Discussion Papers of the
Max Planck Institute for
Research on Collective Goods
2023/1

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January 2023

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The Importance of Reciprocity: Investigating Individual Differences Underlying Conditional Cooperation*

Léon Bartosch‡ / Dorothee Mischkowski§

Abstract

Several models of social preferences have been developed at the intersection of social psychology and behavioral economics, such as social value orientation (SVO) and conditional cooperation. Whereas SVO is well researched in its dispositional and situational correlates, we aim to locate conditional cooperation within the HEXACO personality model, particularly expecting a relation to reactive vs. active prosociality (i.e., Agreeableness vs. Honesty-Humility). Contrary to our expectations, however, in two preregistered, incentivized studies (n total = 521) conditional cooperation was neither related to Agreeableness nor to Honesty-Humility. When investigating the relation between SVO and conditional cooperation, we conceptually replicate a positive relation between both (pro-)social preferences. Surprisingly, while prosocials coincide with conditional cooperators, even most individualists who maximize their outcome in unilateral giving turn to conditionally cooperative behavior in strategic interactions. This underlines the importance of shaping situations as reciprocal acts to elicit cooperative behavior from originally self-interested individuals.

Keywords: Conditional Cooperation · Social Value Orientation · Basic Personality Traits · HEXACO · Reciprocity

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* Acknowledgment: Both studies were funded by the Social Psychology Chair of the University of Cologne. We thank Peter Lewisch and Andreas Glöckner for allowing the re-analysis and further use of the first study's data for the purpose of this manuscript.

Authors' note: The first author is a student under the supervision of the corresponding author. Author contribution: DM developed the research idea. DM and LB jointly delineated the hypotheses and study design. LB programmed the studies and analyzed the data. DM and LB jointly wrote the manuscript.

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Standard economic theory's supposition that all humans uniformly act in a selfish manner has been disproved in the long term (Fehr & Gintis, 2007; Kocher et al., 2008). Instead, substantial variability in social interactions has been shown. Certainly, some individuals default to the behavior that is in their own best interest regardless of the outcome of others. However, more prosocial individuals are willing to renounce some of their own benefits with the aim of improving those of others. These individual differences are referred to as social preferences. Several social-preference models have been established in social psychology and behavioral economics, seeking to explain this variability and referring to distinct forms of prosociality (e.g., conditional cooperation, see Fischbacher et al., 2001; Fischbacher & Gächter, 2010; inequality aversion, see Bolton & Ockenfels, 2000; Fehr & Schmidt, 2000; social value orientation, see Murphy et al., 2011; Van Lange, 1999). In two studies, we aim to locate conditional cooperation within the HEXACO personality model, specifically, to investigate its relation to active vs. reactive prosociality (i.e., Honesty-Humility vs. Agreeableness). Furthermore, we seek to replicate previous findings on the relation between two prominent social-preference models from both disciplines, that is, social value orientation and conditional cooperation. Lastly, we extend these findings by investigating the relation between conditional cooperation and inequality aversion as the prosocial motive to minimize differences in outcomes.

The HEXACO Personality Model. The HEXACO personality inventory (Ashton & Lee, 2001) expands the classical five-factor model of basic traits (see Costa & McCrae, 2009) by a sixth factor: Honesty-Humility. Honesty-Humility and Agreeableness within the HEXACO model are both partially incorporated in the Agreeableness dimension of the five-factor model but focus on different aspects of a prosocial personality. Specifically, the differentiation between Honesty-Humility and Agreeableness allows to distinguish between *active* and *reactive* prosociality. Whereas Honesty-Humility captures the tendency to refrain from exploiting others even when the opportunity is given to do so, Agreeableness mirrors non-retaliation in that one is lenient and forgiving when experiencing harm and wrongdoing in interpersonal relationships (Hilbig et al., 2013). That is, individuals high in Honesty-Humility *proactively* choose to cooperate, even when the opportunity for exploitation is given and would bear no risk of being punished. In turn, Agreeableness reveals prosocial behavior when one is knowingly facing the risk of being exploited. Both prosocial traits thus suggest prosocial behavior but for different situational affordances (Thielmann et al., 2020).

Social Value Orientation. The most prominent social-preference model in social psychology is social value orientation (SVO). SVO operationalizes prosocial behavior as an allocation of resources between oneself and another person in a series of allocation tasks (i.e., dictator games, see Figure 1). This is reflected in a utility function that assesses how strongly one weighs one's own vs. the other person's outcome (Liebrand & McClintock, 1988), and the corresponding degree of inequality (Van Lange, 1999). Earlier measures of SVO, such as the Ring Measure (Liebrand & McClintock, 1988) and the Triple Dominance Measure (Van Lange et al., 1997), are nowadays often replaced by the SVO Slider Measure (Murphy et al., 2011).

Extending nominal categories of SVO that allow to classify individuals as *competitive*, *individualistic*, *prosocial,* or *altruistic*,[1] the first six primary items of the Slider Measure are used to measure a continuous SVO angle. This angle increases with the consideration of the other person's outcome. To differentiate between different prosocial motivations, nine secondary items allow an assessment of the motivation to maximize joint gains (i.e., the sum of outcomes (JGM)), in contrast to minimizing the difference in outcomes (i.e., inequality aversion (IA)).

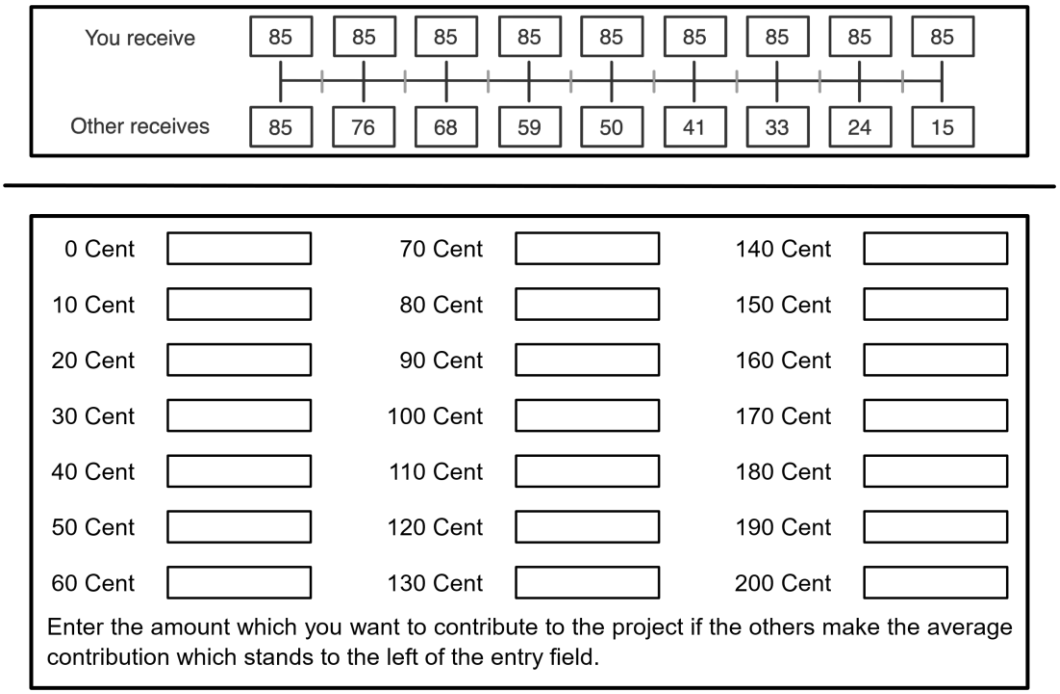
SVO was shown to depict a stable individual difference (de Matos Fernandes et al., 2022; Murphy et al., 2011) and is related to basic traits of prosociality. Specifically, the HEXACO dimension Honesty-Humility, but not Agreeableness, is positively related to SVO (Hilbig et al., 2014). When differentiating among the prosocial motives (i.e., IA vs. JGM), IA was similarly shown to be positively related with Honesty-Humility, particularly when one would benefit from inequality (Mischkowski et al., 2019). With regard to cooperation behavior in social dilemmas where individual and collective interests are at odds, SVO was shown to be highly predictive of cooperation behavior (for a review, see Bogaert et al., 2008). In a meta-analysis, Balliet et al. (2009) identified a medium-sized relation between SVO and the amount contributed in a public-goods game (PGG).[2]

1 In contrast to altruists, who solely aim to maximize the other's payoff, prosocials consider both outcomes to an approximately equal degree. In turn, individualists focus only on optimizing their own outcome, whereas competitive individuals focus on maximizing the difference in outcomes to their advantage.

2 The PGG operationalizes cooperation behavior in social dilemmas. In a PGG, each group member receives a monetary endowment, of which they can then decide how much to contribute to a public good. However, only a percentage of the public good is returned to each group member, independently of their contribution behavior. This results in a social dilemma, since for each individual it is most beneficial not to contribute. The entire group is worse off, though, if no one cooperates as compared to if all group members cooperated.

Figure 1

An Exemplary Item of the SVO Slider (Upper Area) and the Strategy Method (Lower Area)



Note. In the SVO Slider Measure, participants allocate money between themselves (upper row) and an anonymous other (lower row). In the strategy method, participants decide how much they want to contribute, depending on the average contribution behavior of the group members.

Conditional Cooperation. Contradicting rational choice assumptions, cooperation behavior was shown to be particularly strong in initial (i.e., one-shot or first-round) interactions, but not to last over repeated interactions (e.g., Fehr & Gächter, 2000). To explain declining cooperation behavior, Fischbacher et al. (2001) explored the idea of a social preference to reciprocate (un-)cooperative behavior, so-called *conditional cooperation*. Fischbacher and Gächter (2010) showed that only a minority is motivated to exploit unconditionally (i.e., regardless of the group members' behavior). Nonetheless, contributions in a repeated PGG still declined due to the predominance of imperfect conditional cooperators who revert to free-riding over time. Only individuals who were *unconditionally* cooperative were less likely to reduce their contributions over the course of repeated interactions. Conditional cooperation is measured using the strategy method (Selten, 1967), wherein individuals decide how much to contribute for different averaged contribution levels of their group members (see Figure 1). In consequence, different contribution patterns, dependent on the group members' cooperativeness, become visible. Fischbacher et al. (2001) were able to identify three distinct categories: *Conditional cooperators* increase their contributions along with increasing contributions of the group members. *Free-riders* do not contribute anything, regardless of the group members' behavior. *Triangle contributors* display a "hump-shaped" contribution pattern, in that contributions first rise, up to a certain maximum, and then decline. The incline of each participant's contribution pattern, dependent on the interaction partners' average contributions, can be computed yielding the conditionality of their contributions—namely, the slope of conditional cooperation. A slope close or equal to zero indicates that individuals are irresponsive towards their group members'

contributions. Correspondingly, the slope increases the more strongly individuals align their contributions to those of their group members.[3]

When investigating the psychological underpinnings of conditional cooperation, it was shown to be related to positive, though not negative, reciprocity. Specifically, Dariel and Nikiforakis (2014) showed that conditional cooperators were more likely to reciprocate higher wages with higher levels of effort in a gift-exchange game in comparison to free-riders. However, punishment behavior in social dilemmas as a form of negative reciprocity did not differ between conditional cooperators and free-riders (Weber et al., 2018). Evidence on the relation between conditional cooperation and basic personality traits was indicated by Volk et al. (2012), showing a link between conditional cooperation and Agreeableness as part of the five-factor model (Costa & McCrae, 2009). However, relations between conditional cooperation and the six-factor HEXACO personality model (Ashton & Lee, 2007) have yet to be investigated. Given the outlined distinction between active and reactive prosociality by means of its two dimensions, Honesty-Humility and Agreeableness, this is particularly relevant since this distinction matches with the (re-)activity of SVO vs. conditional cooperation: In contrast to SVO which consists of pro-active (e.g., charitable) giving, conditional cooperation consists of the sequential and thus reactive contribution behavior, dependent on the group members' contributions. We therefore expect a positive relation between conditional cooperation and Agreeableness that is additionally anticipated to be larger as compared to a potential positive relation with Honesty-Humility.

Additionally, we aim to shed light on the relation between conditional cooperation and SVO. Both social preferences share important conceptual similarities, despite the difference of SVO consisting of unilateral giving whereas conditional cooperation is part of a strategic situation. First, free-riders as well as individualists solely focus on maximizing their own profit, while ignoring or even willingly exploiting the welfare of others. Second, conditional cooperation minimizes differences in outcomes, which corresponds to the prosocial motivation to minimize inequality. Third, altruists maximize the other person's payoff, while neglecting their own outcome, congruent with individuals who unconditionally cooperate. They knowingly reduce their own outcome by cooperating more than their group members. Congruent with these conceptual similarities, Ackermann & Murphy (2019) revealed a positive correlation between SVO and conditional cooperation. However, a more heterogeneous pattern is shown by Bilancini et al. (2022): They find that a prosocial value orientation and conditional cooperation only coincide when participants were under time pressure during their contribution decision in the public goods game.[4] In a purely correlative study, they find no evidence for a relation between SVO and conditional cooperation. Given these mixed findings, we seek to shed additional light on the relation between both social preferences.

3 Note that this conditionality of contribution behavior does not take the absolute level of contributions into account. That is, a slope close or equal to zero can imply unconditional cooperativeness as well as free-riding. To distinguish the absolute levels of contributions, the intercept needs to be taken into account when regressing an individual's contributions on the averaged group contributions in the strategy method (see results section for classification details).

4 Note that neither Murphy & Ackermann (2019) nor Bilancini et al. (2022) used the continuous slope to compute conditional cooperation, but either referred to categorical types (Bilancini et al., 2022) or a continuous conditional cooperation area of individuals' contribution pattern (see Murphy & Ackermann, 2019).

Aim of the studies and delineation of hypotheses. We pursue three objectives by means of two studies: First, we shed light on the relation between conditional cooperation and prosocial basic traits of the HEXACO model. Because of its reciprocal and thus reactive component, we particularly expect conditional cooperation to positively correlate with Agreeableness—next to a potentially smaller relation with Honesty-Humility. Second, we aim to conceptually replicate the positive correlation between SVO and conditional cooperation (cf. Ackerman & Murphy, 2014; Bilancini et al., 2022). We extend the investigation by testing for a curve-linear (i.e., inverse U-shaped) relation between conditional cooperation and SVO: Since individualists and altruists only give weight to either their own or the other person's outcome, both should unconditionally behave in a (non-)cooperative manner to maximize their own or the collective outcome, independently of their group members' contributions. In turn, prosocials who similarly weigh their own and the other person's outcome should be more likely to behave in a conditionally cooperative manner. As a third aim, we investigate the underlying motives of conditional cooperation in more detail. That is, we test whether conditional cooperation is linked to the prosocial motivation to minimize differences in outcomes (i.e., IA). Since conditional cooperation yields equality in outcomes at the cost of reducing joint gains, we expect a positive relation. Furthermore and not mutually exclusive, we investigate whether conditional cooperation is rooted in the motivation to reciprocate cooperative behavior next to a fear of being exploited.

We therefore derived and preregistered the following hypotheses (see https://aspredicted.org/blind.php?x=9re2sd).[5]

H1: We expect conditional cooperation to be positively related to dispositional prosociality, as measured by the basic-traits model HEXACO.

> H1a: The slope of conditional cooperation positively correlates with reactive prosociality, as measured by the basic-trait dimension Agreeableness.
>
> H1b: The slope of conditional cooperation positively correlates with active prosociality, as measured by the basic-trait dimension Honesty-Humility.

We aim to conceptually replicate a positive correlation between the degree to which an individual is conditionally cooperative and their SVO:

> H2a: With an increasing SVO angle, the slope of conditional cooperation increases.
>
> H2b: Conceptually replicating previous findings on the positive relation between SVO and cooperation behavior (Balliet et al., 2009), we expect a positive correlation between the mean contribution in the strategy method and the SVO angle.

On descriptive grounds, we assess the percentage overlap of the different types in the strategy method (i.e., free-riders, conditional cooperators, hump-shaped, others; Fischbacher et al.,

5 Note that we changed the order of hypotheses.

2001) and the SVO types (i.e., competitors, individualists, prosocials, altruists; Murphy et al., 2012).

Beyond the expected linear relation, we expect a curvilinear relation between the slope of conditional cooperation and the SVO angle:

H3: We expect an inverse U-shaped relation between the slope of conditional cooperation and the SVO angle. That is, we expect an increasing slope up to a prosocial value orientation that corresponds to perfect IA (i.e., an angle of $37.48°$; Murphy et al., 2011). With a further increasing SVO angle towards altruism, however, we expect the slope to decrease.

As outlined above, conditional cooperation yields equality in outcomes. We therefore test whether the prosocial motivation to minimize differences in outcomes (vs. maximizing joint gains) is positively linked to conditional cooperation.

H4: We expect increasing IA with conditional cooperation, as would be reflected in a positive correlation between the slope and the IA index.

To shed further light on the psychological motives of conditional cooperation, we assessed the motivation for reciprocity and the fear of being exploited.

> H5a: We expect a positive correlation between the slope of conditional cooperation and the fear of being exploited in the PGG.
>
> H5b: We expect a positive correlation between the slope of conditional cooperation and a motivation to reciprocate cooperative behavior.

Methods

We conducted two correlative, pre-registered online studies in line with economic standards (i.e., incentivized, without deception). All materials and datasets are available online at https://osf.io/9reyw/?view_only=524e875d7f1749c2b9c8c56444f35a49. Since the design of both studies is largely identical, we report the results in a high-powered overall analysis.[6] We report all manipulations, measures, and exclusions in these studies.

6 Note that Study 1 consists of a re-analysis of a previously conducted, unpublished study (see https://aspredicted.org/SMG_ZZG for its preregistration). Participants played a variation of the Common Commitment Game (Schmidt & Ockenfels, 2021), in addition to the one-shot PGG – experimentally varying the order of the two games to investigate potential spillover effects. Since the manipulation of the order had no effect on the contributions in the PGG, the slope of conditional cooperation, nor on the mean contribution in the strategy method (all $p > .17$), it allows us to reanalyze the data for the hypotheses presented here. Importantly, the presented results do not change when including the order of games as a covariate.

Materials and Measures.

To measure social value orientation (SVO) and inequality aversion (IA), we used the 15-item version of the SVO Slider Measure (Murphy et al., 2011), which provides a continuous SVO angle and an IA index ranging from 0 (high JGM) to 1 (high IA).[7] We used the German 100-item version of the HEXACO Personality Inventory-Revised (HEXACO-PI-R; Lee & Ashton, 2018), containing 16 items to measure each of the six HEXACO dimensions, and four items to measure the interstitial scale of Altruism (vs. Antagonism). We further added four Altruism items from the German 200-item version of the HEXACO-PI-R, resulting in a total of 104 items. We assessed the participants' conditional cooperation using the strategy method (Fischbacher et al., 2001; Selten, 1967): Participants first played a one-shot public-goods game in groups of four players with an initial endowment of 2.00 euros and a marginal per capita return of 0.5. Afterwards, the participants stated how much they wanted to contribute for 21 different possible average contributions by the group members, ranging from 0 cents to 200 cents in steps of 10 cents.

Procedure. For both studies, we recruited participants from the database of the local Decision Lab. The SVO Slider Measure as well as the HEXACO-PI-R had been assessed beforehand as part of the Decision Lab's base assessment. Study 1 was run via Unipark Questback EFS; Study 2 was programmed in oTree (Chen et al., 2016). After providing informed consent, participants read the instructions of the PGG, followed by two comprehension check questions. Participants had the option to redisplay the instructions, while we allowed for up to three incorrect answers. If at least one of the two comprehension questions were answered incorrectly three times, participants were still allowed to take part, but were considered to have a lack of game understanding. As preregistered, they were consequently excluded from the analyses.[8] In the following, participants played the PGG, which was immediately followed by the strategy method. For exploratory purposes, we asked participants in the second study in a subsequent free-form field about their behavioral motives in the strategy method. Additionally, we solicited a rating of the participants' fear of being exploited in the PGG and their motivation for reciprocity in the strategy method.[9] To assure data quality, we included a self-report seriousness check (Meade & Craig, 2012) assessing participants' attention and potentially experienced distraction. Participant payment consisted of a fixed amount (EUR 1.00) as a participation fee and the behavior-related payout in the PGG between EUR 1.00 and EUR 5.00. Participants were informed that their payment would be determined, in 3 out of 4 cases, by their outcome in the PGG, and with the remaining probability of 25% by their choice in the strategy method.

Participants. An a-priori power analysis using G*Power (Faul et al., 2009) revealed a required sample size of $N = 217$ to detect a small-sized effect ($f^2 = .05$) in a linear multiple regression (one predictor) with a power of $1 - \beta = .90$ ($\alpha = .05$, two-tailed). Our effect of interest was H3 – we expected a positive correlation between the SVO angle and the slope of conditional cooperation. However, Schönbrodt and Perugini (2013) suggest a general sample size of 250 for

7 Note that we recoded IA for the sake of better interpretability. Originally, the deviation from prototypical IA was assessed, where decreasing values represented increasing IA (Murphy & Ackermann, 2012).

8 Results do not change when including participants with a lack of game comprehension.

9 Note that in the first study we did not ask the participants any questions about their behavioral motives in the strategy method, their fear of being exploited or their motivation for reciprocity, resulting in a subsample for these measures of the second study only (*n* = 253).

stable correlations which we aimed and achieved to meet: We conjoined both datasets from the first study ($N = 268$), as well as the subsequent study ($N = 253$) for a high-powered overall analysis, resulting in a sample of $N = 521$ (337 female, 2 non-binary).[10] Participants had a mean age of 29.06 years ($SD = 11.09$; $Min = 18$; $Max = 82$).

Results

For the analysis we used R (R Core Team, 2022).[11] We depict means, standard deviations, and correlations of all variables of interest in Table 1.

Classification. We categorized participants with similar behavioral patterns in the strategy method according to Fischbacher et al. (2012). We classified all participants who showed an increasing pattern in contributions with a significant positive Spearman rank correlation ($p < .01$) as conditional cooperators. Participants who consistently contributed 0, regardless of the amount contributed by the group members, were classified as "free-riders". Participants are triangle contributors when showing a significantly increasing contribution pattern until some maximum, and significantly decreasing contributions thereafter.[12] All participants who did not belong to either of these categories were classified as "other". We classified participants as competitive, individualistic, prosocial, or altruistic according to Murphy et al. (2011).[13] The percentages of the different types in the strategy method, the different SVO types, and their combinations are presented in Table 2.

Descriptive statistics. Similar to Fischbacher et al. (2001) and Fischbacher et al. (2012), our sample consisted mostly of conditional cooperators, as reflected in the average slope of 0.74 (see Table 2). The percentage of altruistic, competitive, as well as "hump-shaped" participants is negligibly small. Underlining the conceptual overlap of both social-preference models, free-riders in the strategy method mostly consist of individualists, as classified by their SVO (see Table 2). In the same vein, the majority of conditional cooperators consists of prosocials. Interestingly, however, more than two thirds of the individualists behave in a conditionally cooperative manner in the strategy method and refrain from free-riding.[14]

10 $N = 35$ stated that due to unserious participation their data should not be used for analysis (see Meade and Craig (2012)), and $n = 28$ were excluded due to a lack of game comprehension.

11 We used R packages mediation (Tingley et al., 2014), tidyverse (Wickham et al., 2019), psycho (Makowski, 2018), car (Fox & Weisberg, 2019), and knitr (Version 1.38; Xie, 2014; Xie, 2015; Xie, 2022).

12 Significance was again determined in line with Fischbacher et al. (2001) using Spearman rank correlation ($p < .01$).

13 That is, we classified individuals with a SVO angle greater than $57.15°$ as altruists; individuals with angles between $22.45°$ and $57.15°$ as prosocials; individuals with angles between $-12.04°$ and $22.45°$ as individualists; and individuals with an angle less than $-12.04°$ as competitives.

14 For a distribution of the continuous variables (i.e., the slope of conditional cooperation and the SVO angle), see Figure 3.

Table 1

Bivariate Correlations of All Variables with Internal Consistency Reliabilities (Cronbach's Alpha) in the Diagonal

Variable	*n*	Range	*M* (*SD*)	1	2	3	4	5	6	7	8	9	10	11	12	13
1. SVO Angle	521	-16.26° – 61.39°	27.31 (14.04)	—												
2. IA	318 [a]	0 – 1	.77 (.25)	-.02	—											
3. PGG Contribution (in %)	521	0 – 100	65.17 (40.02)	.23 ***	.02	—										
4. Mean Contribution in the Strategy Method	521	0 – 100	45.86 (22.81)	.32 ***	-.01	.50 ***	—									
5. Slope of Conditional Cooperation	521	-1.50 – 1.50	0.74 (0.43)	.21 ***	-.07	.27 ***	.21 ***	—								
6. Fear of Being Exploited	253 [b]	1 – 7	4.00 (2.04)	-.19 **	-.08	-.43 ***	-.27 ***	.01	—							
7. Motivation for Reciprocity	253 [b]	1 – 7	5.04 (2.21)	.11 †	.00	.10	.06	.64 ***	.16 **	—						
8. Honesty-Humility	521	1 – 5	3.53 (0.66)	.31 ***	.18 **	.10 *	.15 ***	.03	-.04	-.08	.83					
9. Emotionality	521	1 – 5	3.31 (0.61)	.02	.05	-.01	-.00	.03	.00	.07	.09 *	.82				
10. Extraversion	521	1 – 5	3.29 (0.71)	.02	-.10 †	-.01	.03	.04	.01	.07	.05	-.11 *	.89			
11. Agreeableness	521	1 – 5	3.04 (0.63)	.20 ***	.05	.12 **	.16 ***	.06	-.05	.03	.31 ***	-.23 ***	.25 ***	.85		
12. Conscientiousness	521	1 – 5	3.60 (0.62)	.01	.08	.00	.01	-.06	.01	-.08	.22 ***	.14 **	.22 ***	-.01	.85	
13. Openness	521	1 – 5	3.42 (0.59)	.10 *	.10 †	.10 *	-.00	.10 *	-.05	.12 *	.16 ***	.03	.24 ***	.12 **	.16 ***	.77

Note. SVO = social value orientation. IA = inequality aversion. PGG = public-goods game.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$ (all two-sided).

[a] Note that the IA index can only be computed for prosocials (see Ackermann & Murphy, 2012; Murphy & Ackermann, 2014). Therefore, the analysis regarding the IA index is based on a subsample of $n = 318$.

[b] The first study did not include the questions regarding the strategy method, the fear of being exploited in the PGG, or motivation for reciprocity in the strategy method. Consequently, the respective data are only present in the second study ($n = 253$).

Table 2

Distribution of SVO Types and Conditional Cooperation Types

	Competitive	Individualistic	Prosocial	Altruistic	Σ
Conditional Cooperators	3 (0.6 %)	106 (20.3 %)	296 (56.8 %)	1 (0.2 %)	409 (78.5 %)
Free-Riders	1 (0.2 %)	27 (5.2 %)	7 (1.3 %)	1 (0.2 %)	36 (6.9 %)
Hump-Shaped	0 (0.0 %)	3 (0.6 %)	0 (0.0 %)	0 (0.0 %)	3 (1.7 %)
Other	2 (0.4 %)	21 (4.0 %)	50 (9.6 %)	0 (0.0 %)	73 (14.0 %)
Σ	6 (1.2 %)	157 (30.1 %)	356 (68.3 %)	2 (0.4 %)	521 (100.0 %)

Note. SVO = social value orientation.

Confirmatory analyses. We expected a positive correlation between the slope of conditional cooperation and reactive prosociality as measured by the HEXACO basic trait dimension Agreeableness (H1a) as well as a small yet positive correlation between the slope of conditional cooperation and active prosociality assessed by the basic trait dimension Honesty-Humility (H1b). Contrary to our expectations, the slope of conditional cooperation was unrelated to both Honesty Humility ($r = .03$, $p = .511$, $R^2 = .00$, 95% CI $[-.06, .11]$) and Agreeableness ($r = .06$, $p = .16$, $R^2 = .00$, 95% CI $[-.02, .15]$).

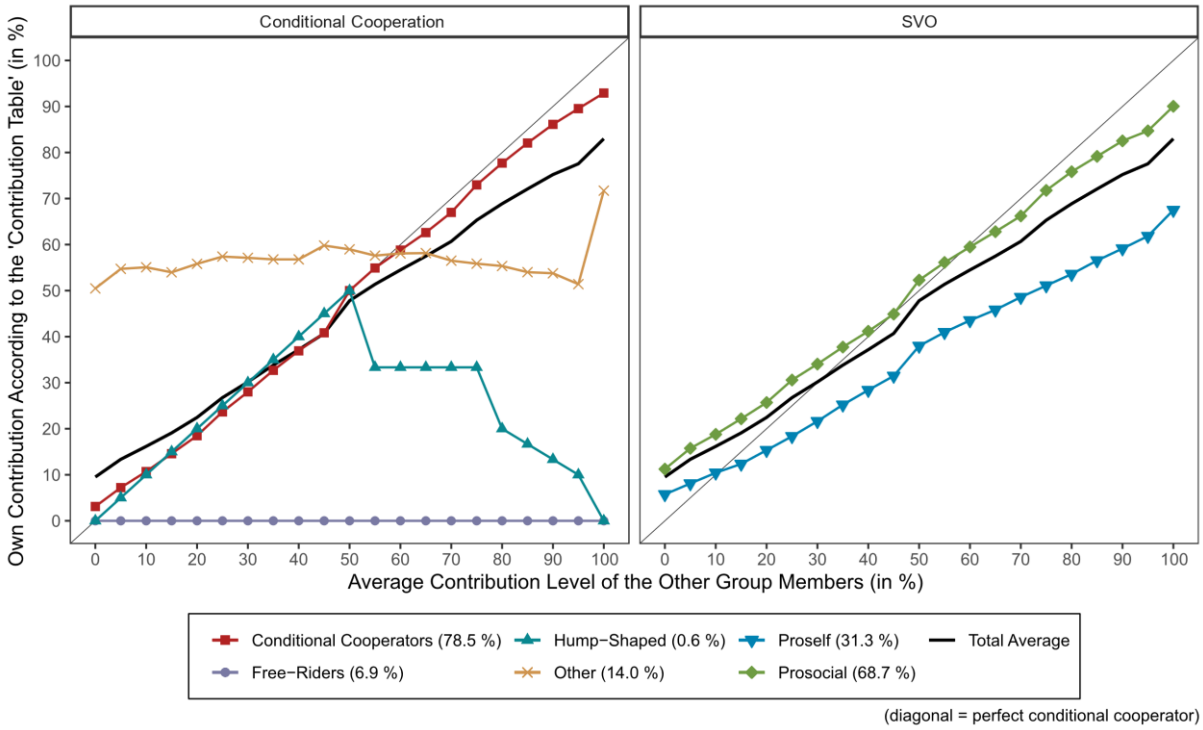
In line with expectations (H2a), we replicated a significant positive correlation between the slope of conditional cooperation and the SVO angle ($r = .21, p < .001$, $R^2 = .04$, 95% CI $[.13, .30]$). This reflects the conceptual overlap of both prosocial preferences empirically. However, taking the small effect size into account, it similarly shows that both social preferences are distinct from one another. Extending the relation between cooperation behavior and SVO (see Balliet et al., 2009) to the mean contribution in the strategy method, we find, in line with our expectations (H2b), a positive relation between the SVO angle and the mean contribution ($r = .32$, $p < .001$, $R^2 = .10$, 95% CI $[.24, .39]$). Shedding additional light at the interdependence of both social preferences, Figure 2 depicts average contributions as a function of the average contribution level of the other group members separately for each category of conditional cooperation (i.e., conditional cooperators, free-riders, hump-shaped, and other; left side of Figure 2) and SVO (i.e., proselfs and prosocials; right side of Figure 2).[15] When comparing the conditional cooperation behavior of prosocials and proselfs, two points are noteworthy: First, prosocials are significantly more conditionally cooperative than proselfs. That is, the slope ($M = 0.80, SD = 0.39$) and the mean contribution ($M = 50.6, SD = 20.4$) of prosocials were significantly higher than the slope ($M = .62, SD = .48$) and the mean contribution ($M = 35.4, SD = 24.3$) of proselfs (slope: $t(262.63) = 4.09$, $p < .001$, $d = 0.40$, 95% CI $[0.09, 0.26]$; mean contribution: $t(269.95) = 6.95$, $p < .001$, $d = 0.68$, 95% CI $[10.90, 19.52]$). Secondly, we elaborate on the surprisingly large proportion of proselfs who behave conditionally cooperative

15 Note that we grouped all individuals with a SVO angle higher than 22.45 as prosocial, and with a SVO angle lower than 22.45 as proself, respectively, for lack of altruistic and competitive participants.

in strategic interactions. As already indicated descriptively, proselfs strongly differed from free-riders. That is, their above mentioned slope and mean contribution deviated significantly from zero (i.e., free-riding; slope: $t(162) = 16.63, p < .001, d = 1.30, 95\%\ CI\ [0.55, 0.70]$; mean contribution: $t(162) = 18.59, p < .001, d = 1.45, 95\%\ CI\ [31.65, 39.17]$). These results indicate that both prosocials and proselfs behave in a positive reciprocal manner, but prosocials do so even more strongly.

Figure 2

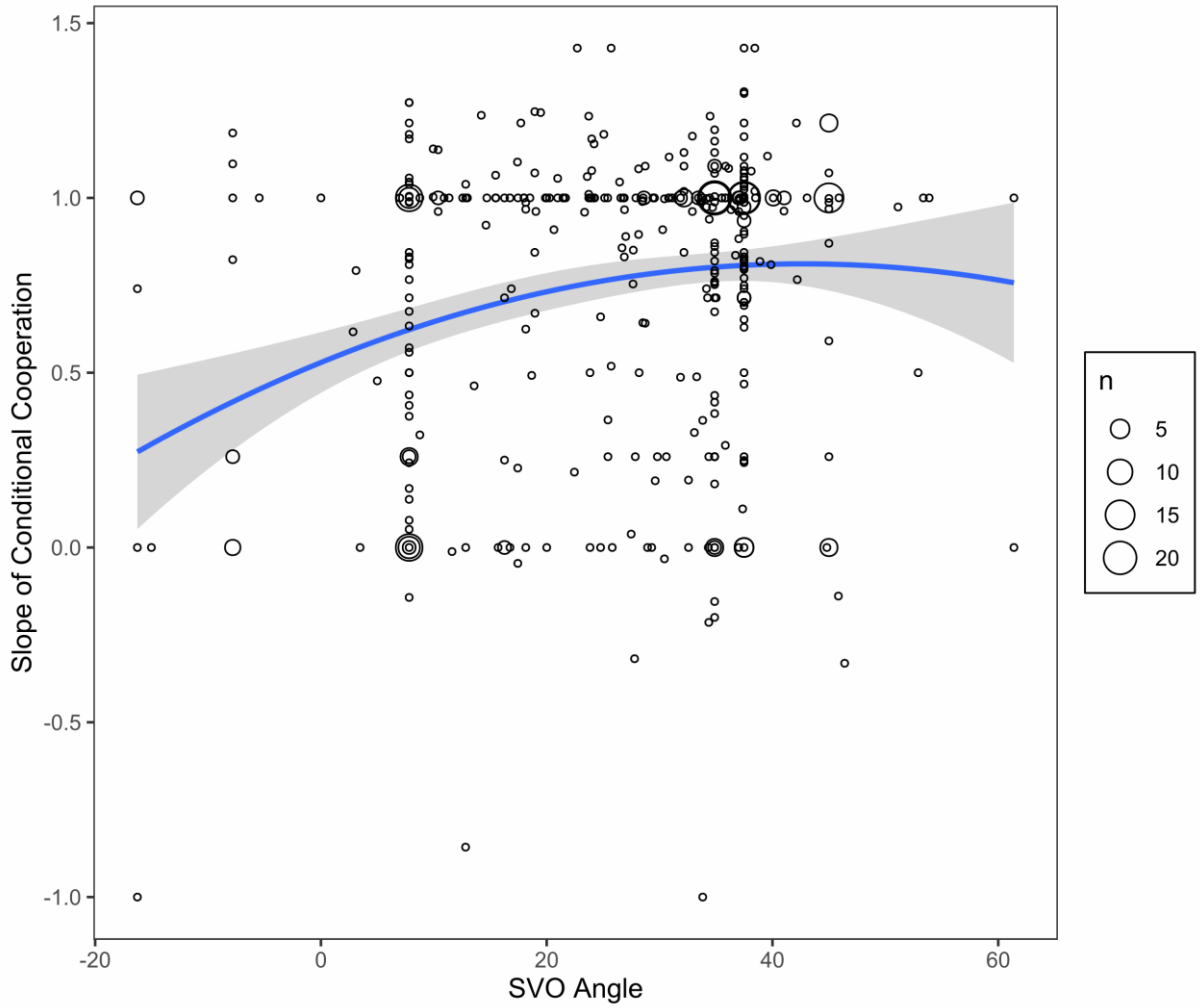
Average Contributions in the Strategy Method as a Function of Group Level Contribution for Different Types of Social Preferences (Conditional Cooperation and SVO)



When including both the linear and the quadratic term of SVO to predict the slope of conditional cooperation (H3), the positive linear effect persists ($\beta = 0.01$, $p = .010$, $95\%\ CI\ [0.00, 0.02]$). Despite the descriptive tendency (see Figure 3), we neither found evidence for a quadratic effect ($\beta = 0.00$, $p = .876$, $95\%\ CI\ [-0.00, 0.00]$) nor for an interaction between both predictors ($\beta = -0.00$, $p = .322$, $95\%\ CI\ [-0.00, 0.00]$) ($R^2_{adj} = .05$).

Figure 3

Relation of Social Value Orientation (SVO) and the Slope of Conditional Cooperation



Note. The size of a dot indicates the number of observations. The blue line depicts the quadratic regression with 95 % confidence bands. Prototypical behavior is observable at two levels: First, slopes of $\mathbf{0}$ and $\mathbf{1}$ are particularly common as those values depict the behavior of free-riders or unconditional cooperators and perfect conditional cooperators, respectively. Second, SVO angles of $\mathbf{7.82}°$ and $\mathbf{37.48}°$ are frequently visible. They portray prototypical individualistic and prosocial (i.e., perfectly inequality averse) decision makers, respectively.

When turning to the underlying motives of conditional cooperation, we expected a positive relation between IA and conditional cooperation (H4), based on the behavioral similarities of equally sharing (i.e., contributing to) resources. However, the slope of conditional cooperation and IA did not correlate ($r = -.07$, $p = .232$, $R^2 = .00$, 95% CI $[-.18, .04]$). In a similar vein, the fear of being exploited ($r = .01$, $p = .860$, $R^2 = .00$, 95% CI $[-.11, .13]$) was unrelated to conditional cooperation. In contrast, the motivation for reciprocity turned out to be highly predictive for conditional cooperation (H5b; $r = .64$, $p < .001$, $R^2 = .41$, 95% CI $[.56, .71]$). This pattern persisted in an overall regression model, including both the fear of being exploited and the motivation for reciprocity to predict the slope of conditional cooperation: It solely revealed a positive effect of the motivation for reciprocity ($\beta = 0.15$, $p < .001$, 95% CI $[0.11, 0.18)$, but no

effect of the fear of being exploited ($\beta = -0.00$, $p = .950$, 95% CI $[-0.05, 0.04]$) nor an interaction between both predictors ($\beta = -0.00$, $p = .348$, 95% CI $[-0.01, 0.00]$).[16]

Discussion

Standard economic theory predicts selfish behavior to predominate in social interactions. However, research has reliably contradicted this assumption and found considerable individual differences on this matter—so-called social preferences. Past research at the junction of social psychology and behavioral economics has developed various social-preference models, accounting for deviations from individualism and referring to various forms of prosociality, such as conditional cooperation (Fischbacher et al., 2001), inequality aversion (Bolton & Ockenfels, 2000; Fehr & Schmidt, 2000), and social value orientation (Van Lange, 1999; Murphy et al., 2011). While SVO is largely adopted in the field of social and personality psychology, conditional cooperation has been less researched in its psychological underpinnings and correspondingly lacks usage as a behavioral measure of reciprocity. The aim of our studies is to close this gap by locating conditional cooperation within the HEXACO personality inventory and further investigating its relation with SVO. Additionally, we shed light on the underlying motives of conditional cooperation by investigating its relation with inequality aversion, a motivation for reciprocity, and the fear of being exploited.

Across two studies, we found no evidence for active or reactive dispositional prosociality to be predictive for conditional cooperation. That is, the slope of conditional cooperation in the strategy method was unrelated to the HEXACO dimensions Honesty-Humility and Agreeableness. The lacking relation with Honesty-Humility might be less surprising, given that Honesty-Humility is known for predicting *un*conditional cooperative behavior (e.g., Hilbig & Zettler, 2009; Hilbig et al., 2013). The reciprocal and reactive component of conditional cooperation, however, precisely matches the situational affordance of reciprocity that is linked to Agreeableness (see Thielmann et al., 2020). One reason that might explain the lacking relation is the bandwidth-fidelity dilemma (see Ones & Viswesvaran, 1996; Salgado et al., 2015): The slope reflecting the conditionality of cooperation could simply be too specific to be related to the basic traits of pro-sociality. Specifically referring to the previously identified positive relation between conditional cooperation and Agreeableness as part of the five-factor model (Volk et al., 2012), the conceptual differences in Agreeableness between the HEXACO personality model and the five-factor model (see e.g., Hilbig et al., 2014) could be responsible for the differing findings.

When comparing both social preferences, we replicated the connection in that SVO and conditional cooperation were positively correlated. Most participants were classified as conditional cooperators, replicating the dominance of this social preference (see Fischbacher et al., 2001). A major part of these conditional cooperators were prosocials (i.e., participants with a prosocial SVO). However, conditional cooperation was not rooted in the prosocial motivation

16 Note that the fear of being exploited and the motivation for reciprocity were only moderately related ($r = .16$, $p = .009$, $R^2 = .03$, 95% CI $[.04, .28]$).

to establish equality in outcomes. That is, we did not find conditional cooperation to be related to dispositional IA among prosocials, contradicting the assumption of Fischbacher et al. (2001). This might be due to the reduced variance of prosociality, as the IA is solely computable for the subsample of prosocials (see Murphy et al., 2011). Furthermore, striving for equality in outcomes might conceptually differ from a motivation to reciprocate prosocial behavior, even though this leads to equality in outcomes. Rather, we found that conditional cooperation was strongly correlated with the motivation for reciprocity—corroborating previous findings (e.g., Columbus & Böhm, 2021; Dariel & Nikiforakis, 2014).

In addition to dispositional prosocials, we find that most *individualists* conditionally cooperated in the strategic interaction as well. That is, they refrained from maximizing their personal benefit—as they do in unilateral dictator games—when being assured of an equal contribution of their group members. This underlines the importance and potential of shaping situations as reciprocal acts to increase cooperative behavior. Schmidt and Ockenfels (2021) provide a first and successful attempt in this regard, when implementing a reciprocal contribution mechanism into the negotiation of public goods.

It remains to critically discuss the limitations of our studies and the corresponding implications for future research. First, the question of whether our findings generalize to less prosocial samples needs to be raised. It is noteworthy that our samples deviate from previous distributions of conditional cooperation in that we identified considerably fewer triangle contributors and free-riders (see Fischbacher et al., 2001; Fischbacher et al., 2012; Thöni & Volk, 2018). In a similar vein, more than two thirds of the participants were classified as prosocial according to their SVO. The lack of altruists in particular might explain why we did not find the hypothesized inverse U-shaped relationship between the SVO and the slope of conditional cooperation: Conceptually, the conditionality of SVO is mirrored in a weighing function that increasingly puts weight on the outcome of others until an unconditional, altruistic value orientation is reached. However, the fact that our sample hardly included any altruists who solely focus on the outcome of others might impede to detect a reduced slope for these individuals that would yield an inverse U-shaped relation between the SVO angle and the slope of conditional cooperation in the first place.

Finally, one conceptual difference between both models of social preferences needs to be taken into account when comparing the reduced number of free-riders with the number of individualists: The classification of free-riding in the strategy method assesses individualism more conservatively than SVO by additionally requiring low reciprocity. This differentiation needs to be considered when deciding how to assess social preferences. Conditional cooperation might be particularly suited as a behavioral (i.e., incentivized) measure of reciprocity, complementing self-report reciprocity scales. Here, future research is needed to investigate the relation between this incentivized measure and positive vs. negative reciprocity scales (see Perugini et al., 2003). In contrast, the unilateral giving in the SVO framework disentangles behavioral assimilation from the weighing of outcomes. As such, despite their empirical relatedness, both measures of social preferences are rooted in different motives. We recommend moving the focus on these motivational differences to the fore when deciding how to operationalize social preferences. Finding common ground in the conceptualization and usage of

social-preference models provides the next step to foster interdisciplinary work and to bring social psychology and behavioral economics further together.

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