earnings of the repeated decision task could vary between €1.00 and €5.00, depending on the decisions of the participants.

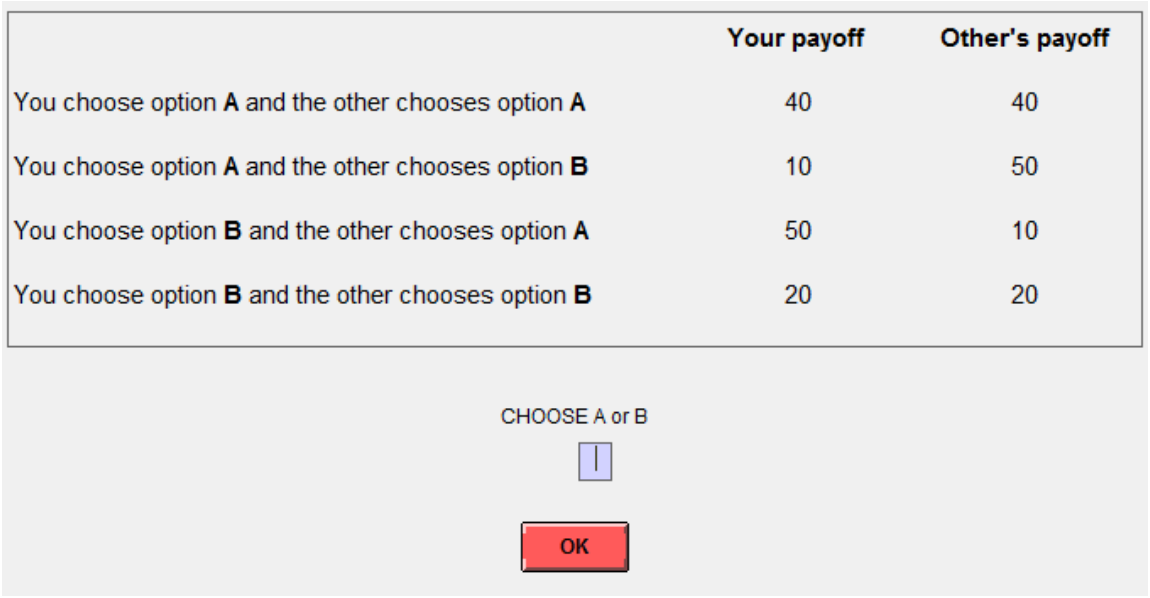

Figure 2. Visualisation of the repeated decision-making task: At every decision, this chart was shown to the participants and they had to choose whether they wanted to enter A (cooperation) or B (no cooperation).

Social value orientation task. To measure the social value orientation of the participants, the SVO slider measure of Murphy, Ackermann and Handgraaf (2011) was used. After reading the short explanation of the task, the participants had to click on the 'OK' button to start the task. Then, a chart appeared on the screen with nine options to allocate

points between themselves and the other person they were randomly matched with (see figure 3). The participants had to choose one of the nine options on the slider bar (e.g., 85 point for themselves and 50 point for their unidentified component) and press the 'OK' button. This repeated for six times and each time the nine options on the slider bar differed. The slider bars of the six questions are specifically designed to be able to make a distinction between pro-selfs and pro-social. The SVO was calculated by z-Tree with the formula of Murphy, Ackermann and Handgraaf (2011)[2]. During this task the participants earned extra money. The extra earnings of this task were determined by calculating the points (each representing €0.01) of two randomly chosen decisions, one of their own decisions and one of the other's decisions. These extra earnings could vary between €0.65 and €2.00, depending on the decisions of the participants and the two randomly chosen decisions.

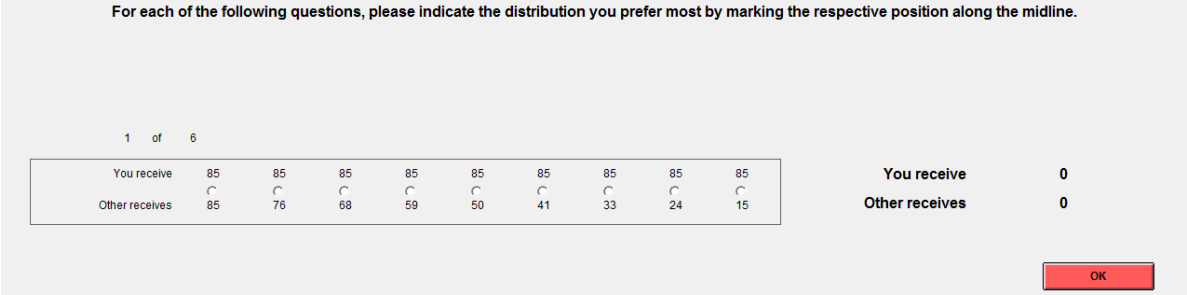

Figure 3. Visualisation of the social value orientation (SVO) task: Six times, the participants had to choose one of the nine options from the SVO slider, which showed different options for every question.

Procedure

To answer the main research question of the present study, a laboratory study is conducted in the Experimenteel Laboratorium voor Sociologie en Economie (ELSE laboratory) of the University of Utrecht. Because the study is about joint action, the participants took part in the experiment in groups of ten to eighteen people depending on the turnout. Upon their arrival in the laboratory, all participants were seated in the same room, everyone behind a computer. Before the experiment started, the participants were asked to

[2] The formula is as follows: SVO° = arctan ((Mean allocation for self − 50) / (mean allocation for other − 50)). The result of this calculation is showed in angles, where a higher degree implies that the participant takes the interests of the other into account. Pro-socials would have angles between 22.45° and 57.15°; pro-selfs would have angles between –12.04° and 22.45° (Murphy, Ackermann and Handgraaf, 2011). Where Murphy, Ackermann and Handgraaf (2011) made a distinction between four social value orientations (altruistic, pro-social, individualistic and competitive), the present study have focussed only on pro-socials and pro-selfs. However, one participant had an angle lower than -12.04, indicating an extreme pro-self orientation consistent with a competitive social value orientation. To still be able to include this participant in the analysis, this participant was recoded into pro-self.

read the information letter and sign the informed consent. The experiment took place behind the computer, using z-Tree software (Fischbacher, 2007). Z-Tree is software for developing and carrying out economic experiments and can be used to randomly match participants with other participants without revealing their identities to each other. All participants started with a show up fee of €2.50. On top of this show up fee, they could earn extra earnings during each task.

Participants started with a welcome instruction which explained the joint action task and the repeated decision task very carefully. Besides this textual explanation, the welcome instruction also included an example of a decision from the decision-making task so that the participants knew what awaited them. The welcome instruction was followed by the joint action task, already explained. For performing this task, the participants were matched with a randomly chosen participant by the z-Tree software. After 40 trails of the joint action task, the participants were again randomly matched with another participant by the z-Tree software. As a measure of cooperative behaviour, participants took part in a decision-making task which consisted of a series of ten prisoner's dilemmas. After every decision, the participants were shown what the other participant had chosen and what their payoff for that round was. At the end of this task, participants were asked to explain shortly how they made the decisions by writing down their reasoning behind their decision-making.

The decision-making task was followed by a task to test the social value orientation (SVO) of the participants. They had to make a series of decisions about allocating resources between them and the other person they were randomly matched with by the z-Tree software. The choices they made influenced both the amount of money they received as well as the amount of money the other received. In total, the participants made 6 of these decisions.

The participants ended with a questionnaire consisting of demographic questions and the option to enter a comment concerning the experiment. Finally, the final amount of money that the participants had earned during the whole experiment was showed. The experimenter came by and gave the participants the money they had earned, after which the participants could leave the laboratory. The amount of money varied from participant to participant, because of the different choices they made during the experiment.

Data preparation and analysis

The analysis was conducted with a mixed design ANOVA. A mixed design ANOVA is a statistical test to measure a mixture of between-group and repeated measures variables (Field, 2009). As within-subjects variables the first five decisions during the decision-making task (First5PD) and the last five decisions during the decision-making task (Last5PD) were

entered so these different time frames could be compared. These two within-subjects variables were computed by the sum of cooperative decisions during the time frames, reporting a value between 0 (no cooperative decisions) and 5 (full cooperation). Thus, the cooperation rate is calculated by the number of cooperative decisions during the repeated decision-making task. For the mixed design ANOVA the two variables *First5PD* and *Last5PD* were combined into the repeated-measures factor *Endgame*. Between-subject factors included in the analysis to examine their effect on the endgame were *reward* (reward vs no reward), *timing* (before vs after) and *social value orientation* (pro-self vs pro-social). The between-subject factor social value orientation was recoded before the analysis was conducted, because one participant scored below the pro-self angle determined by Murphy, Ackermann and Handgraaf (2011), indicating an extremely pro-self orientation consistent with the competitive social value orientation. Since the data of this participant was still valuable to the analysis as pro-self individual, the social value orientation of this participant was recoded into pro-self.

Results

The analysis is conducted with a mixed design ANOVA. Before interpreting the outcome of the mixed design ANOVA, its assumptions were tested. The Kolmogorov-Smirnov statistic was used to test the assumptions of normality and it indicates that the normality assumption is not met. The assumption of homogeneity of the variance was not violated because the Levene's test showed non-significant outcomes. All effects are reported as significant at $p < .05$.

The design of the present study is a 2 (*timing reward*: reward after joint action vs. reward before joint action) x 2 (*reward*: receiving a reward vs. not receiving a reward) x 2 (*SVO:* pro-self vs. pro-social) x 2 (*Endgame:* number of cooperative decisions in de first five rounds of the repeated prisoner's dilemma vs. number of cooperative decisions in the last five rounds). First, the 2 (*timing reward*: reward after joint action vs. reward before joint action) x 2 (*reward*: receiving a reward vs. not receiving a reward) interaction, as described in the first hypothesis, was examined. The findings show that there is no significant interaction effect between timing and reward on the combined dependent variables, F (1,68) = 2.073, p = .154, partial η^2 = .030. This finding suggest that getting a reward or getting no reward at different times did not influence the level of cooperativeness during the repeated decision-making task.

Second, the 2 (*timing reward*: reward after joint action vs. reward before joint action) x 2 (*reward*: receiving a reward vs. not receiving a reward) x 2 (*SVO:* pro-self vs. pro-social)

interaction, as described in the second hypothesis, was examined. It is expected that there is a larger differences between the conditions for the pro-self compared to the pro-socials. However, the data of the mixed design ANOVA does not support this expectation. The interaction effect between timing, reward and social value orientation on the combined dependent variables is not significant, F (1,68) = .390, p = .534, partial η^2 = .006, indicating that differences in reward, timing and social value orientation have no significant effect on the number of cooperative decisions made during the repeated decision task.

Then, it was examined whether there was a main effect for the endgame, as stated in the third hypothesis. It was expected that there will be less cooperative decisions during the last five rounds of the repeated decision task compared to the first five rounds, based on the endgame theory of Normann and Wallace (2011). The mixed design ANOVA shows that there is a significant main effect of endgame, F (1,68) = 40,014, $p < .001$, partial η^2 = .370, indicating that there was a significant difference between the extent of cooperative decisions between the first five decisions and the last five decisions which supports the third hypothesis. A pairwise comparison revealed that the average of the first five decisions in the decision task (M = 3.277, SD = .202) was significantly higher than the average if the last five decisions in the decision task (M = 2.399, SD = .231).

The fourth interaction that was examined was the 2 (*timing reward*: reward after joint action vs. reward before joint action) x 2 (*reward*: receiving a reward vs. not receiving a reward) x 2 (*Endgame:* number of cooperative decisions in de first five rounds of the repeated prisoner's dilemma vs. number of cooperative decisions in the last five rounds) interaction, as stated in the third hypothesis. It was expected that for participants who received a *reward after* the joint action task the endgame effect will be less present. However, the results show that the interaction between timing and reward on endgame was not significant, F (1,68) =1.678, p =.200, partial η^2 = .024. The means and standard errors are presented in table 2. In other words, timing and reward did not have significant influence on the course of the prisoner's dilemma and therefore the fourth hypothesis is not supported. Looking at the effect of reward and timing on the endgame separately, also no significant effects were found, timing F (1,68) = 2.285, p = .135, partial η^2 = .033; reward F (1,68) = 2.324, p = .132, partial η^2 = .033.

Table 2

Means and standard errors of the 2 (timing reward: reward after joint action vs. reward before joint action) x 2 (reward: receiving a reward vs. not receiving a reward) x 2 (endgame: first five rounds vs. last five rounds) design.

Timing	Reward	Endgame	Mean	Std. Error
Before	NO	First 5	3.19	.46
		Last 5	1.71	.53
	YES	First 5	4.03	.38
		Last 5	3.33	.43
After	NO	First 5	2.94	.41
		Last 5	2.24	.46
	YES	First 5	2.96	.36
		Last 5	2.32	.42

Exploring the data further, none of the other interactions was significant. However, the influence of social value orientation on endgame was marginal significant, F (1,68) = 2.613, p = .056, partial η^2 = .053. This marginal significant p-value indicates that there might be a difference between the endgame effect of pro-social individuals and pro-self individuals. The profile plot in figure 4 shows the course of the prisoner's dilemma of the pro-social individuals and the pro-self individuals. A pairwise comparison revealed that pro-social individuals were more cooperative (M = 3.371, SD = .287) at the first half of the game compared to pro-self individual (M = 3.182, SD = .283). However this difference was not significant, F (1,68) = .221, p = .640, partial η^2 = .0003. In the second half of the game, pro-social individuals again scored higher on cooperation (M = 2.764, SD = .328) compared to pro-self individuals (M = 2.034, SD = .324), although this difference was not significant. F (1,68) = 2.508, p = .118, partial η^2 = .036. However, both pro-social and pro-self individuals showed a significant endgame effect (pro-social, F (1,68) = 9.446, p = .003, partial η^2 = .122; pro-self, F (1,68) = 34.731, p < .001, partial η^2 = .338). The findings of the pairwise comparison are visualised in figure 4.

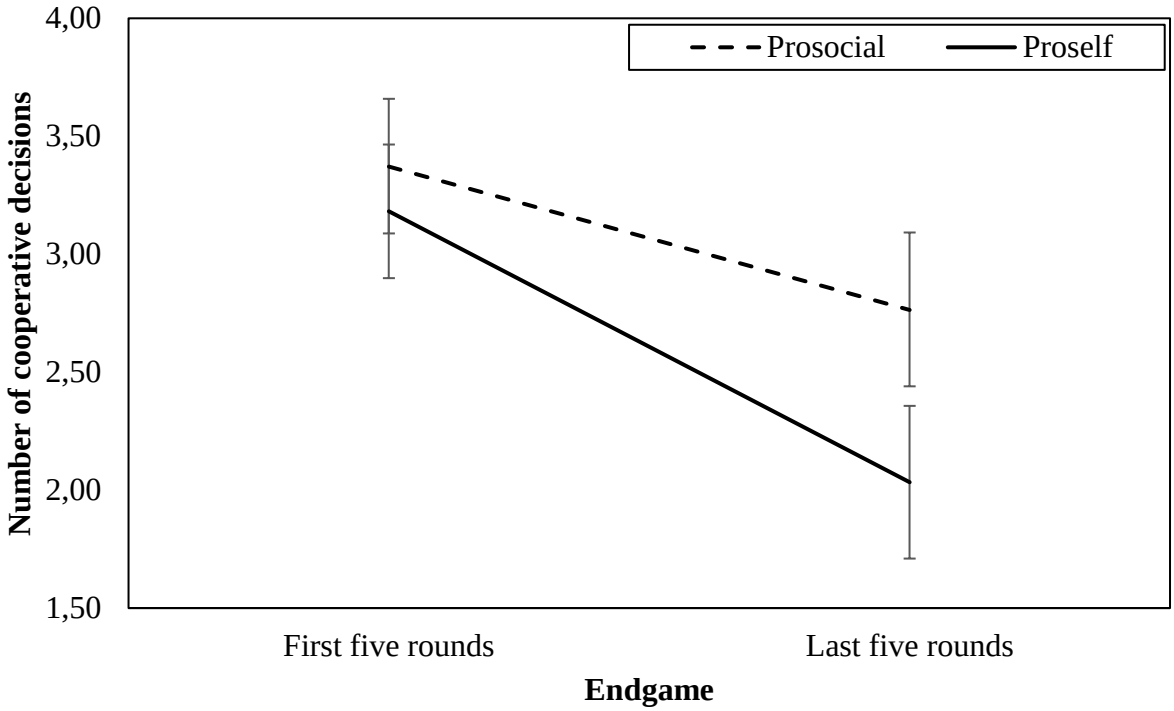

Figure 4. Number of cooperative decisions representing to what extent participants chose to cooperate during the first and last five decisions of the repeated decision task. The error bars show the standard errors.

Discussion and conclusion

The purpose of the present study was to investigate to what extent people's choices to cooperate are motivated by a collective goal. Marien and Greene (in prep.) already found that an interaction of action-outcome learning and reward learning can influence the extent of choices to cooperate in a joint action setting. To examine if these choices to cooperate are motivated by a collective goal, the present study elaborated the findings of Marien and Greene (in prep.) by performing a laboratory experiment to examine a characteristic of goal-directed behaviour, namely persistency (Locke, Shaw, Saari, & Latham, 1981). The central question of the present study was: *To what extent influences a joint action outcome, paired to a positive signal, ones persistency to continue to cooperate?*

The first hypothesis expected that participants who repeatedly received a reward after the joint action task will cooperate more during the following repeated decision task, compared to the participants in the other three conditions of the 2x2 interaction where they received no reward, or a reward before the joint action task. The findings do not support this expectation since there was no effect of the interaction between reward and timing on the

combined dependent variables *First5D* and *Last5PD*. In short, getting a reward or getting no reward at different timings, does not influence the level of cooperativeness during the decision-making task. This non-significant result contradicts the findings of the study of Marien and Greene (in prep.), where they did find that the *reward after* condition showed the highest cooperation rate. An explanation for this contradiction could be the underpowered sample size of the present study. Because of the 2x2 interaction, there were only 14-22 participants per cell, which makes the power to detect differences relatively small. It turned out to be harder than expected to get the lab sessions completely full. Another possible explanation for the contraction between the present study and the study of Marien and Greene (in prep.) is the difference in the decision-making task used to measure the cooperation rate. Where Marien and Greene (in prep.) used an one-shot prisoner's dilemma, the present study used a repeated prisoner's dilemma. The main difference is that the participants in the present study made their decisions, including the first, with the knowledge that there will be ten similar decisions during the task. This could have influenced the decision-making tactics of all participants and also the impact of the manipulation by reward and the timing of the reward. To measure the effects of the different cooperation measure instruments, future research should compare the two instruments to see if there is a clear difference of impact.

Because the study of Marien and Greene (in prep.) found a difference in impact of the *reward after* manipulation on cooperative behaviour between pro-social and pro-self individuals, the second hypothesis stated that the manipulation (*reward after*) during the joint action task was expected to have a larger impact on the motivation to cooperate for pro-selfs than for pro-socials (as measured with the SVO). This hypothesis was not supported either. This result contradicts the findings of the previous study of Marien and Greene (in prep.). They found that pro-selfs were more easily influenced by the manipulation. It could be the case that, again, the small sample size of the present study influenced the present findings. While the number of participants per cell of the 2x2 interaction described in the first hypothesis where already low, measuring the interaction between the manipulation (reward and timing) and SVO, also the pro-self and pro-socials were distinguished per cell leaving between six and fourteen participants in each subgroup. These extremely low numbers of participants per subgroup makes measurement of interaction between reward, timing and SVO less reliable. Future research should be performed with a larger sample size to make the analysis more reliable.

With the mixed design ANOVA, the expected endgame and factors that may affect the endgame were examined. The third hypothesis stated that there will be less cooperative

decisions during the last five rounds of the repeated decision task compared to the first five rounds, based on the endgame theory of Normann and Wallace (2011). In line with the study of Normann and Wallance (2011), this hypothesis was supported. The number of cooperative decisions made during the first five rounds were significantly higher than the number of cooperative decisions made during the last half of the decision-making task. However, there was no significant difference shown between the endgame effects of the participants, which contradicts the fourth and last hypothesis. It was expected that participants in the *reward after* condition would cooperate more during the last five rounds, showing less or no endgame effect compared to the participants in the other three conditions. In line with the findings of 2x2 interaction as described in the first hypothesis, the manipulation with reward and timing had also no significant impact on the endgame. Only the marginal significant result of the interaction between endgame and SVO indicate that there might be a difference between the endgame effect of pro-social individuals and pro-self individuals, where the pro-self individuals show a slightly larger endgame effect then the pro-social individuals. Even though this interaction is not significant, it indicates an interesting new link between the end game and social value orientation. As the endgame was more pronounced for pro-self individuals, the manipulation to reduce the endgame effect might have only effect for pro-self individuals and not for pro-social individuals, suggesting that future research should mainly focus on pro-self individuals. Further research on this interaction should give new insight in both research areas and could link them together.

Together, the findings on these four hypotheses form the answer to the central question, as stated at the start of the present study. Unfortunately, most of the hypotheses, which were formulated based on existing literature, were not supported by the present findings. No effect of the positive experience with cooperation during the joint action was found on the motivation to cooperate later on. This was measured with the combination of action-outcome learning and reward learning, as used in the study by Marien and Greene (in prep). With the repeated prisoner's dilemma, the persistency of the decision-making behaviour was measured. Overall, the motivation to cooperate declined during the last five decisions, showing no persistency until the end of the task. There were no significant differences between the four conditions in cooperative behaviour and its persistency

Strengths, limitations, and future directions

Two limitations can be defined which had strong influence on the present findings. The first limitation is that, after the data gathering, a programming error has been detected. Where the participants were told that during the decision-making task they would be matched

with one other participant for all the ten decisions, this appeared to be programmed wrong resulting in a randomization error. Unfortunately, this programming error had a major effect on the data of the decision-making task. Because of the repeated prisoner's dilemma, participants make their choices in response to the decisions of the other. However, because of the error, these cooperation interactions between the participants were disturbed. Before the task started, participants were informed by a written instruction that they would be cooperating with one participant during the whole task, so perceptually seen the error had no effect. However, it could have influenced the decisions they made during the task. In light of this limitation, future research should re-test these cooperation interactions in a setting where the participants are matched with the same person during the whole task in order to see if the decision-making patterns differ compared to the ones of the present study.

A second limitation of the study is the sample size. Prior to the collection of data, a power analysis was conducted in order to determine the desired number of participants. The power analysis determined that 96 participants were desired, but only 76 individuals participated in the experiment. The experiment was conducted in the ELSE lab of the University of Utrecht, where they work with a large participants pool. Unfortunately, when participants signed in for the experiment, they did not always show up. A direct consequence is the small sample sizes per cell of the design, influencing the reliability of the results. In light of this limitation, future research should repeat the study with a larger sample size to increase the reliability of the results.

Despite these limitations, the present study also has a number of strengths. Firstly, the current study adds new ideas and insights to the existing research on shaping collective goals by extending the research of Marien and Greene (in prep.) and integrating research areas. Combining action-outcome learning, reward learning, research on joint action and research on the endgame effect makes this study innovative. Second, using the software program z-Tree made it possible to create a representative cooperative setting where participants actually worked together with another participant and actually received the rewards which were showed to them during the tasks. This has a positive influence on the reliability of the present findings.

To conclude, the findings of the present study extend and integrate previous research on shared goal formation by an interaction of action-outcome learning and reward learning (Marien, Aarts & Custers, 2013; Marien, Aarts & Custers, 2015; Marien & Greene, in prep.) with research on the end game effect (Normann & Wallace, 2011). Both research areas are already examined, but combining them is what makes the present study innovative. Mainly

because of the programming error and the small sample size, the present study cannot give complete understanding of the interaction between the two areas yet, but with this study the first step is made. The research design of the present study offers the opportunity to investigate persistency in cooperative behaviour, as a known characteristic of goal-directed behaviour. Future research is needed to complete the present study in investigating to what extent people's choices to cooperate are motivated by a collective goal and to fully understand how people make their choices to cooperate (e.g., intuitive vs. deliberate) and how choices can be stimulated.

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