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## Article

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Games

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## Article

# The Impact of Order Effects on the Framing of Trust and Reciprocity Behaviors

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**Abstract:** Trust and reciprocity have paramount importance in cooperative relationships. The influence of psychological effects such as framing and anchoring on trust and reciprocity has been investigated; however, the impact of an order effect on them is still unexplored. The goal of our study was to examine how order impacts the framing of trust and reciprocity by manipulating framing and order as within- and between-subjects factors, respectively. Different groups of participants first completed two framings of the one-shot trust game (give vs. take frame) in a counterbalanced order (give first and then take second vs. take first then give second) in the role of trustors or trustees and rated the expectations of their counterparts' decisions afterward. Our results revealed higher trust in the take than give frame in the first decision and a reverse outcome in the second decision due to strong anchoring. Reciprocity was higher in the give than take frame in the first decisions, and no difference in the second decisions was observed due to weak anchoring. Anchoring also caused an order effect in trust and reciprocity, with higher trust when the take frame was played first, and higher reciprocity when the give frame was played first. Our results contribute to our knowledge about situational factors that shape trust and reciprocity, highlighting the impact of the context of the decision environment in terms of the impact of the order on framing.

**Keywords:** order effects; framing effects; anchoring bias; trust; reciprocity; trust game; uncertainty



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## 1. Introduction

Humans are highly social and cooperative animals, and cooperation is the cornerstone of societies and individuals' prosperity [1,2]. Two core human capacities in cooperative social behavior are trust toward others and reciprocity toward those who have trusted [3]. Trust is defined as the willingness to accept the vulnerability of betrayal based upon an expected reward due to another party's anticipated reciprocity [4]. In contrast, reciprocity is a response to a positive (or negative) action with another positive (or negative) action [5]. Trust initiates cooperative behavior. The subsequent reciprocity strengthens such prosocial inclination, both leading to the formation of social affiliation [5]. Yet, regarding the hypothetical and actual gain/loss evaluations inherent in reciprocity and trust, respectively [6], both behaviors comprise a social dilemma made up of the conflict between betrayal and reward for the trustor and social motivations for the trustee. On the one hand, trustors do not know about the prospective behavior of trustees, thus they infer the intention from

their partners' uncertain expected behavior. On the other hand, trustees are already aware of trustors' decisions and attribute intentions to their partners' real observed behaviors [7]. Therefore, trust entails social uncertainty, and reciprocity relates to social intention-based motivations [3].

To resolve the social dilemma, heuristic strategies are implemented—utilizing different cognitive and social appraisal functions [4,8,9]—that lead to boundedly rational decisions [10]. Trustors focus only on cues that are easily processed and sufficiently valid [11] without carefully taking the perspective of trustees [12–15]. In contrast, trustees only attend to their own payoffs and are unwilling to take the perspective of trustors [12,16]. Both trust and reciprocity are context-dependent and, given their heuristic nature, can be examined by psychoeconomic effects such as framing or order. Motivated by prior research on the effect of order on social behaviors, we investigated how order affects trust and reciprocity toward strangers and their framing.

Within the field of decision-making, the way of information presentation (e.g., gain vs. loss frame) has been shown to influence people's strategy and their subsequent decisions. Prospect theory calls this phenomenon the “framing effect,” whereby people consider losses more salient than gains in nonsocial economic decisions [17]. Regarding framing in social domains, intentions play a more critical role than monetary gain/losses. Studies on social framing show frame-induced alterations in social cognitive functions in addition to pure monetary motivations (e.g., loss aversion), including changes in the perceived intention of the partner or oneself and differences in perspective-taking [18–21]. Therefore, a body of evidence suggests that the formation of cooperative social behavior depends on the context of social interactions, which can be provided via different framings based on economic exchange games.

Variations of the two-person sequential reciprocal investment game—involving player one (trustor) and player two (trustee)—have become the paradigm of choice for measuring trust and reciprocity under different framings [3]. Berg, Dickhaut, and McCabe introduced the trust game (TG) that represents the give frame (G-Frame) with the default of no trust [22]. In the TG, both players receive an endowment at the beginning of the game (e.g., \$10). First, the trustor can decide whether to keep the endowment or to give any amount of it to the trustee  $X \in [\$0, \$1, \dots, \$10]$ , which then is tripled by the experimenter and sent to the trustee. Then, the trustee decides to return any amount of the received money  $Y \in [\$0, \$1, \dots, \$10 + 3 \cdot X]$  to the trustor. In contrast, Bohnet and Meier introduced the distrust game (DTG) that represents the take frame (T-Frame) with the default of full trust [16]. In the DTG, the trustor is endowed with \$0, and the trustee with \$40. First, the trustor decides whether to leave the trustee with the endowment or takes  $Z \in [\$0, \$3, \dots, \$30]$  from the trustee ( $Z = 3 \cdot (\$10 - X)$ ,  $X \in [\$0, \$1, \dots, \$10]$ ), which is then divided by the experimenter and sent to the trustor. Next, the trustee decides how much of the remaining money to send to the trustor  $Y = [\$0, \$1, \dots, \$40 - Z]$ . Importantly, both games differ only in the starting point (i.e., no trust [G-Frame] vs. full trust [T-Frame]) but not in their payoff space, and the distrust measured in T-Frame can be converted into trust ( $X = \$10 - Z/3$ ) and is therefore comparable with the trust measured in the G-Frame.

Framing has many real-life parallels in realms such as medicine (patients generally believe in their doctor's integrity), education (parents typically trust their children's teachers), and law (clients mostly have confidence in their attorneys) [23,24]. Therefore, it is important to compare trust and reciprocity behaviors under both frames. Previous research indicates that framing (G vs. T) using investment games (TG vs. DTG) influences trust and reciprocity differently. On the one hand, the direction of the framing effects regarding trust is mixed. Employing a between-subjects one-shot game design, Bohnet and Meier showed higher trust in the T- than G-Frame due to the inaccuracy of perspective-taking of the trustors about the impact of their behavior on their partners' intention [16]. However, Reimann et al., implementing a counterbalanced within-subjects study design, demonstrated a reverse framing effect with higher trust in the G- than T-Frame [25]. Finally, Zhang et al. reported similar results but employed an iterated between-subjects one-shot game

design [25]. They attribute their results to the trustors' accurate expectations about trustees' reciprocity and understanding of the game rules regarding the two frames, probably due to playing several game rounds with different partners.

In contrast, the direction of the framing effects regarding reciprocity is consistent: lower reciprocity is observed in the T- than G-Frame in all previous work [16,23–25]. The reasons are the different underlying intention-based motivations related to each frame. Any distrust amount in the G-Frame is perceived as an act of omission while an act of commission in the T-Frame, inducing less trustworthiness and more punishment under the T-Frame [16]. The reciprocal response to omission vs. commission is congruent with previous literature stating that the more benign the trustee perceives the trustor's intentions of action, the more they will honor trust [26–28]. Overall, emerging evidence indicates that framing influences trust via perspective-taking and reciprocity via intention-based motivations, but the impact of order effects on framing of trust and reciprocity is still unexplored. Since we use single-shot versions of T- and G-Frame, our study results were based on Bohnet and Meier's work [16].

The formation of social cooperative behavior depends on the environment and the configuration of decisions, such as order. In sequential task decisions under different contexts, individuals may judge their preference for attributes or options by comparing them to options or attributes in earlier tasks. Therefore, different orders for presenting sequential tasks can alter judgments and decisions—a phenomenon defined as “order effect” [29]. The presence of the order effect has been demonstrated in many domains, including self-report questionnaires [30–32], economic surveys [33], preference judgments of goods, and advertising [34]. The underlying mechanism of order effects is attributed to anchoring [35,36], whereby initial exposure to a task or stimuli activates a cognitive content that endures and affects later decisions [37]. A plethora of anchoring studies shows that the difficulty in assessing the probabilities and likely consequences in economic decision-making under valuation and uncertainty leads to egocentric judgments [38]. These judgments begin with a spontaneous consideration of one's comprehension, skills, or perspective on the world. They will be followed by final judgments that are likely the product of insufficient adjustment from these self-generated anchors [39]. Most notably, anchoring impacts social norms [40], and the presence of numerical anchors manipulates the entrusted amounts in the TG [41].

Regarding the order effect in social interactions, several studies show that the order of decision tasks matters, as the first decision alters the second. An order effect among five-years-old children's decisions playing the dictator game (DG) has been reported, where the children share more with their friends and less with strangers only if they played with their friends but not with strangers first [42]. In contrast, no order effect among younger children (ages of 3 to 4 years old) was reported when playing a DG and ultimatum game (UG) [43,44], suggesting the inability to evaluate their counterparts' intentions. Further, responders demand more amounts and reject lower amounts but only when they play the no-veto-cost (NVC) game before the UG (Note that the NVC is similar to UG in which the proposer loses the endowment if the responder rejects their offer, but the responder does not face any cost) [45]. Moreover, participants take less when the DG is played first and destruct less when the joy of destruction game is played first [46]. Whereas it is possible to take some of the endowed money from others in the DG, all of the others' endowment could be destructed in the joy of destruction game with the possibility of adding some of their money for others. Overall, previous evidence suggests that the order of decisions matters in social interactions.

However, no study on order effects in trust and reciprocity decisions exists. Although framing effects and anchoring bias are frequently investigated, order effects in economic exchange games are understudied. Further, previous studies considered order effects in economic games primary as an intervention factor that can be controlled by counterbalancing the task order with a within-subjects design whereby each group of participants interacts with different task orders [47]. Hence, the underlying mechanism of order effects has not

been explored in social interactions. Related to social interactions in TG, despite a couple of studies dealing with anchoring bias in trust decisions [43,44], the impact of the order effects on trust and reciprocity under different framings has not been explored yet. Moreover, there is no in-depth comparison of the impact of anchoring bias on social behaviors of trust and reciprocity that are distinct in nature, since trust involves uncertainty whereas reciprocity does not. Therefore, our study sheds light on how the initial encounter in trust or reciprocity can direct subsequent decisions under a different context. Our results may provide insights about the impacts of order and/or anchoring on other social interactions with or without uncertainty, in addition to having practical implications for designing behavioral tasks for social interactions.

The goal of our study was to investigate how the order effect impacts the framing of trust and reciprocity as measured with a one-shot TG (G-Frame) and a one-shot DTG (T-Frame). A cohort of healthy adults was randomly assigned into two groups of trustors or two groups of trustees interacting with each other by completing the games in a counterbalanced order (playing either the G-T-Frame or T-G-Frame order). The two trustor groups started both games first, and about four weeks later, their decisions were matched with the decisions of the two other trustee groups. After completing their games, trustor and trustee groups reported their expectations about their anonymous partners' behaviors to provide additional support for mechanisms underlying order or framing effects. Our factorial design with Frame (G, T) as a within-subjects factor and Order (G-T, T-G) as a between-subjects factor allowed us not only to investigate the order effects on trust and reciprocity but also the framing effects of trust and reciprocity independently (comparing only the first decisions) and dependently (comparing first and second decisions) of order.

Overall, we hypothesized an order effect for trust and reciprocity but with a different impact on the original framing effect of trust and reciprocity. First, we predicted replications of a framing effect for first trust and reciprocity decisions: (i) higher trust in T- than G-Frame due to trustors' inaccuracy in the perspective-taking about the impact of their behavior on their partners' intention and (ii) higher reciprocity in G- than T-Frame due to an act of omission in the former vs. an act of commission in the latter frame [16]. Second, we conjectured an order effect for trust and reciprocity decisions with the first frame played acting as an anchor: (i) higher average trust in the order switching from a G- to T-Frame and (ii) higher average reciprocity in the order switching from a T- to G-Frame, both compared to the opposite orders. The anchoring bias also leads to differences in both trust and reciprocity decisions when comparing first (i.e., unanchored) and second (i.e., anchored) decisions. Finally, we assumed an impact of order effects on framing of trust and reciprocity decisions due to anchoring: (i) no differences in trust between the two framings in each order leading to a framing effect in the second decision due to strong anchoring based on the uncertain nature regarding the trustee's intention and (ii) difference in reciprocity between the two framings in each order leading to no framing effect in the second decision due to weak anchoring based on certain nature of the trustor's intention. Consequently, an overall framing effect across the two frames played in different orders would disappear for trust but not for reciprocity.

## 2. Results

### 2.1. Control Measures

Table 1 shows the descriptive statistics of demographics and self-report questionnaire control measures for the four groups: trustor (To) in G-T order (To: G-T); To in T-G order (To: T-G); trustee (Te) in G-T order (Te: G-T); and Te in T-G order (Te: T-G). Both demographics and self-report questionnaire control measures were matched across groups.

**Table 1.** Descriptive (mean  $\pm$  standard deviation) and inferential statistics ( $p < 0.05$ ) of demographics and self-report control questionnaire measures of four groups of participants with different frame orders (G-T: Give-Frame then Take-Frame or T-G: Take-Frame then Give-Frame).

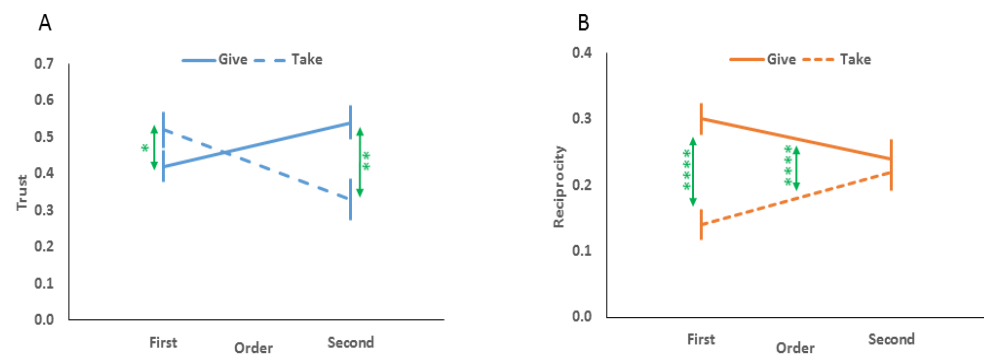
	Trustor Groups		Trustee Groups		Statistics		
	G-T (n = 40)	T-G (n = 43)	G-T (n = 41)	T-G (n = 47)	F-Value	p-Value	$\eta_p^2$
<b>Demographics</b>							
Age	19.09 $\pm$ 1.02	19.67 $\pm$ 1.85	19.57 $\pm$ 1.57	19.67 $\pm$ 1.77	1.14	0.33	0.01
Gender	1.49 $\pm$ 0.50	1.48 $\pm$ 0.50	1.49 $\pm$ 0.50	1.50 $\pm$ 0.50	0.01	0.99	0.00
SES	5.47 $\pm$ 1.07	5.22 $\pm$ 1.50	4.98 $\pm$ 1.37	5.33 $\pm$ 1.38	0.90	0.43	0.01
<b>NEO Personality Inventory</b>							
Trust Trait	28.05 $\pm$ 4.60	27.48 $\pm$ 4.77	27.36 $\pm$ 5.20	27.67 $\pm$ 4.95	0.21	0.89	0.00
<b>Interpersonal Reactivity Index</b>							
Perspective Taking	17.63 $\pm$ 3.92	17.59 $\pm$ 3.29	17.55 $\pm$ 3.55	19.19 $\pm$ 3.51	2.35	0.07	0.03
Fantasy	18.37 $\pm$ 4.30	17.00 $\pm$ 4.15	15.91 $\pm$ 4.36	16.29 $\pm$ 3.97	1.13	0.34	0.01
Empathic Concern	19.23 $\pm$ 3.56	19.26 $\pm$ 3.85	17.70 $\pm$ 4.52	18.65 $\pm$ 3.85	1.54	0.20	0.02
Personal Distress	14.77 $\pm$ 3.86	15.09 $\pm$ 4.20	14.51 $\pm$ 3.99	14.27 $\pm$ 3.42	0.48	0.69	0.00
<b>Dispositional Moral Sensitivity Questionnaire</b>							
Empathic Guilt	23.60 $\pm$ 5.59	23.43 $\pm$ 6.38	21.98 $\pm$ 6.96	23.60 $\pm$ 5.79	0.78	0.50	0.01
Tendency to Punishment	12.67 $\pm$ 6.05	12.39 $\pm$ 5.77	11.70 $\pm$ 4.51	13.54 $\pm$ 5.19	1.15	0.33	0.01
Intrusiveness of Empathy	16.47 $\pm$ 4.98	16.28 $\pm$ 6.22	14.94 $\pm$ 6.73	15.81 $\pm$ 5.25	0.74	0.52	0.01
Frequency of Perception	9.30 $\pm$ 4.53	9.91 $\pm$ 4.96	8.57 $\pm$ 3.56	10.19 $\pm$ 3.63	1.61	0.18	0.02
Sympathetic Imagination	9.09 $\pm$ 2.82	8.35 $\pm$ 4.21	7.34 $\pm$ 3.57	8.02 $\pm$ 3.54	2.01	0.11	0.03
Beliefs in Reciprocity	39.81 $\pm$ 8.37	41.54 $\pm$ 8.00	39.45 $\pm$ 7.61	39.98 $\pm$ 5.74	1.10	0.35	0.01
<b>Personal Norm of Reciprocity</b>							
Positive Reciprocity	52.26 $\pm$ 7.01	50.98 $\pm$ 7.29	51.45 $\pm$ 6.63	51.92 $\pm$ 5.66	0.33	0.80	0.00
Negative Reciprocity	34.86 $\pm$ 9.83	35.02 $\pm$ 10.30	33.28 $\pm$ 9.22	35.58 $\pm$ 7.18	0.80	0.49	0.01
<b>Perception of Betrayal Scale</b>							
Preoccupation with Betrayal Events	32.95 $\pm$ 12.58	31.30 $\pm$ 11.6	34.89 $\pm$ 13.50	37.46 $\pm$ 12.32	1.72	0.16	0.02
Betrayal Causing Life Change	21.93 $\pm$ 7.66	21.59 $\pm$ 8.29	20.34 $\pm$ 7.63	23.35 $\pm$ 8.52	0.94	0.41	0.01
Lack of Trust Due to Betrayal	23.37 $\pm$ 7.31	24.22 $\pm$ 8.01	21.74 $\pm$ 8.14	24.40 $\pm$ 8.27	1.05	0.37	0.01
Betrayal Leading to Traumatic Changes	14.23 $\pm$ 5.10	12.96 $\pm$ 5.21	14.51 $\pm$ 6.23	14.83 $\pm$ 5.25	0.95	0.41	0.01

SES, socioeconomic status (assessment of someone's perceived rank relative to others in terms of their job, income, and education on a scale of one to ten [48]).

## 2.2. Game Measures

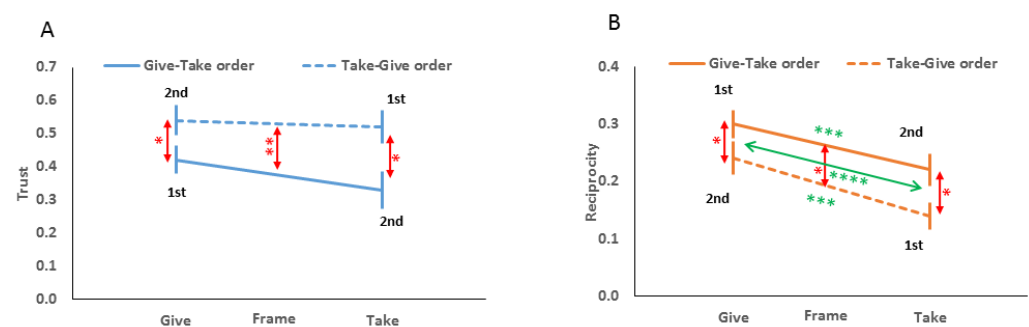
First, an independent samples *t*-test separately for trust and reciprocity decisions was performed to test the replication of between-group framing effects on trust and reciprocity decisions. Comparing the first decision between trustor (To: G vs. To: T) and trustee (Te: G vs. Te: T) groups revealed higher trust in T- than G-Frame ( $t(81) = -1.75, p < 0.05, d = 0.38$ ) (Figure 1A) but higher reciprocity in G- than T-Frame ( $t(86) = 4.90, p < 0.001, d = 1.05$ ) (Figure 1B). In addition, comparing the second decision between trustor (To: G vs. To: T) and trustee (Te: G vs. Te: T) groups revealed higher trust in G- than T-Frame ( $t(81) = 2.88, p < 0.01, d = 0.64$ ) (Figure 1A) but similar reciprocity in both frames ( $t(86) = 0.71, p = 0.47, d = 0.15$ ) (Figure 1B).





**Figure 1. Framing effects on trust and reciprocity. (A). Trust.** Comparing the first decision between trustor groups (Give-Frame [G-Frame], Take-Frame [T-Frame]) revealed higher trust in T- than G-Frame, whereas comparing the second decision showed higher trust in G- than T-Frame. The overall framing effect for trust disappeared when frames were compared for both decisions based on the reverse framing effects for the first and second trust decisions. **(B). Reciprocity.** Comparing the first decision between trustee groups (G-Frame, T-Frame) demonstrated more reciprocity in G- than T-Frame, but comparing the second decisions showed similar reciprocity for both frames. The overall framing effect for reciprocity remained intact, driven by the framing effect of the first decision. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*\*  $p < 0.001$ , green color: framing effect.

Next, a  $2 \times 2$  analysis of variance (ANOVA) separately for each of trust and reciprocity decisions was conducted with Frame (G, T) as a within-subjects factor and Order (G-T, T-G) as a between-subjects factor. For trust decisions, the ANOVA revealed a significant main effect of Order ( $F(1,81) = 7.53$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.08$ ) but no main effect of Frame ( $F(1,81) = 1.10$ ,  $p = 0.168$ ,  $\eta_p^2 = 0.02$ ) and no interaction effect of Frame  $\times$  Order ( $F(1,81) = 0.75$ ,  $p = 0.38$ ,  $\eta_p^2 = 0.00$ ) (Figure 2A). The post hoc  $t$ -test analysis for the main effect of Order showed that trust was higher in the T-G order than the G-T order ( $t(81) = -3.17$ ,  $p < 0.005$ ,  $d = 0.69$ ). Additional  $t$ -test analyses showed that trust was higher when the T-Frame was played as the first game ( $t(81) = 2.14$ ,  $p < 0.05$ ,  $d = 0.42$ ) and when the G-Frame was played the second ( $t(81) = 2.56$ ,  $p < 0.05$ ,  $d = 0.51$ ).

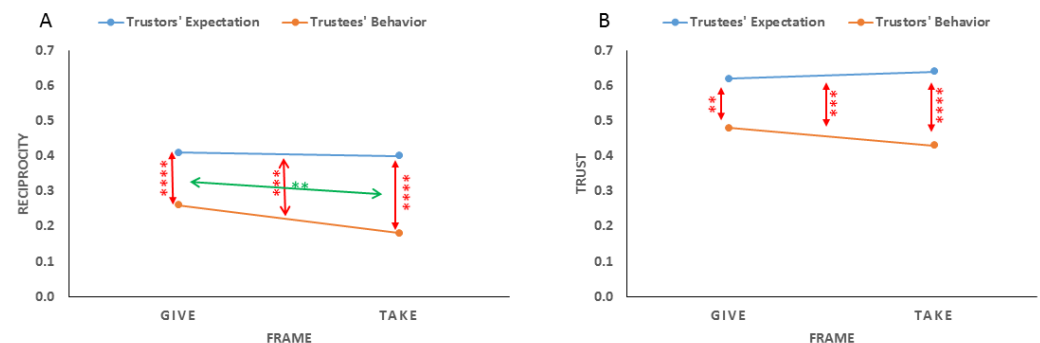


**Figure 2. Impact of order on framing of trust and reciprocity. (A). Trust.** An order effect was observed for trust with higher trust in Take-Give (T-G) than Give-Take (G-T) order. Trust was higher in the first than the second decision for the Take-Frame (T-Frame) but lower in the first than the second decision for the Give-Frame (G-Frame) due to an anchoring bias. Framing within each order disappeared due to strong anchoring to the first decisions. **(B). Reciprocity.** An order effect was detected with higher reciprocity in the G-T than T-G order. Reciprocity was lower in the first than second decision for the T-Frame but higher in the first than second decision for the G-Frame due to an anchoring bias. Framing within each order did not disappear due to weak anchoring to the first decisions. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.005$ , \*\*\*\*  $p < 0.001$ , red color: order effect, green color: framing effect.

For reciprocity decisions, the ANOVA revealed a significant main effect of Order ( $F(1,86) = 5.79, p < 0.05, \eta_p^2 = 0.06$ ) and Frame ( $F(1,86) = 23.02, p < 0.000, \eta_p^2 = 0.21$ ) but no significant interaction effect of Order  $\times$  Frame ( $F(1,86) = 0.16, p = 0.77, \eta_p^2 = 0.00$ ) (Figure 2B). The post hoc  $t$ -test analyses for the main effect of Order showed that reciprocity was higher in the G-T than T-G order ( $t(86) = 2.40, p < 0.05, d = 0.51$ ) and that reciprocity was higher in the G- than T-Frame for the main effect of Frame ( $t(87) = 4.85, p < 0.000, d = 1.03$ ). Additional  $t$ -test analyses demonstrated that reciprocity was higher when the G-Frame was played first ( $t(86) = 1.99, p < 0.05, d = 0.42$ ) and the T-Frame second ( $t(86) = 2.21, p < 0.05, d = 0.47$ ). Finally, reciprocity decreased when G-Frame was played first and then T-Frame ( $t(40) = 3.12, p < 0.005, d = 0.47$ ) whereas it increased when T-Frame was played first and then G-Frame ( $t(46) = 3.68, p < 0.005, d = 0.51$ ).

### 2.3. Expectation Measures

A  $2 \times 2$  repeated-measures ANOVA on differences between expected and real decisions was separately conducted for trustors and trustees with Frame (G, T) as a within-subjects factor and Congruence (Expectation, Behavior) as a between-subjects factor. For trustors, the two-way ANOVA revealed significant main effects of Frame ( $F(1,169) = 7.30, p < 0.01, \eta_p^2 = 0.04$ ) and Congruence ( $F(1,169) = 45.34, p < 0.001, \eta_p^2 = 0.21$ ) and a significant interaction effect of Frame  $\times$  Congruence ( $F(1,169) = 6.19, p < 0.05, \eta_p^2 = 0.03$ ) (Figure 3A). The post hoc  $t$ -test analyses for the main effects showed that difference of Congruence was lower in the G- than T-Frame ( $t(169) = 2.76, p < 0.01, d = 0.39$ ) (i.e., main Frame effect) and trustors expected higher reciprocity than trustees' real reciprocity ( $t(169) = 6.73, p < 0.001, d = 0.96$ ) (i.e., main Congruence effect). The post hoc  $t$ -test analysis for the interaction effect of Frame  $\times$  Congruence showed that trustors expected higher reciprocity than trustees' real reciprocity in the G-Frame ( $t(169) = 4.73, p < 0.001, d = 0.68$ ) and this difference was even more significant in the T-Frame ( $t(169) = 6.63, p < 0.001, d = 0.95$ ).



**Figure 3.** Player's expectations regarding partners' real behavior for trust and reciprocity. (A). **Trustors.** Trustors expected higher reciprocity than their partners' real reciprocity under both frames (Give [G], Take [T]). A framing effect was observed with a lower incongruency (Expectation, Reality) in the G- than T-Frame—being more evident in the T- than G-Frame. (B). **Trustees.** Trustees expected higher reciprocity than their partners' real trust under both frames (G, T). \*\*  $p < 0.01$ , \*\*\*  $p < 0.005$ , \*\*\*\*  $p < 0.001$ , red color: Congruence, green color: framing effect.

For trustees, the two-way ANOVA revealed a significant main effect of Congruence ( $F(1,169) = 17.97, p < 0.001, \eta_p^2 = 0.09$ ) but no main effect of Frame ( $F(1,169) = 0.30, p = 0.58, \eta_p^2 = 0.00$ ) and no interaction effect of Frame  $\times$  Congruence ( $F(1,169) = 1.10, p = 0.16, \eta_p^2 = 0.01$ ) (Figure 3B). The post hoc  $t$ -test analysis for the main effect of Congruence showed that trustees expected higher trust, but trustors' real trust was lower ( $t(169) = 4.23, p < 0.001, d = 0.60$ ).



### 3. Discussion

Our study aimed to examine how order effects impact the framing of trust and reciprocity as measured with a one-shot TG (G-Frame) and a one-shot DTG (T-Frame). Interacting with each other, two groups of trustors and two groups of trustees completed two sequential exchange games in a counterbalanced order (G-T, T-G). Our factorial design enabled us to examine order effects on trust and reciprocity and framing effects on trust and reciprocity independently of (comparing only the first decisions) and dependently on (comparing first and second decisions) order. Our results first replicated previously reported framing effects for trust and reciprocity regarding the first decision: trust was higher in the T- than G-Frame due to trustors' inaccuracy in perspective-taking about the impact of their behavior on their partners' intention, and reciprocity was higher in the G- than T-Frame due to the difference in trustees' reciprocal responses to the act of omission versus commission. Our results further demonstrated an order effect for both trust and reciprocity, but in an opposite direction. Compared to the opposite order, higher trust was observed when changing from the T- to the G-Frame, but higher reciprocity from the G- to the T-Frame due to strong and weak anchoring, respectively. Our results finally revealed that anchoring to the first decision reversed the framing effect in the second decision only for trustors but removed the framing effect for trustees. Hence, an overall framing effect across the two frames played in different orders disappeared for trust but not for reciprocity due to the difference in the degree of anchoring for trust and reciprocity.

#### 3.1. Framing Effects for First Trust and Reciprocity Decisions

Our first hypothesis concerning the framing effect for first trust and reciprocity decisions was confirmed. The trustor group starting with the T-Frame (i.e., DTG) invested more money than the trustor group beginning with the G-Frame (i.e., TG), whereas the trustee group starting with the G-Frame reciprocated more than the trustee group beginning with the T-Frame. The underlying mechanism for the framing effect in trust is due to the inaccuracy in trustors' perspective-taking about the impact of their behavior on their partners' intention [16], and in reciprocity is due to the difference in the trustees' reciprocal responses to the act of omission vs. commission, reciprocating less (i.e., punishing more) for the commission of distrust than for the omission of trust [16,24,25]. Previous research suggests that both trust and reciprocity are boundedly rational decisions and are driven by heuristic strategies. While trustors generally focus on cues that are easily processed and sufficiently valid, trustees act egoistically [11] without carefully taking the perspective of their partners [12–15]. Our results regarding players' expectations support this argumentation, demonstrating that players' expectations regarding the partners' behaviors were significantly lower than their partners' real behaviors under both frames (and for trustor being even more inaccurate under the T- than G-Frame).

#### 3.2. Order Effects in Trust and Reciprocity Decisions

Our second hypothesis regarding an order effect in trust and reciprocity decisions was verified. Between both decisions, higher trust was observed when switching from a T- to a G-Frame, whereas higher reciprocity was observed when switching from a G- to T-Frame in comparison to the opposite frame orders. Our findings are consistent with previous research on order effects reported for social decision-making [45,46]. Anchoring to the initially played game elicits mental content that influences the later decision; i.e., for the order starting with a frame with higher trust or reciprocity, the overall trust or reciprocity across both decisions was higher compared to the opposite order due to anchoring to the first decision. Trust was higher (lower) in the first (second) than the second (first) decision (i.e., anchored decision) for the T-Frame. In contrast, reciprocity was lower (higher) in the second (first) than the first (second) decision in the G-Frame.

### 3.3. The Impact of the Order on Framing of Trust and Reciprocity Decisions

Our third hypothesis considering the influence of order on framings of trust and reciprocity decisions was proved. Regarding second decisions, trust was higher in the G- than T-Frame due to anchoring, reversing the initially observed framing effect for the first trust decision. However, reciprocity did not differ between frames that is in contrast with the initially observed framing effect for which the first reciprocity decision was higher in the G- than F-Frame. This difference between anchoring in trust and reciprocity is based on the uncertain nature of trust but not reciprocity, whereby trustors *infer* the intention from their partners' uncertain expected behavior, while trustees *attribute* intentions to their partners' real observed behaviors [7]. When frames were compared for both played orders, the framing effect disappeared in trustors being not capable of distinguishing between such framings due to strong anchoring but not in trustees being capable of distinguishing between such framings due to weak anchoring. This finding is congruent with previous research about the presence of the anchoring bias in decision-making under uncertainty, particularly in social uncertainty in trust decisions regarding the anchoring of social norms or numerical anchors [40,41]. As a consequence, based on the reverse framing effects for the first and second trust decisions, the overall framing effect for trust disappeared when frames were compared for both decisions together. However, this overall framing effect remains intact for reciprocity, which was driven by the first decisions.

## 4. Materials and Methods

### 4.1. Participants

Healthy students ( $n = 171$ , 85 males, age [mean  $\pm$  standard deviation] =  $19.50 \pm 1.58$  years) with no history of psychiatric and neurological disorders or head injury completed the study (i.e., experimental tasks and questionnaires). They were randomly assigned into four groups: trustor groups (To [ $n = 83$ ]: G-T [ $n = 40$ ]; To: G-T [ $n = 43$ ]) and trustee groups (Te [ $n = 88$ ]: G-T [ $n = 41$ ]; Te: T-G [ $n = 47$ ]) (Table 1). The study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee at Shenzhen University, China. Participants gave written informed consent for the study and received compensation as a constant attendance fee (¥100, approximately \$16) and a variable reward based on their decisions in games (from ¥0 to ¥40, approximately \$5.50).

### 4.2. Experimental Tasks

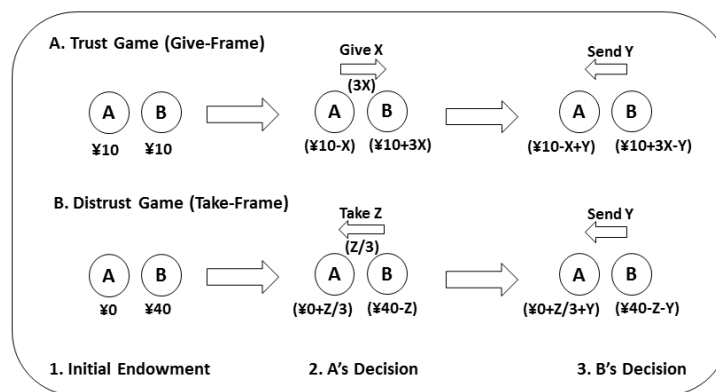
Participants completed two experimental tasks (trust games [G- and T-Frame] and an expectation task) and self-report control questionnaires.

#### 4.2.1. Trust Games

**Trust Game (G-Frame):** Both players A and B are endowed with ¥10. First, A decides whether to keep the endowment or send any amount  $X \in [\text{¥}0, \text{¥}1, \dots, \text{¥}10]$  (e.g., ¥5) to B, which is afterward tripled by the experimenter ( $3 \cdot X$ , ranging from ¥3 to ¥30) (e.g., if A sends ¥5 then B receives ¥15). Then, B decides whether to keep or return any amount  $Y \in [\text{¥}0, \text{¥}1, \dots, \text{¥}10 + 3 \cdot X]$  of the received money to A (Figure 4A).

**Distrust Game (T-Frame):** Only B is endowed with ¥40, and A has ¥0. First, A decides whether to leave the endowment to B or take any amount  $Z \in [\text{¥}0, \text{¥}3, \dots, \text{¥}30]$  ( $Z = 3 \cdot (\text{¥}10 - X)$ ,  $X \in [\text{¥}0, \text{¥}1, \dots, \text{¥}10]$ ) from B, which is afterward divided into three by the experimenter ( $Z/3$ , ranging from ¥1 to ¥10) (e.g., if A takes ¥6 then A receives ¥2). Then, B decides whether to keep or send any amount  $Y = [\text{¥}0, \text{¥}1, \dots, \text{¥}40 - \text{¥}Z]$  to A (Figure 4B).

Trust was calculated for the G-Frame as the amount given by A ( $X$ ) and for T-Frame as the amount not taken by A ( $\text{¥}10 - Z/3$ ). In contrast, reciprocity was calculated in both games as the ratio of the amount sent back by B ( $Y$ ) over the amount that B had before after A's decision [16].



**Figure 4. Types of game frames. (A). Trust Game (Give-Frame).** 1. **Initial Endowment.** Both players A and B are endowed with ¥10. 2. **A's Decision.** A decides whether to keep the endowment or send any amount  $X \in [\text{¥}0, \text{¥}1, \dots, \text{¥}10]$  to B, which is afterward tripled by the experimenter ( $3 \cdot X$ , ranging from ¥3 to ¥30). 3. **B's Decision.** B decides whether to keep or return any amount  $Y \in [\text{¥}0, \text{¥}1, \dots, \text{¥}10 + 3 \cdot X]$  of the received money to A. **(B). Distrust Game (Take-Frame):** 1. **Initial Endowment.** Only B is endowed with ¥40, and A has ¥0. 2. **A's Decision.** A decides whether to leave the endowment to B or take any amount  $Z \in [\text{¥}0, \text{¥}3, \dots, \text{¥}30]$  ( $Z = 3 \cdot (\text{¥}10 - X)$ ,  $X \in [\text{¥}0, \text{¥}1, \dots, \text{¥}10]$ ) from B, which is afterward divided by three by the experimenter ( $Z/3$ , ranging from ¥1 to ¥10). 3. **B's Decision.** B decides whether to keep or send any amount  $Y = [\text{¥}0, \text{¥}1, \dots, \text{¥}40 - \text{¥}Z]$  to A. Note that trust is calculated for the trust game as the amount given by A ( $X$ ) and for the distrust game as the amount not taken by A ( $\text{¥}10 - Z/3$ ), and reciprocity in both games as the ratio of the amount sent by B ( $Y$ ) over the amount that B had after A's decision.

#### 4.2.2. Expectation Tasks

After playing both games, players (trustor and trustee) were asked to estimate their partners (trustor and trustee) decision for both frames (expected reciprocity and trust).

#### 4.2.3. Self-Report Control Questionnaires

Based on the existing literature, several questionnaires that have been associated with trust and reciprocity were used to control for psychological traits in the experimental groups, including the trust trait (disposition to believe that others are honest and well-intentioned) in the Revised NEO Personality Inventory (NEO-PI) [49], Interpersonal Reactivity Index (IRI, measuring four scales related to empathy, including: perspective taking, fantasy, empathic concern, and personal distress) [50], Dispositional Moral Sensitivity Questionnaire (DMSQ, measuring tendency toward reflection, detection and explaining moral problems including five factors: empathic guilt, punishment, intrusiveness of empathy, frequency of perception and sympathetic imagination) [47], Personal Norm of Reciprocity (PNR, measuring three aspects of reciprocity including beliefs in reciprocity, positive reciprocity and negative reciprocity) [51], and Perception of Betrayal Scale (POBS, including four scales: preoccupation with betrayal events, betrayal causing life change, lack of trust due to betrayal, betrayal leading to traumatic responses) [52].

#### 4.3. Procedure

The experiment consisted of one session with trust games. Before the experimental tasks, participants filled out control measure questionnaires. Then, the two groups completed two one-shot trust games under the G- and T-Frame in a counterbalanced order: the first group played in G-T order and the second group in T-G order as trustors. About four weeks later, another two groups completed those games in a counterbalanced order: the third group played in G-T order and the fourth group in T-G order as trustees, whose decisions were matched with the trust decision of the previous groups. No deception was applied in this study, i.e., trustors and trustees had a real but delayed interaction, and the final payoffs were determined based on the decisions of both players. Overall, each player

made two one-shot decisions (Frame: G and T) as different players (Role: To or Te), each time with a different partner.

#### 4.4. Statistical Analyses

The statistical analyses were performed using the software package SPSS (version 26, IBM Corporation 2019) with a statistically significant threshold of  $p < 0.05$  (two-tailed). Note that a statistically significant threshold of  $p < 0.05$  (one-tailed) was applied due to our hypotheses on replicating the framing effects for trust and reciprocity for the first played game. Behavioral data were checked for assumptions of normal distribution (Kolmogorov–Smirnov test) and variance homogeneity (Bartlett’s test for homogeneity). Standardized effect sizes were calculated: ANOVA, partial eta squared ( $\eta_p^2$ ), small: 0.01, medium: 0.06, and large: 0.14), and  $t$ -test (Cohen’s  $d$ , small: 0.2–0.3, medium:  $\sim 0.5$ , and large:  $> 0.8$ ).

##### 4.4.1. Control Measures

To ensure comparability of the four independent groups, ANOVAs on demographics and self-report questionnaire measures were performed with Group (To: G-T, To: T-G, Te: G-T, Te: T-G) as a between-subjects factor.

##### 4.4.2. Game Decision Measures

To test the replication of framing effects for game decisions, independent samples  $t$ -test separately for trust and reciprocity decisions was performed, comparing the first and second decisions between trustor (To: G vs. To: T) and trustee (Te: G vs. Te: T) groups. To test the impact of an order effect separately on framings of trust and reciprocity decisions, a repeated-measures  $2 \times 2$  ANOVA for each of trust and reciprocity decisions was conducted with Frame (G, T) as a within-subjects factor and Order (G-T, T-G) as a between-subjects factor. Finally, to determine the directions of the identified main effects (e.g., Order, Frame, Role), planned follow-up post hoc dependent and independent samples  $t$ -test analyses were performed.

##### 4.4.3. Expectation Measures

To test for differences between expected and real decisions, a repeated-measures  $2 \times 2$  ANOVA was separately conducted for trustors and trustees with Frame (G, T) as a within-subjects factor and Congruence (Expectation, Reality) as a between-subjects factor. For trustors, the difference between their expected reciprocity and real reciprocity of trustees was tested, whereas the difference between their expected trust and real trust of trustors was tested for trustees. To determine the directions of the identified main effects (e.g., Frame, Congruence), planned follow-up post hoc dependent and independent samples  $t$ -test analyses were performed.

## 5. Conclusions

In summary, our study was the first to demonstrate that order impacts the framing of trust and reciprocity differently. First, we replicated previous framing effects for trust and reciprocity for first decisions due to trustors’ inaccuracy in perspective-taking about the impact of their own behavior on their partners’ intention and trustees’ reciprocal responses to the act of omission vs. commission. Second, we showed an order effect for both trust and reciprocity decisions due to strong vs. weak anchoring, respectively. Finally, we demonstrated that anchoring to the first decision reversed the framing effect in the second decision for trustors but not for trustees, which led to a disappearance of an overall framing effect for trust but not reciprocity.

In conclusion, our findings shed light on the nature of trust and reciprocity as boundedly rational decisions and their dependence on the decision context. Our results suggest that previously observed give and take framing effects on trust and reciprocity decisions may be unstable and malleable to changes not only by different cognitive or social factors but also due to the methodological factors of designing the study, such as order effects. In

fact, order effect has been either overlooked or treated as an intervening variable that could be controlled by counterbalancing and/or randomizing the order of games' presentation. However, in this study we counterbalanced the games and the impact of the order effect on behavior did not disappear. Therefore, we suggest more careful considerations when planning research under different framings or studies where participants have to perform various social decision-making tasks. In addition to our emphasis on the importance of order effects in the research design in social decision-making, we also provide a theoretical explanation on its underlying mechanism, i.e., an anchoring bias, which has not been addressed in previous literature.

Nevertheless, a couple of limitations have to be considered regarding our study. First, our sample consisted of young students ranging from 17 to 25 years old; therefore, our findings might not be representative of older adults. A recent meta-analysis shows a moderate effect of age on trust, revealing that young adults are less trusting than older adults—with those differences existing regarding type of response (self-report vs. behavior), degrees of trustworthiness (positive vs. negative intent), and measure of trust (financial vs. non-financial) [52]. Future studies should apply a more extensive age range, compare different age groups (young vs. older adults), or a longitudinal study design to verify our current results. Second, our sample was selected from an Asian population, which raises questions about the generalizability of the results to other cultures. Both cultural and geographic differences in trust behavior (measured with the standard one-shot TG) have been reported in a meta-analysis [53].

Future research should concentrate on studying populations from diverse cultures to determine whether our results can be replicated. In addition, multi-shot trust and distrust games were not addressed in the present study. This could be informative on the development of trust and reciprocity behaviors during the process of multi-shot playing. This question is worth exploring because it could be more similar to real-life situations where individuals have to be in touch with different people for a long period of time. Additionally, the order effect and its underlying mechanism (anchoring bias) have not been noted in other economic games such as ultimatum game or dictator game either in one-shot or multi-shot conditions. Therefore, we suggest investigating whether anchoring is a general mechanism underlying appearance of the order effect in economic games or if it is specific to certain contexts such as take and give framings of trust game.

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**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy/ethical issues.

**Conflicts of Interest:** The authors declare no conflict of interest.

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