

Distributional Preference Types and the Deliberative System*

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Abstract

We experimentally investigate the effects of a self-control manipulation on revealed social preferences. The control group is exposed to a social preference identification procedure in two consecutive weeks, while the treatment group accomplishes an ego depletion task before being exposed to the same procedure in week two. We find that ego depletion has a moderating effect on revealed social preferences - types with a pronounced pro-social disposition reduce their other-regarding concerns, while types with a selfish disposition become more pro-social. Our results may help to shed light on the question why studies investigating the effects of suppressing the deliberate system report seemingly contradicting results.

1 Introduction

To better understand human decision making, psychologists and economists are often concerned with the question which behaviors result out of controlled processes and which result out of automatic processes (for a summary of dual-process theories and multiple-self models, see Alós-Ferrer and Strack, 2014). With respect to social or distributional preferences, two competing hypotheses have been suggested (see, for example Halali et al., 2011, 2013; Hauge et al., 2014; Rand et al., 2012, 2014).¹ In a nutshell, H_1 suggests that egoism-based self-interest is the primary motive and that pro-social preferences result from - and are controlled by - a deliberative process. On the contrary, H_2 suggests that pro-social preferences are automatic, while self-interest considerations are controlled by the deliberative system. Finally, it is possible that the answer is type-dependent: for some individuals pro-social behavior may be the motive that is controlled by the deliberative system, while for others the controlled motive may be own-money maximization. In this paper we investigate whether the deliberative system controls different basic motives for different distributional preference types.

Different methods have been applied to suppress the deliberative system in order to uncover intuitive decision making processes. One method relies on the reduction of an individual's self-control by exposing it to an ego depletion task.² Since self-control is the capacity of human beings to modify, change, or override their impulses, desires and habitual responses, a depletion task enhances intuitive reasoning (Baumeister, 2002; Baumeister and Heatherton, 1996; Vohs, 2006). Hence, H_1 suggests that ego depletion results in increased selfish behavior, while H_2 suggests that it increases pro-social behavior. The second method to uncover intuitive reasoning is by means of the concept of cognitive load (Gilbert et al., 1995; Swann et al., 1990). Again, the two hypotheses H_1 and H_2 suggest opposing effects on behavior.

Existing studies present inconclusive and partly conflicting results regarding the two competing hypotheses. For example, Xu et al. (2012) and DeWall et al. (2008) find decreased helping behavior among ego depleted subjects. This is in line with evidence on behavior in dictator games: Halali et al. (2013) find that depleted dictators choose the equal split significantly less often than non-depleted ones, and Achtziger et al. (2015) as well as Xu et al. (2012) find that depleted dictators give less than non-depleted ones. On the contrary, dictators whose deliberative system is suppressed choose the equal split more often in Schulz et al. (2014). Kessler and Meier (2014) find that charitable giving increases after ego depletion (but only if the study is run later in a session of the overall experiment), while Hauge et al. (2014) find no effect of cognitive load on giving in dictator or donation games, and Grossman et al. (2014) find no effect on giving in a giving game. Since ego depletion tasks as well as cognitive load tasks are meant to suppress the deliberate system, there is a puzzle why some

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¹By distributional or social preferences we mean that subjects may not only care for their own material payoff, but also for the material payoffs of others when making decisions.

²According to Baumeister et al. (1998, 2007), self-control relies on a limited resource which gets depleted from exertion. Hence, acts of self-control cause short term impairments (i.e., ego depletion) of self-control in subsequent tasks - even if the subsequent task is unrelated.

studies find clear evidence of increased selfishness while others find either no effect or evidence of increased pro-social behavior.

Inconclusive or seemingly conflicting evidence is offered also by studies investigating the effects of a suppression of the deliberative system on behavior in ultimatum games (Cappelletti et al., 2011; Halali et al., 2013; Achtziger et al., 2014), with depleted proposers sometimes making smaller offers and sometimes being unaffected by the manipulation or even increasing their offers. Another aspect of behavior that has been studied in the literature on ego depletion and self-control concerns response times. Again, the findings in the literature are rather inconclusive: while Cappelletti et al. (2011) and Rand et al. (2012, 2014) find a positive effect of time pressure on offers in the ultimatum game and on cooperation, Tinghög et al. (2013) find no effect, and Piovesan and Wengström (2009) and Ubeda (2014) report that faster responses are generally associated with more selfish and less cooperative behavior.

A potential explanation for the seemingly conflicting evidence is that different distributional preference types have different basic motives controlled by the deliberative system. If this is the case then they are likely to react differently to a suppression of their deliberative system. This may explain the diverging results in the literature. So far, two papers have investigated how individual differences in distributional preferences interact with a suppression of the deliberative system. Halali et al. (2013) find that participants' social value orientation (SVO McClintock, 1972) does not moderate the effect of ego depletion neither in the ultimatum nor in the dictator game. Cornelissen et al. (2011) combine data of SVO tasks with dictator experiments under cognitive load. While they do not detect a main effect of cognitive distraction, they find an interaction effect between SVO and cognitive load: pro-socials become more generous under cognitive load, whereas pro-selves become (insignificantly) less generous.

We contribute to this line of research by identifying distributional preferences at the individual level by means of a non-parametric identification approach the equality equivalence test (Kerschbamer, 2015). We then investigate how these preferences change in reaction to an ego depletion task. The equality equivalence test elicits non-strategic preferences in two domains of income allocations: in one - the domain of advantageous inequality - the decision maker is ahead of another person (i.e., receives a higher income); in the other - the domain of disadvantageous inequality - the decision maker is behind. According to the revealed benevolence, neutrality or malevolence of the decision maker in the two domains, she or he is classified into one of nine archetypes of distributional preferences. For instance, a decision maker who reveals benevolence in both domains is classified as 'altruist', while a decision maker who reveals benevolence in the domain of advantageous inequality but neutrality in the domain of disadvantageous inequality is classified as 'maximin'. The equality equivalence test also yields a two-dimensional index of preference intensity - one score for the domain of advantageous inequality and one for the domain of disadvantageous inequality.

We find that suppressing the deliberative system has a moderating impact on revealed distributional preferences. While ego depletion appears to have no effect in the aggregate, it has a pronounced and systematic impact on the individual level with some subjects becoming more pro-social and others becoming less pro-social in reaction to the depletion task. Specifically, in the domain of disadvantageous inequality altruistic subjects become significantly *less* pro-social, while selfish and maximin types become significantly *more* pro-social. By contrast, in the domain of advantageous inequality both altruistic and maximin subjects become *less* pro-social (significant only for maximin), whereas selfish types become again significantly *more* pro-social. For the other archetypes of social preference we observe no significant change - which probably is in large part due to the small number of observations we have for those categories.

Overall it seems that revealed distributional preferences become "less intensive" in response to ego depletion: those subjects with a relatively pronounced pro-social disposition in the domain of disadvantageous inequality (altruistic types) reduce this disposition in response to the depletion task, while types with a selfish disposition in this domain (selfish and maximin subjects) increase their pro-sociality. In the domain of advantageous inequality, those subjects with a relatively pronounced pro-social disposition (maximin and altruistic subjects) reduce their pro-sociality and those subjects with a relatively low pro-sociality (selfish types) increase it. Summarizing, all three preference types display "less intense" preferences in response to ego depletion, and this implies changes in different directions for different types. These findings can help explain why the literature on social preferences and the deliberative system has so far presented conflicting results.

2 Experimental Setup

2.1 Distributional preferences and manipulation of the deliberative system

Our experiment consists of different tasks, distributed over two consecutive weeks. In the first week, subjects are first classified into different distributional preference types by means of the equality equivalence test (Kerschbamer, 2015). Then they are exposed to a risk aversion test and to a cognitive reflection test. In the second week, half of the subjects undergo an ego depletion task while the other half serves as control group. Thereafter, subjects retake the equality equivalence test and then receive information about their earnings and their payment for both weeks.

The equality equivalence test (EET) exposes subjects to a series of binary choices. Each choice involves two allocations, each specifying a payoff for a decision maker (DM) and a payoff for a randomly matched anonymous subject, which we will call the passive subject (PS). In each choice one of the two allocations is a reference allocation in which the DM and PS receive the same income. The other allocation is asymmetric in that it entails unequal payoffs for the two agents. In half of the choice tasks the asymmetric allocation is located in the domain of disadvantageous inequality (in which the DM receives a lower payoff than the PS), in the other half it is located in the domain of advantageous inequality (where the DM receives a higher payoff than the PS). In both domains the EET systematically varies the price of giving (or taking) by increasing the material payoff of the DM in the asymmetric allocation while keeping all other payoffs constant.

For this study we used a test version with ten binary choices five in each domain (see Appendix A A). In the instructions subjects were informed that i) their payment for this part of the experiment would be handed out at the end of the whole experiment (in the second week); ii) they would receive two payments for this task, one as a DM and one as the PS (for another DM); iii) for their payment as a DM one of the 10 binary choices would be selected randomly and the alternative chosen in this decision problem would be paid out; and iv) their payment as the PS would come from another participant (i.e., not from the PS of the DM under consideration).

Given the design of the EET, in each of the two domains a rational DM switches at most once from the symmetric to the asymmetric allocation (and never in the other direction). As shown by Kerschbamer, the switch points in the two domains can be used to construct a two-dimensional index representing archetypes of distributional concerns and preference intensity: the x-score (ranging from -2.5 to +2.5 in integer steps) measures benevolence in the domain of disadvantageous inequality, and the y-score (again ranging from -2.5 to +2.5 in integer steps) measures benevolence in the domain of advantageous inequality. In both domains a negative score means malevolence.

Following standard procedures (Baumeister et al., 1998; Fischer et al., 2007; DeWall et al., 2007; Legault et al., 2009; Freeman and Muraven, 2010; Achtziger et al., 2014, 2015), we suppressed the subjects' deliberative system by means of an ego depletion task. We used a letter counting task, in which participants were asked to cross out a pattern of appearance of the letter "e" in some paragraphs of text. Participants in the control condition were asked to cross out all letters "e", while participants in the depletion condition had to cross out a pattern of "e"s that required the suppression of an impulse (for details, see the instructions in Appendix B).³ The aim of the control condition is to keep participants busy for five minutes without exhausting their cognitive resources. In both conditions, participants were provided with a total of six paragraphs, each containing seven rows of text from "Alices Adventures in Wonderland" by Lewis Carroll. They had five minutes to complete as many paragraphs as possible and were then asked to enter the number of relevant counted "e"s for each paragraph into the computer. The correct counting of "e"s per paragraph was incentivized with three points for a correct number and one point if the number was almost correct, that is, either one unit above or one unit below the correct one.⁴ Feedback about the correct number of paragraphs was given at the end of the experiment.⁵

³The control condition was clearly easier and required less effort, since the dominant, impulsive response in this task is to cross out every "e". In sessions 10 and 11 our subjects also underwent a habituation task before they started with the depletion task, that is, *all* subjects were required to cross out all appearances of the letter "e" in some paragraphs of text for five minutes for a flat payment. Yet, as noted by Achtziger et al. (2014), the logic behind an ego depletion manipulation does not prescribe a habituation task. Indeed, results in these two sessions do not differ from the other sessions.

⁴A subtle methodological issue concerns how monetary incentives associated with the depletion task itself influence behavior in the main game. Achtziger et al. (2014, 2015) find no impact of the incentive scheme on behavior in the ultimatum and dictator game. Hence, we expect the monetary incentives of the depletion task to not to overstate the depletion effects.

⁵In addition, in sessions 5-11 we included the multidimensional mood questionnaire of Steyer et al. (1997) to verify that subjects are not just more tired or in a worse mood after the ego depletion task. As expected, subjects are not significantly more tired in the treatment condition compared to the control condition (attention-tired-dimension, mean T: 11.44, C: 11.77, MWU, $z = 0.49$, $p = 0.62$) and they are not of a significantly worse mood (good-bad-mood-dimension, mean T: 14.08, C: 15.06, WMU test, $z = 1.42$, $p = 0.16$). They are, however, slightly less calm and more nervous (calm-nervous-dimension, mean T: 12.97, C: 14.31, WMU test, $z = 1.62$, $p = 0.10$), which is in line with ego depletion.

2.2 Procedures

The experiment consisted of nine sessions conducted at the Innsbruck EconLab. Over all sessions, 180 subjects participated in the first week. From the 180 subjects in the first week, 15 did not show up in the second week.⁶ In each second-week session, half of the subjects did the ego depletion task (treatment group, T) and half did the control task (C). Sessions lasted approximately 40 minutes in the first week and 50 minutes in the second week and average earnings were 23.09 Euros. From those 165 subjects that showed up in both weeks, we exclude 20 from the analysis. Those participants made inconsistent choices in the risk aversion task or in one of the two tests for distributional preferences.⁷ We therefore remain with 145 subjects that we use in our analysis.

Subjects were recruited via H-Root (Bock et al., 2012). Except for the paper and pencil task in the ego depletion stage, the experiment was computerized via z-Tree (Fischbacher, 2007). The general rules of participation were handed out and read out loud at the beginning of the experiment, detailed instructions for the respective task followed immediately before the task.

3 Results

There is clear evidence that the ego depletion task is more difficult to perform than the control task: subjects solved significantly more paragraphs correctly in the control condition compared to the treatment condition (av. number of correctly solved paragraphs: 0.08 in T and 0.29 in C; Mann-Whitney U-test (MWU): $z = 3.08, p < 0.01$); the same holds for the paragraphs almost correctly solved (av. number: 0.18 in T and 0.57 in C; MWU: $z = 3.78, p < 0.01$).

A comparison of x- and y-scores in week 1 across treatments reveals no significant differences (av. x-score: 0.97 in T and 0.71 in C; MWU: $z = 0.94, p = 0.35$; av. y-score: 1.25 in T and 1.23 in C; MWU: $z = 0.31, p = 0.76$). There are also no significant differences across treatments in age, gender composition, percentage of subjects studying economics, percentage of risk averse subjects or the average number of correct answers in the cognitive reflection test (see Table 1). Hence, it seems that our randomization was successful.

Table 1: Summary statistics

	Treatment	Control	
av. age	23.4	24.26	T-test, $t = 1.18, p = 0.24$
av. x-score	0.97	0.71	MWU test, $z = 0.94, p = 0.35$
av. y-score	1.25	1.29	MWU test, $z = 0.31, p = 0.76$
av. cor. answ. CRT	1.85	1.79	MWU test, $z = 0.27, p = 0.79$
av. paragr. correctly solved	0.08	0.29	MWU test, $z = 3.08, p < 0.01$
av. paragr. almost cor. solved	0.18	0.57	MWU test, $z = 3.78, p < 0.01$
percentage male	0.56	0.57	test of prop., $z = 0.09, p = 0.92$
percentage econ. students	0.36	0.38	test of prop., $z = 0.24, p = 0.81$
percentage risk averse	0.34	0.38	test of prop., $z = 0.41, p = 0.68$
	N=73	N=72	

In week 1, the three largest classes of distributional preference types in both the treatment and the control condition are altruists, maximin and selfish types, who cover more than 90% of all subjects (see Table 2 and Figure 1). The distribution of types in the population is in line with the literature (Balafoutas et al., 2014, 2012; Kerschbamer, 2015). In line with the results for the x- and the y-score, the distribution of archetypes of distributional preferences does not differ significantly across treatments (Pearsons chi-squared (7) = 8.96, $p = 0.25$). In the second week the three largest classes remain altruists,

⁶The 15 subjects for which we have no data for the second week do not differ significantly from the others with respect to the distributional preference type they were classified to in week one; Fisher’s exact test yields $p = 0.16$.

⁷The equality equivalence test and the risk aversion test rely on minimal assumptions regarding the rationality of a DM. In terms of axioms on preferences the assumptions are ordering (completeness and transitivity) and strict (own-money) monotonicity. By ‘inconsistent choices’ we mean choice patterns that are inconsistent with those basic axioms. Average earnings did not differ significantly among the inconsistent and consistent subjects (23.29 and 23.06, respectively; Mann-Whitney U-test, $z = 0.28, p = 0.78$). Half of the inconsistent subjects were in the treatment condition. 18 out of the 20 subjects behaved inconsistently already in the first week; there were only two subjects (one in each condition) who made consistent choices in the first week but inconsistent ones in the second.

maximin and selfish types in both treatments; again, the distribution of types is indistinguishable (Pearsons chi-squared (6) = 2.44, $p = 0.88$).

Table 2: The distributional preference types in week 1 and in week 2

	Week 1				Week 2			
	Treatment		Control		Treatment		Control	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
altruist	28	38	30	42	28	38	32	44
envious	1	1	4	6	1	1	2	3
equality av.	1	1	0	0	0	0	0	0
inequality av.	0	0	3	4	1	1	2	3
kick-down	1	1	1	1	0	0	0	0
kiss-up	2	3	0	0	1	1	0	0
maximin	14	19	15	21	12	16	11	15
selfish	26	36	19	26	29	40	24	33
spiteful	0	0	0	0	1	1	1	1

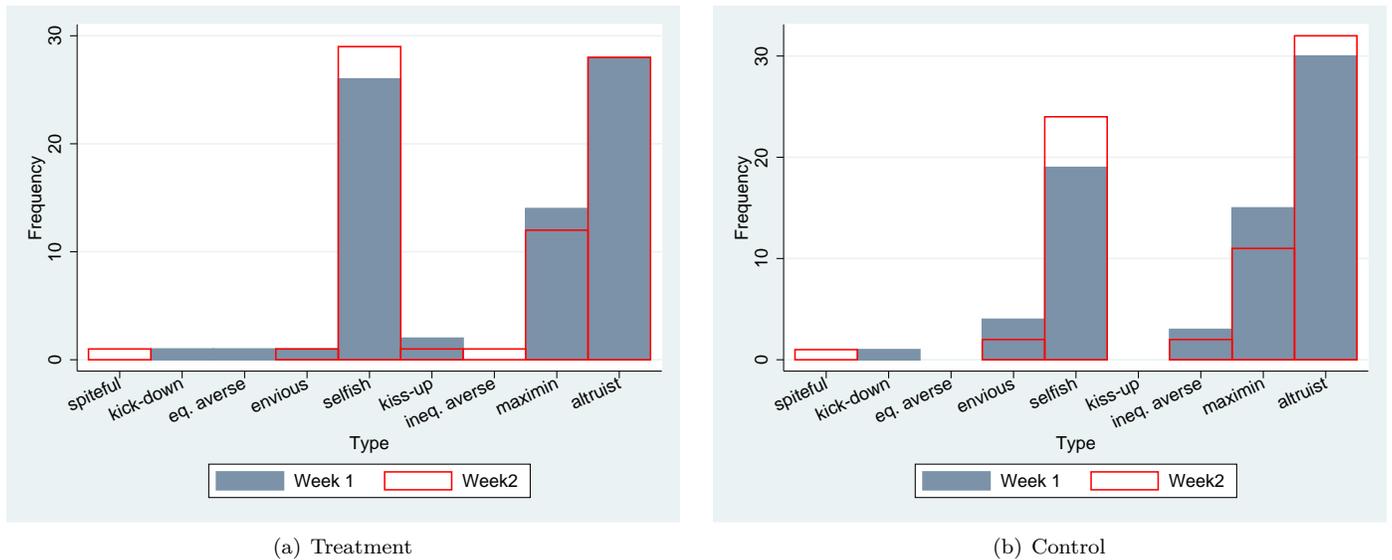


Figure 1: The distribution of distributional preference types over both weeks

Result 1 Overall, distributional preference types are relatively stable over the two weeks. Slightly more subjects change type in the treatment condition than in the control condition, but the proportions are not significantly different from each other.

While 33% of the subjects change the type in the treatment condition from one week to the next, only 24% change type in the control condition.⁸ Yet, these proportions are not significantly different from each other (two-sample test of proportions, $z = 1.24$, $p = 0.22$). A similar result holds for the x- and the y-scores: 33% of the subjects change the x-score in the treatment condition, 31% in the control condition ($z = 0.30$, $p = 0.76$); 27% change the y-score in the treatment condition and 31% in the control condition ($z = 0.42$, $p = 0.68$).

⁸Balafoutas et al. (2014) also show that preference types remain predominantly constant over the two weeks at the individual level; their Spearman rank correlation coefficients are $\rho = 0.50$ for choices in the disadvantageous inequality block and $\rho = 0.53$ for choices in the advantageous inequality block, with $p < 0.01$ for both correlation coefficients. In the control group, our Spearman rank correlation coefficients are $\rho = 0.75$ for choices in the disadvantageous inequality block and $\rho = 0.77$ for choices in the advantageous inequality block, with $p < 0.01$ for both correlation coefficients.

When we consider the direction of the changes of the x- and the y-scores, the differences between the treatment and control group remain insignificant. On average the x-score drops by 0.10 in the treatment condition, while it increases by 0.15 in the control condition (see Table 3). The difference in these changes is not significant (MWU: $z = 1.57$, $p = 0.12$), and both changes are by and large indistinguishable from zero (Wilcoxon signed-ranks (WSR) test, T: $z = 0.55$, $p = 0.58$; C: $z = 1.72$, $p = 0.09$). For the y-score, changes are smaller and also not significantly different from zero: the y-score increases on average by 0.01 in the treatment condition (WSR test, $z = 0.43$, $p = 0.67$), while it remains constant in the control condition. An ordered logistic regression with clustered robust standard errors on the individual level confirms the insignificance for the interaction dummy of the second week and the treatment condition (“week x treatment”) for both scores (see Table 4). Hence, overall, we can say that x- as well as y-scores do not change from one week to the next on aggregate.

Table 3: The changes in the scores, for all subjects and depending on the type

		all subjects	altruists	selfish	maximin	other
av. change x-scores	T	-0.10	-0.39	0.19	0.21	-0.80
change different from 0?		$z = 0.55$	$z = 2.82$	$z = 2.24$	$z = 1.67$	$z = 2.00$
W. signed rank test		$p = 0.58$	$p < 0.01$	$p = 0.03$	$p = 0.09$	$p = 0.05$
av. change x-scores	C	0.15	0.00	0.05	0.07	1.13
change different from 0?		$z = 1.71$	$z = 0.00$	$z = 0.57$	$z = 1.20$	$z = 1.97$
W. signed rank test		$p = 0.09$	$p = 1.00$	$p = 0.57$	$p = 0.23$	$p = 0.05$
av. change y-scores	T	0.01	-0.04	0.19	-0.50	0.80
change different from 0?		$z = 0.43$	$z = 0.40$	$z = 1.89$	$z = 2.44$	$z = 1.42$
W. signed rank test		$p = 0.67$	$p = 0.69$	$p = 0.06$	$p = 0.01$	$p = 0.18$
av. change y-scores	C	0.00	-0.03	0.11	0.00	0.13
change different from 0?		$z = 0.00$	$z = 0.44$	$z = 1.00$	$z = 0.00$	$z = 0.37$
W. signed rank test		$p = 1.00$	$p = 0.65$	$p = 0.32$	$p = 1.00$	$p = 0.72$
number of observations	T	73	28	26	14	5
	C	72	30	19	15	8

However, once we consider the three major distributional preference types separately we find significant differences (see Table 3 and Figure 2; for a graphical overview of the changes of all types see Appendix C Figure 3). From the sign of the differences it becomes clear why there are no significant changes on the aggregate level: changes go into opposing directions.

Result 2 *In the domain of disadvantageous inequality (x-score), subjects classified as altruists (selfish, maximin) in the first week become significantly less (more) benevolent in week 2 in the treatment condition. In the domain of advantageous inequality (y-score), subjects classified as maximin (selfish) in the first week become significantly less (more) benevolent in week 2 in the treatment condition. All other changes are not significant.*

Consider first subjects classified as *altruists* in the first week. In the domain of disadvantageous inequality those subjects become *less* benevolent (more selfish) in the second week in the treatment condition but not in the control condition (mean change in x-score T: -0.39, N = 28, st.dev. = 0.69; C: 0.00, N = 30, st.dev. = 0.59): The reduction in x-scores in the treatment condition is significantly different from zero (WSR test, $z = 2.82$, $p < 0.01$) while the change in the control condition is not. In the domain of advantageous inequality, altruists become slightly less benevolent in both conditions (mean change in y-score T: -0.04, st.dev. = 0.69; C: -0.03, st.dev. = 0.41). Yet, neither of the changes is significantly different from zero (T, WSR test, $z = 0.40$, $p = 0.69$; C, WSR test, $z = 0.44$, $p = 0.65$).

Next consider subjects classified as *selfish* in the first week. Those subjects become *more* benevolent in both domains, both in the treatment and in the control condition (mean change in x-score T: +0.19, N= 26, st. dev. = 0.40; C: +0.05,

Table 4: Ordered logistic regression; dependent variable x-score / y-score, standard errors clustered on indiv. level

	(1)	(2)	(3)	(4)	(5)	(6)
	dep. variable: x-score			dep. variable: y-score		
treatment	0.29 (0.90)	0.36 (1.08)	0.35 (1.03)	-0.10 (-0.31)	-0.09 (-0.30)	-0.12 (-0.40)
week	0.22 (1.61)	0.25 (1.62)	0.25 (1.61)	-0.03 (-0.24)	-0.04 (-0.31)	-0.05 (-0.33)
week x treatment	-0.33 (-1.51)	-0.36 (-1.46)	-0.38 (-1.51)	0.01 (0.06)	0.03 (0.14)	0.03 (0.15)
male		0.83** (2.44)	0.95*** (2.79)		0.77** (2.34)	0.81** (2.43)
age		0.04* (1.83)	0.04* (1.81)		-0.00 (-0.21)	-0.00 (-0.22)
econ		-0.33 (-1.09)	-0.27 (-0.84)		-0.60** (-2.00)	-0.60* (-1.95)
CRT		0.14 (1.02)	0.14 (0.96)		-0.02 (-0.14)	-0.04 (-0.22)
risk averse		-0.49 (-1.53)	-0.42 (-1.34)		-0.42 (-1.36)	-0.37 (-1.16)
tired week 2			0.10 (0.30)			-0.02 (-0.07)
good mood week 2			0.32 (0.85)			-0.02 (-0.07)
food week 2			-0.68** (-2.21)			-0.44 (-1.52)
<i>N</i>	290	290	290	290	290	290

z statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Week = 1 if week is the second week. “week x treatment” is an interaction term that is 1 if week = 1 and treatment = 1. Male = 1 if the subject is male. Econ = 1 if the subject studies economics. CRT is the number of correct answers in the cognitive reflection test (between 0 and 3). Risk averse = 1 if the subject is risk averse. Tired week 2 = 1 if the subject answered “yes” to the question if he/she is tired in the second week. Good mood week 2 = 1 if the subject described their mood as being in the better 50% of the scale in the second week. Food week 2 = 1 if the subject did *not* eat in the last two hours in the second week.

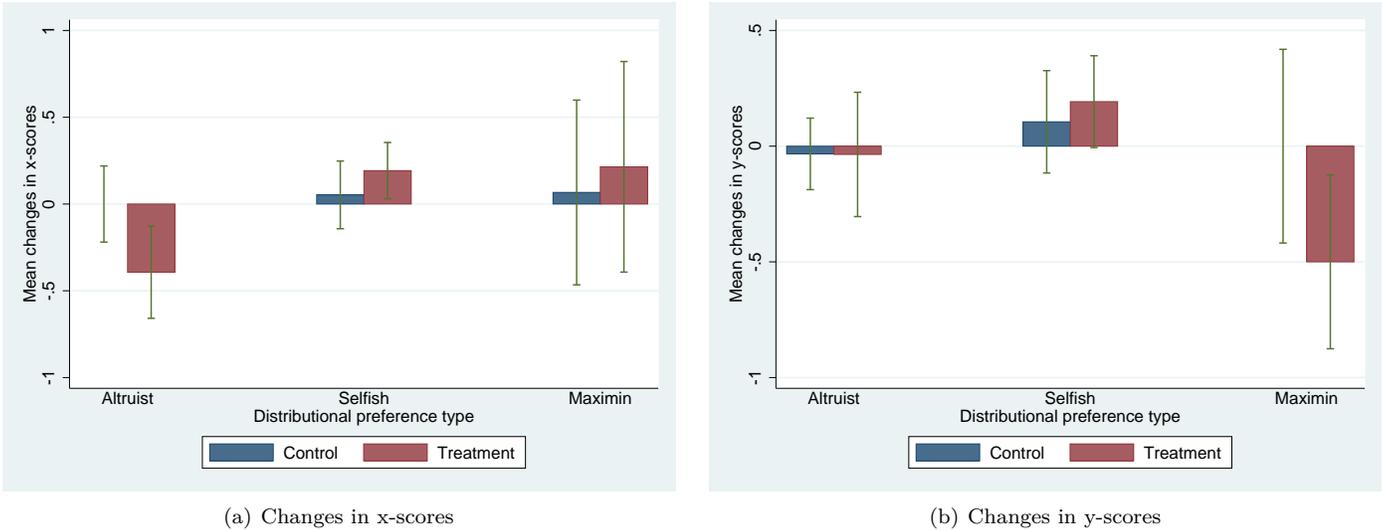


Figure 2: The change in the scores, depending on the type

$N = 19$, st. dev. = 0.40; mean change in y-score T: +0.19, $N=26$, st. dev. = 0.49; C: + 0.11, $N=19$, st. dev. = 0.46); yet, only the change in the treatment condition is significantly different from zero (T: x-scores, WSR test, $z = 2.44$, $p = 0.03$; y-scores, WSR test, $z = 1.89$, $p = 0.06$; C: x-scores, WSR test, $z = 0.57$, $p = 0.57$; y-scores, WSR test, $z = 1.00$, $p = 0.32$).

Finally consider subjects classified as *maximin* in the first week. In the domain of disadvantageous inequality those subjects become on average *more* benevolent both in the treatment and in the control condition (mean change in x-score T: +0.21, $N= 14$, st. dev. = 1.05; C: + 0.07, $N=15$, st. dev = 0.96). Yet, the change is only significant for the treatment condition (T: WSR test, $z = 1.67$, $p = 0.09$; C: WSR test, $z = 1.20$, $p = 0.23$). In the domain of advantageous inequality, maximin subjects become on average *less* benevolent in the treatment condition, and do not change in the control condition (mean change in y-score T: - 0.50, $N=14$, st. dev. = 0.65; mean change in y-score C: 0.00, $N= 15$, st. dev. = 0.76): While the change for the treatment condition is highly significant, it is clearly insignificant for the control (T: WSR test, $z = 2.44$, $p = 0.01$; C: $z = 0.00$, $p = 1.00$).

The above results can be summarized as indicating that all three main preference types (altruist, selfish and maximin) display less intense preferences in response to our ego depletion treatment. Finally, while the x-score for those individuals classified as “other types” changes significantly between the two weeks (see Table 3), none of the changes is significant when we consider the types separately (note that, overall, we only have five observations in the “other types” class in the treatment condition and eight in the control condition).

4 Discussion

Overall, and in line with evidence from Balafoutas et al. (2014), we find that distributional preferences are relatively stable over time. With respect to ego depletion we find that, in the aggregate, distributional preferences are not influenced by a reduction in the capacity for self-control. However, when we break down behavior according to different distributional preference types, we find a systematic impact: for all types of distributional preferences the revealed type is less extreme with ego depletion than without. Specifically, selfish subjects become more pro-social when the capacity for self-control has been reduced, while altruistic subjects become less pro-social (at least in the domain of disadvantageous inequality; for the domain of advantageous inequality the change in benevolence for altruists is insignificant). Subjects classified as maximin - who per definition are benevolent in the domain of advantageous and neutral in the domain of disadvantageous inequality - decrease their benevolence in the domain of advantageous and increase their benevolence in the domain of disadvantageous inequality when their capacity for self-control has been reduced. The fact that different distributional preference types react differently to a reduction in the capacity for self-control explains why we see no effect of ego depletion on distributional preferences in the aggregate: the changes in benevolence simply cancel out.

Turning to the two hypotheses discussed in the introduction it seems that for all types of social preferences the primary motive is less extreme than the motive revealed under self-control. Benevolent subjects seem to use the deliberative system

to become even more benevolent, while more selfish subjects seem to use their self-control to strengthen their own-money maximizing motive. The fact that different distributional preference types cope differently with reduced self-control may have implications for a wide range of areas. For instance, organizations relying on charitable giving may want to use information on previous giving behavior in order to decide when to ask a given donor for a donation.

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A Version of the Equity Equivalence Test (Kerschbamer, 2015) we used

Choices in the disadvantageous inequality block:

Alternative: Left		Your Choice		Alternative: Right	
<i>You receive</i>	<i>The other person receives</i>	<i>Cross here your choice</i>		<i>You receive</i>	<i>The other person receives</i>
3 points	6 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
3.8 points	6 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
4 points	6 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
4.2 points	6 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
5 points	6 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points

Choices in the advantageous inequality block:

Alternative: Left		Your Choice		Alternative: Right	
<i>You receive</i>	<i>The other person receives</i>	<i>Cross here your choice</i>		<i>You receive</i>	<i>The other person receives</i>
3 points	2 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
3.8 points	2 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
4 points	2 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
4.2 points	2 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points
5 points	2 points	<input type="checkbox"/>	<input type="checkbox"/>	4 points	4 points

B Instructions

[Instructions were originally in German.]

Instructions [WEEK 1]

Welcome to an experiment over decision making!
Thank you for your participation!

Please, from now on, do not talk anymore to the other participants. For a better understanding, in the following we will only use male designations. Those should be understood as gender neutral.

During the experiment, you and the other participants are asked to take decisions. All decisions are to be taken on the computer. During the experiment, you are connected to other participants, but you will not know with which participants you are connected respectively. Your own as well as the decisions of the participants that are connected with you will determine your payments, according to the rules that follow below. Each participant will only be informed about his / her payment, but will not know how much other participants earn.

The experiment consists of five parts in total. Parts 1, 2 and 3 will take place now and will last for around 50 Minutes. Parts 4 and 5 will take place next Tuesday, 03.02.2015 at 10:00, and will last for around 60 Minutes.

The five parts of the experiment are completely independent from each other. That is, your payment for part x only depends on decisions that you take in part x, and does not depend on decisions you take in other parts of the experiment.

At the beginning of each part you receive the specific instructions. We will read the instructions out loud and will give you time for questions.

Your earnings are given in points. At the end of the experiment, the points will be converted in Euros and the amount will be paid to you in cash. The exchange rate is the following:

$$1 \text{ point} = 1 \text{ Euro.}$$

Please note that the total amount you may earn in the five parts of the experiment will be paid out at the end of part 5 in the next week. Please note also that you will receive the amount you earn today only if you participate in the parts 4 and 5 in the next week. If you are impeded to come next week, your earnings of part 1, 2 and 3 will lapse.

Whenever you have questions - also during the experiment - please raise your hand or attract attention to yourself. We will then come to your seat. Please do not ask questions in public.

Instructions to part 1 of the experiment

Part 1 of the experiment consists of 10 decisions. In each of these 10 decisions, you will be paired with another participant of the experiment at random. We will denote the participant paired with you in the following “your passive person”. You will see later on, why we denote this person “passive person”. You will not know at any point in time the identity of your passive person. Your passive person will not know at any point in time your identity.

Each of your 10 decisions is a choice between the alternatives LEFT and RIGHT. Each alternative has consequences for your own payment and for the payment to your passive person.

Example: You may be asked if you prefer alternative LEFT, in which you receive 3.8 points and your passive person 6 points, or alternative RIGHT, in which you receive 4 points and your passive person receives 4 points as well. You then have to decide which of the two alternatives to choose. This decision problem is presented on the screen as follows:

Alternative LINKS	Alternative LINKS	IHRE WAHL	Alternative RECHTS	Alternative RECHTS
Sie erhalten Euro	Passive Person erhält Euro	Hier Ihre Wahl anklicken	Sie erhalten Euro	Passive Person erhält Euro
3.8	6.0	LINKS <input checked="" type="radio"/> <input type="radio"/> RECHTS	4.0	4.0

You will take 10 of such decisions in total. After you have taken all decisions, you will see all 10 decisions on one screen. You may then correct them once.

Your payment of part 1 of the experiment is determined as follows:

Payment as active person: For each participant one of the 10 decision situations is selected separately and at random, and the alternative chosen in the respective situation will then be paid out. If, for example, the situation above would be selected and if you had chosen in the above situation the alternative RIGHT, then you would receive 4 points as active person, while your passive person would receive 4 points as passive person.

Payment as passive person: As your passive person receives points from your decision, without doing anything for it, you also receive points from another participant in the experiment, without doing anything for it; that is, you are for another participant the passive person. We will ensure that we will not draw your active and passive person being the same person. That is, if person X is your passive person, then for sure you will not be the passive person of person X.

Do you have questions?

Instructions to part 2 of the experiment

Part 2 of the experiment consists of 10 decisions. Each of the decisions is the choice between alternative A and alternative B. Each decision only has consequences for your own payment, not for the payment of other participants in the experiment.

Alternative A always presents itself as an uncertain payout: With 50% probability you will receive 5 points, with 50% probability, 0 points.

Alternative B always presents itself as a certain payout: With 100% probability you will receive the amount that varies from decision to decision.

In total you take 10 of these decisions. After you have taken all decisions, you will see again all 10 decisions on one screen. You may then correct them once.

Your payment of part 2 of the experiment is determined as follows:

One of the 10 situations will be selected at random and used for payment. All situations have the same probability to being selected. Your payment of part 2 is then determined as follows:

- If you have chosen alternative A in the selected situation, then, with 50% probability you will receive 5 points and with 50% probability you will receive 0 points.
- If you have chosen alternative B in the selected situation, then you will receive the certain amount in the selected decision.

Do you have questions?

Instructions to part 3 of the experiment

In part 3 of the experiment you will be invited to answer some questions.

Your payment of part 3 of the experiment is determined as follows:

For each correct answer you will receive 1 point.

[On the computer screen:]

- A bat and a ball cost 1.10 Euro in total. The bat costs 1.00 Euro more than the ball. How many cents does the ball cost? __ cents
- If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? __minutes
- In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake? __days

Instructions [WEEK 2]

Welcome to an experiment over decision making!
Thank you for your participation!

Please, from now on, do not talk anymore to the other participants. For a better understanding, in the following we will only use male designations. Those should be understood gender neutral.

During the experiment, you and the other participants are asked to take decisions. All decisions are to be taken on the computer. During the experiment you are connected to other participants, but you will not know with which participants you are connected respectively. Both your own as the decisions of the participants that are connected with you will determine your payments, according to the rules that follow below. Each participant will only be informed about his / her payment, but will not know how much other participants earn.

The experiment consists of five parts in total. Today, parts 4 and 5 will take place. They will last for approximately 50 minutes.

The five parts of the experiment are completely independent from each other. That is, your payment for part x only depends on decisions that you take in part x, and does not depend on decisions you take in other parts of the experiment.

At the beginning of each part you receive the specific instructions. We will read the instructions out loud and will give you time for questions.

Your earnings are given in points. At the end of the experiment, the points will be converted in Euros and the amount will be paid to you in cash.

The exchange rate is the following:

1 point = 1 Euro.

Whenever you have questions - also during the experiment - please raise your hand or attract attention to yourself. We will then come to your seat. Please do not ask questions in public.

Instructions to part 4 of the experiment

In this part of the experiment, the participants in the experiment have to accomplish different tasks. The task you have to accomplish depends on the number you have been assigned. Your number is: 301 [*401 for the treatment group*].

Please enter this number in the computer in the correspondent field.

Your task in this part of the experiment consists of identifying letter sequences in the text on the enclosed sheet of paper (title: task sheet), in which the letter “e” appears according to a specific pattern.

The exact instructions after which pattern you have to search you will find at the beginning of the task on your computer screen.

Please cross out the identified relevant “e”s, and subsequently write down the number of occurrences below the respective paragraph in the corresponding field.

You have 5 minutes for this task. Time will be measured from the experiment instructor. It does not play a role which paragraphs you work on. After 5 minutes, the instructor of the experiment will ask you to stop. Please write down then the number of relevant “e”s for each paragraph you have been working on in the corresponding field in the computer; you have 1 minute for this task.

At the end of this part of the experiment

We will collect all sheets and check if you have crossed out all relevant “e”s in the paragraphs for which you have entered a number unequal zero in the computer.

Your payment for part 4 of the experiment is determined as follows:

You will receive 3 points for each paragraph in which you have identified the number of relevant “e”s correctly. For paragraphs for which your answer is almost correct you will receive 1 point. As almost correct we count all answers, for which the given number is by 1 larger or smaller than the correct number.

Please write down your 6-digit participation number on the following sheet of paper with the title “task sheet” and to the sheet with the title “exercise sheet”.

Do you have questions?

Exercise task [*Only in session 10 and 11*]

Before we start with this part of the experiment, there is an exercise task. On the attached sheet (title “exercise sheet”) you will have to identify a sequence of letters that we will show you after these instructions on your computer screen.

Please cross out all the relevant “e”s you find, and write down the number of occurrences below the respective paragraph in the corresponding field. After 5 minutes, the instructor of the experiment will ask you to stop. Please write down the number of relevant “e”s for each paragraph that you have worked on in the respective field in the computer; you have 1 minute time for this.

You will receive 1 point for this exercise.

Attention: The pattern after which you have to search may be different in the exercise and in the actual task. Please pay attention to the new instructions on the computer screen after you have worked on the exercise task!

Do you have questions?

Exercise sheet [*Only in session 10 and 11*]

Please write down your participant number: _____

Paragraph 1:

Alice was beginning to get very tired of sitting by her sister on the bank, and of having nothing to do. Once or twice she had peeped into the book her sister was reading, but it had no pictures or conversations in it, "and what is the use of a book," thought Alice, "without pictures or conversations?" So she was considering in her own mind (as well as she could, for the day made her feel very sleepy and stupid), whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a White Rabbit with pink eyes ran close by her. There

This paragraph contains __ relevant "e"s.

Paragraph 2:

was nothing so very remarkable in that, nor did Alice think it so very much out of the way to hear the Rabbit say to itself, "Oh dear! Oh dear! I shall be too late!" But when the Rabbit actually took a watch out of its waistcoat-pocket and looked at it and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat-pocket, or a watch to take out of it, and, burning with curiosity, she ran across the field after it and was just in time to see it pop down a large rabbit-hole, under the hedge. In another moment, down went Alice

This paragraph contains __ relevant "e"s.

Paragraph 3:

after it! The rabbit-hole went straight on like a tunnel for some way and then dipped suddenly down, so suddenly that Alice had not a moment to think about stopping herself before she found herself falling down what seemed to be a very deep well. Either the well was very deep, or she fell very slowly, for she had plenty of time, as she went down, to look about her. First, she tried to make out what she was coming to, but it was too dark to see anything; then she looked at the sides of the well and noticed that they were filled with cupboards and book-shelves; here and

This paragraph contains __ relevant "e"s.

Paragraph 4:

there she saw maps and pictures hung upon pegs. She took down a jar from one of the shelves as she passed; it was labelled 'ORANGE MARMALADE', but to her great disappointment it was empty: she did not like to drop the jar for fear of killing somebody, so managed to put it into one of the cupboards as she fell past it. 'Well!' thought Alice to herself, 'after such a fall as this, I shall think nothing of tumbling down stairs! How brave they'll all think me at home! Why, I wouldn't say anything about it, even if I fell off the top of the house!' (Which was very likely true.) Down,

This paragraph contains __ relevant "e"s.

Paragraph 5:

down, down. Would the fall never come to an end! 'I wonder how many miles I've fallen by this time?' she said aloud. 'I must be getting somewhere near the centre of the earth. Let me see: that would be four thousand miles down, I think--' (for, you see, Alice had learnt several things of this sort in her lessons in the schoolroom, and though this was not a very good opportunity for showing off her knowledge, as there was no one to listen to her, still it was good practice to say it over) '—yes, that's about the right distance—but then I wonder what Latitude or Longitude I've got to?' (Alice

This paragraph contains __ relevant "e"s.

Paragraph 6:

had no idea what Latitude was, or Longitude either, but thought they were nice grand words to say.) Presently she began again. ‘I wonder if I shall fall right through the earth! How funny it’ll seem to come out among the people that walk with their heads downward! The Antipathies, I think–’ (she was rather glad there was no one listening, this time, as it didn’t sound at all the right word) ‘–but I shall have to ask them what the name of the country is, you know. Please, Ma’am, is this New Zealand or Australia?’ (and she tried to curtsy as she spoke–fancy curtseying as you’re falling

This paragraph contains __ relevant “e”s.

Task sheet

Please write down your participant number: _____

Paragraph 1:

Down, down, down. There was nothing else to do, so Alice soon began talking again. 'Dinah'll miss me very much to-night, I should think!' (Dinah was the cat.) 'I hope they'll remember her saucer of milk at tea-time. Dinah my dear! I wish you were down here with me! There are no mice in the air, I'm afraid, but you might catch a bat, and that's very like a mouse, you know. But do cats eat bats, I wonder?' And here Alice began to get rather sleepy, and went on saying to herself, in a dreamy sort of way, 'Do cats eat bats? Do cats eat bats?' and sometimes, 'Do bats eat cats?' for, you see,

This paragraph contains __ relevant "e"s.

Paragraph 2:

as she couldn't answer either question, it didn't much matter which way she put it. She felt that she was dozing off, and had just begun to dream that she was walking hand in hand with Dinah, and saying to her very earnestly, 'Now, Dinah, tell me the truth: did you ever eat a bat?' when suddenly, thump! thump! down she came upon a heap of sticks and dry leaves, and the fall was over. Alice was not a bit hurt, and she jumped up on to her feet in a moment: she looked up, but it was all dark overhead; before her was another long passage, and the White Rabbit was still in sight, hurrying

This paragraph contains __ relevant "e"s.

Paragraph 3:

down it. There was not a moment to be lost: away went Alice like the wind, and was just in time to hear it say, as it turned a corner, 'Oh my ears and whiskers, how late it's getting!' She was close behind it when she turned the corner, but the Rabbit was no longer to be seen: she found herself in a long, low hall, which was lit up by a row of lamps hanging from the roof. There were doors all round the hall, but they were all locked; and when Alice had been all the way down one side and up the other, trying every door, she walked sadly down the middle, wondering how she was ever to get

This paragraph contains __ relevant "e"s.

Paragraph 4:

out again. Suddenly she came upon a little three legged table, all made of solid glass; there was nothing on it except a tiny golden key, and Alice's first thought was that it might belong to one of the doors of the hall; but, alas! either the locks were too large, or the key was too small, but at any rate it would not open any of them. However, on the second time round, she came upon a low curtain she had not noticed before, and behind it was a little door about fifteen inches high: she tried the little golden key in the lock, and to her great delight it fitted! Alice opened the door

This paragraph contains __ relevant "e"s.

Paragraph 5:

and found that it led into a small passage, not much larger than a rat-hole: she knelt down and looked along the passage into the loveliest garden you ever saw. How she longed to get out of that dark hall, and wander about among those beds of bright flowers and those cool fountains, but she could not even get her head through the doorway; 'and even if my head would go through,' thought poor Alice, 'it would be of very little use without my shoulders. Oh, how I wish I could shut up like a telescope! I think I could, if I only know how to begin.' For, you see, so many out of the way

This paragraph contains __ relevant "e"s.

Paragraph 6:

things had happened lately, that Alice had begun to think that very few things indeed were really impossible. There seemed to be no use in waiting by the little door, so she went back to the table, half hoping she might find another key

on it, or at any rate a book of rules for shutting people up like telescopes: this time she found a little bottle on it, ('which certainly was not here before,' said Alice,) and round the neck of the bottle was a paper label, with the words 'DRINK ME' beautifully printed on it in large letters. It was all very well to say 'Drink me,' but the wise little Alice was not

This paragraph contains __ relevant "e"s.

Instructions to part 5 of the experiment

Part 1 of the experiment consists of 10 decisions. In each of these 10 decisions, you will be paired with another participant of the experiment at random. We will denote the participant paired with you in the following “your passive person”. You will see later on, why we denote this person “passive person”. You will not know at any point in time the identity of your passive person. Your passive person will not know at any point in time your identity.

Each of your 10 decisions is a choice between the alternatives LEFT and RIGHT. Each alternative has consequences for your own payment and for the payment to your passive person.

Example: You may be asked, if you prefer alternative LEFT, in which you receive 3.8 points and your passive person 6 points, or alternative RIGHT, in which you receive 4 points and your passive person receives 4 points as well. You then have to decide which of the two alternatives to choose. This decision problem is presented on the screen as follows:

Alternative LINKS	Alternative LINKS	IHRE WAHL	Alternative RECHTS	Alternative RECHTS
Sie erhalten Euro	Passive Person erhält Euro	Hier Ihre Wahl anklicken	Sie erhalten Euro	Passive Person erhält Euro
3.8	6.0	LINKS <input checked="" type="radio"/> RECHTS	4.0	4.0

You will take 10 of such decisions in total. After you have taken all decisions, you will see all 10 decisions on one screen. You may then correct them once.

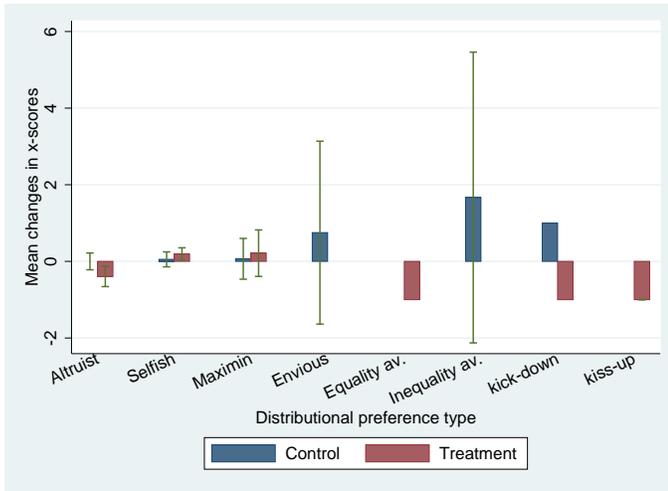
Your payment of part 5 of the experiment is determined as follows:

Payment as active person: For each participant one of the 10 decision situations is selected separately and at random, and the alternative chosen in the respective situation will then be paid out. If for example the situation above would be selected and if you had chosen in the above situation the alternative RIGHT, then you would receive 4 points as active person, while your passive person would receive 4 points as passive person.

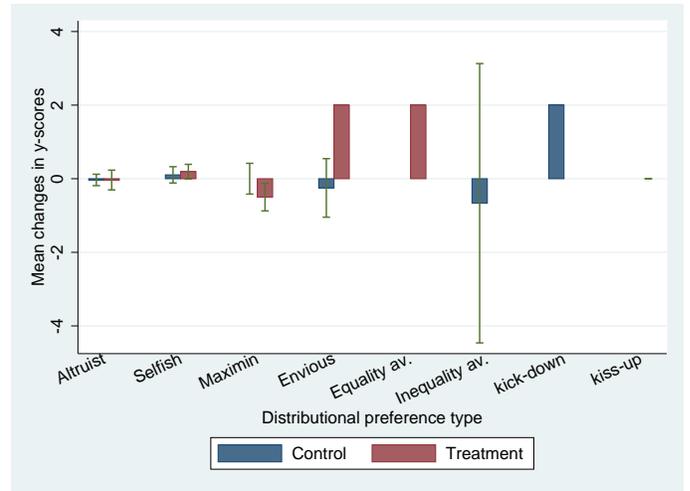
Payment as passive person: As your passive person receives points from your decision, without doing anything for it, you also receive points from another participant in the experiment, without doing anything for it; that is, you are for another participant the passive person. We will ensure that we will not draw your active and passive person as the same person. That is, if person X is your passive person, then for sure you will not be the passive person of person X.

Do you have questions?

C Pictures of the changes when we include also the remaining types



(a) Changes in x-scores



(b) Changes in y-scores

Figure 3: The change in the scores, depending on type