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Affect and fairness:

Dictator games under cognitive load*

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Abstract: We investigate the role of affect and deliberation on social preferences. In our laboratory experiment subjects decide on a series of mini Dictator games while they are under varying degrees of cognitive load. The cognitive load is intended to decrease deliberation and therefore enhance the influence of affect on behavior. In each game subjects have two options: they can decide between a fair or an unfair allocation. We find that subjects in a high-load condition are more generous - they more often choose the fair allocation than subjects in a low-load condition. The series of mini Dictator games also allows us to investigate how subjects react to the games' varying levels of advantageous inequality. Low-load subjects react considerably more to the degree of advantageous inequality. Our results therefore underscore the importance of affect for basic altruistic behavior and deliberation in adjusting decisions to a given situation.

Keywords: social preferences, cognitive load, affect and emotion, lab experiment

JEL-codes: C91; D03;

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In 2010 David Freer risked his life to save a stranger drowning in sea. When asked about the incident he replied: “For split a second, I thought, ‘do I really want to risk stranding both of us?’ Then instinct just kicked in.”[1] Most theories in economics are cognitive in nature and view behavior as a deliberate act based on a thorough assessment of all possible contingencies. However, most people would agree with David Freer that affect and emotions do influence behavior - particularly in a social context.

To incorporate the role of affect, a two-system framework of the decision process has been proposed in the literature.[2] According to these dual process theories, two different modes of cognitive processes govern decisions: One process can be characterized as operating fast, automatic, effortless and often emotionally charged. The other process operates slower, in a deliberate manner, and demands greater cognitive capacity. Loewenstein and O’Donoghue (2007) refer to these two modes as corresponding to affect and deliberation. A number of factors, such as situation, mood, exhaustion of willpower and cognitive load influences whether the cognitive or the affective processes have a greater influence on decision making.

In our study subjects decide on a version of the Dictator game while they are under cognitive load. The additional memory load is intended to decrease cognitive capacity and therefore diminish deliberation.[3] As such, decisions taken under this additional load are governed to a greater extent by the affective system. Originally introduced to study short-term memory (Baddeley and Hitch, 1974), dual-task techniques have been successfully applied to a wide range of topics in psychological research. For example, studies show that individuals under cognitive load rely to a greater degree on stereotypes (Gilbert & Hixon, 1991), exert less self-control as measured by the choice between cake and fruit salad (Shiv & Frederokhin, 1999) or exhibit higher discount rates of future rewards (Hinson, Jameson, & Whitney, 2003).

In which direction does the affective system steer other-regarding decisions, when the deliberate system is occupied with an additional cognitive task? In other words, is fair behavior deeply rooted in human’s affective system or is it a rather effortful, cognitive process that overrides immediate selfish responses? The behavioral predictions are not clear, and existing studies give conflicting answers.

[1] See "Father risks his live to save man in sea" (2010).

[2] See for example Stanovich and West (2000), Kahneman (2003), Lieberman (2003), Strack and Deutsch (2004), Loewenstein and O'Donoghue (2007) and Evans (2008).

[3] Other studies stimulate the affective system. For example, Kirchsteiger, Rigotti, and Rustichini (2006) prime second movers by showing them either a funny or depressing movie.

One side of the debate posits that the deliberate system inhibits immediate selfish urges and guides decisions based on moral and ethical principles. The affective system - evolutionary older and thus more related to animal behavior - is driven by immediate self-interest. The perspective that moral decisions are the result of a process of reasoning and reflection has a long history in philosophy. Like Kant's categorical imperative or the Ten Commandments, philosophy and religion offer ways of grounding values. Similarly, among evolutionary biologists, scholars have argued that civilization is only a thin veneer hiding human's selfish nature. For example, according to Williams (1988), morality is an accidental byproduct of human evolution. This view is also reflected in Schopenhauer's (1851) quote "Man is at bottom a dreadful wild animal. We know this wild animal only in the tamed state called civilization…" or Ghiselin's (1974) "Scratch an 'altruist' and watch a 'hypocrite' bleed." In a similar vein, Moore and Loewenstein (2004) argue that self-interest is an automatic process, whereas ethical responsibilities operate via controlled processes.[4]

Contrary to this perspective, de Waal (2006) argues that human morality is more fundamental and has evolved from social instincts humans share with other animals. Support for this view comes from studies on animal behavior where basic social behavior is observed (for an overview, see Preston & de Waal, 2002). Similarly, van Winden (2007) emphasizes the importance of emotion in contrast to cognition in the individual enforcement of, as well as the compliance with, norms like fairness. According to the social intuitionist approach of Haidt (2001), moral decisions are the result of quick, automatic heuristics. His considerations are based on the observation that individuals exhibit moral reactions to hypothetical scenarios, but have difficulties to reason their views. Empirical support for a specific heuristic - the equality heuristic - comes from Güth, Huck, and Müller (2001). Subjects were faced with mini-Ultimatum Games (UGs), where only two allocations, a fair and an unfair one, were feasible.[5] They find that the fair allocation was chosen more often when it consisted of an equal split compared to an "almost-equal split". Their finding is in line with a focal-point interpretation: fairness concerns are only triggered, when the focal equal split is feasible.

[4] See also Rachlin (2002), who views altruism as a self-control problem, and the subsequent discussion in that issue of Behavior and the Brain Science.

[5] In a standard UG one player, the Proposer, decides on the distribution of a sum of money. A second player, the Receiver, can either accept or reject this proposal. If accepted, the money is divided according to the proposal. If rejected, both players obtain a payoff of zero. See Güth, Schmittberger, and Schwarze (1982).

Related Empirical Literature

The debate, whether altruistic choice is primarily guided by deliberation or by affective reactions, is far from settled. The existing evidence from neuroscience, response times and cognitive load studies is inconclusive.

Neuroscience has investigated the neural correlates of the two-system theory. Moll et al. (2006) studied charitable donations using functional magnetic resonance imaging (fMRI). They find that evolutionary older areas of the brain associated with the affective system (mesolimbic reward system) are not only activated when receiving monetary rewards but also when giving to charity. However, brain areas associated with deliberation (prefrontal cortex) are activated when (i) individuals are opposed to the charitable cause and (ii) the decision to donate comes at a cost. This suggests that the affective system is not solely governed by material self-interest. The deliberative system on the other hand mediates the affective reaction, when it is either in conflict with more abstract moral beliefs or with self-interest. Related is the fMRI study by Sanfey, Rilling, Aronson, Nystrom, and Cohen (2003) who study the Ultimatum game. Activation in brain areas associated with the affective part of the brain (anterior insula) exhibit a positive correlation with rejection rates of unfair offers. Acceptances of unfair offers on the other hand were attributed to the cognitive part of the brain (right dorsolateral prefrontal cortex). As rejecting an unfair offer comes at a cost, their finding is further evidence that the affective system did not steer behavior towards self-interest. While these studies report correlations between behavior and brain activity, Knoch, Pasqual-Leone, Meyer, Treyer, and Fehr (2006) investigate causal effects. They use repetitive transcranial magnetic stimulation (rTMS) to disrupt the prefrontal cortex. They find that subjects are more willing to accept unfair offers, when the right prefrontal cortex is disrupted. As such their finding suggests that choices are more likely to be self-regarding, when deliberation is impaired. Comparing these three studies the evidence on the role of affect on social preferences is mixed. Closest to our study is Moll et al. (2006). Like their study, our experiment is non-strategic. In contrast, however, our research has the advantage that we can draw causal inference.[6]

The existing empirical evidence on cognitive load and social preferences is likewise inconclusive. Roch, Lane, Samuelson, Allison, and Dent (2000) find that individuals under

[6] See also Rubinstein (2007) and Piovesan and Wengström (2009) on response times and social preferences. The latter find longer response times for pro-social choices in a version of a Dictator game. In as far as longer response times reflect more cognitive activity, their results suggest that it is deliberation overwriting immediate selfish responses. In a strategic situation Rubinstein (2007) finds the opposite. Egoistic decisions of proposers in the Ultimatum game exhibit a longer reaction time. An early study on time pressure and helping behavior is Darley and Batson (1973).

high cognitive load are more likely to request an equal split from a common resource pool. In case of an Ultimatum Game Capelletti, Güth, and Ploner (2008) do not find an effect of cognitive load. Closer to our study are the experiments by Hauge, Brekke, Johansson, Johansson-Stenman, and Svedsäter (2009), Cornelissen, Dewitte, and Warlop (2011) and Benjamin, Brown, and Shapiro (2006). All three studies focus on Dictator game giving. However, none of the studies finds a main effect of the cognitive load task that consisted of memorizing a seven digit-number. Cornelissen et al. (2011) find a treatment difference for a subset of individuals - those that were classified as pro-socials in a different task give a higher amount in the high-load condition.[7]

To preclude strategic considerations our focus is on the Dictator games (DG). Compared to previous research on cognitive load and DG, our experimental study comprises two main innovations: First, we apply a different cognitive load task. Hauge et al. (2009) suggest that their cognitive load task (seven-digit number) might have been insufficient in order to find treatment effects. Our cognitive load, an n-back task (Gevins and Cutillo, 1993), is very likely to impose a higher cognitive load than simple tasks like memorizing seven digit numbers. In addition to solely memorizing, n-back tasks require monitoring, updating and manipulation of information. N-back tasks have been used in functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) studies to investigate the role of working memory. They have consistently shown increasing activity of the frontal-cortex (for overviews see Owen, McMillan, Laird & Bullmore, 2005; Fletcher & Henson, 2001). Thus, our memory load task has been shown to specifically activate those areas in the brain that are associated with deliberation. Second, our experiment comprises a series of mini-DGs. This allows us (i) to investigate how subjects react to varying incentives posed by different mini-DGs and (ii) test the equality heuristic. The implementation of a series of games has also a methodological purpose. Other studies informed subjects on their whole choice set before they were under cognitive load. In principal, subjects in these studies could decide prior to being under load. In our experiment we informend subjects only about the general structure of the decision situation. The payoff structure of the particular game was revealed under cognitive load. Thus, subjects could not choose their strategy prior to being under cognitive load.

[7] See also the studies by van den Bos, Peters, Bobocel, and Ybema (2006) and Skitka, Mullen, Griffin, Hutchinson, and Chamberlin (2002) which investigate subjects' evaluation of hypothetical scenarios under varying load conditions.
Van den Bos et al. (2006) report that high-load subjects express a higher level of satisfaction with advantageous inequality, while Skitka et al. (2002) find for a subset of subjects (liberals) that they are less willing to help someone in need when they are cognitively busy. Related is also the study by Barnes, Schaubroeck, Huth and Ghumman (2011). They show that low levels of sleep (which is negatively related to self-control resources) is positively related to unethical behavior like cheating.

Experimental design and procedures

Our experiment consists of two parallel tasks. While subjects are engaged in a cognitive load task they simultaneously decide on a social task. Our treatment variation is the difficulty of the cognitive load task. Subjects are randomized to either a high- or a low-load condition.

Social decision task

The social decision task consists of a series of 20 mini Dictator games (mini-DGs). In each mini-DG the Dictator decides on the distribution of money between him and an anonymous other. The choice set is restricted to two allocations. One allocation always exhibits a greater inequality (unfair allocation) than the other (fair allocation). Table 1 lists the 20 mini-DGs. For example, in Game No. 1 subjects can decide between the allocation 50/50 on the one hand and 60/40 on the other.

Apart from the overall effect of cognitive load, this series of mini-DGs allows us to investigate how individuals in the two treatment conditions react to varying degrees of inequality in the different games. For example, the unfair allocation in the mini-DG with the allocations 50/50 and 60/40 (Game No. 1) leads to less inequality (and lower payoff to the dictator) than in the game with 50/50 and 80/20 (Game No. 9): in the former game the receiver gets twenty points less than the dictator, whereas in the latter it is 60 points. We hypothesize that low-load individuals are more responsive to the different incentives posed as they have more cognitive resources to evaluate each single game.

For every mini-DG with an equal split we included an additional one with an "almost-equal split" slightly favoring the Dictator. This allows us to test the hypothesis that an equal split constitutes a focal point as suggested by Güth et al. (2001), Roch et al. (2000), or Messick and Schell (1992). Thus, if the equal split constitutes a decision heuristic, we would expect to see a higher percentage of individuals choosing the equal split compared to the almost-equal split in otherwise identical mini-DGs. This effect should be exaggerated under high cognitive load, as the decisions are less influenced by deliberation.

To further investigate possible heuristic and as a robustness check each mini-DG has a counterpart exhibiting a slightly different pie-size. In particular, ten games exhibit a pie size of 100 and ten games a pie size of 94. The relative shares in the respective games are identical up to rounding differences. A pie-size of 100 may be more easily accessible than a pie-size of 94 as the percentage shares and levels coincide in the former case. For example, general linguistic usage denotes an equal split as a fifty-fifty option. In case of a pie-size of 100 the equal split corresponds to 50 points each. Therefore, it might constitute a stronger focal point than the equal split of 47 points each. A similar argument can be made for the other allocations.

To conclude, our experimental design consist of 4 "core-games" with each coming in four flavors, that is, each differs along two dimensions: (i) the pie-size and (ii) whether the fair allocation constitute an equal split or an almost equal split (Game No. 1 to 16 in table 1). We included 2 more core-games that neither exhibit an equal nor almost equal split (Game No. 17-20). The only variation within these core-games is the pie-size. On the one hand we were interested how behavior is affected when the fair allocation exhibits a greater degree of inequality. On the other hand we wanted to introduce more variation in our games so that the systematic design of our games does not become too obvious for subjects.

Table 1: The 20 mini-Dictator Games

Game No.	Core-Games Dictator's share in fair and unfair allocation, rounded	Equal Spilt	Pie Size	Fair Allocation		Unfair Allocation	
				Dictator	Receiver	Dictator	Receiver
1	50 - 60	equal	100	50	50	60	40
2			94	47	47	56	38
3		not eq.	100	51	49	60	40
4			94	48	46	56	38
5	50 - 70	equal	100	50	50	70	30
6			94	47	47	66	28
7		not eq.	100	51	49	70	30
8			94	48	46	66	28
9	50 - 80	equal	100	50	50	80	20
10			94	47	47	75	19
11		not eq.	100	51	49	80	20
12			94	48	46	75	19
13	50 - 90	equal	100	50	50	90	10
14			94	47	47	85	9
15		not eq.	100	51	49	90	10
16			94	48	46	85	9
17	80 - 90	not eq.	100	80	20	90	10
18			94	75	19	85	9
19	60 - 100	not eq.	100	60	40	100	0
20			94	56	38	94	0

Note: The social decision task consists of a series of 20 binary mini-DGs. Column 2: the game's varying degree of inequality; the first number refers to the (rounded) Dictator's percentage share in the fair, the second in the unfair allocation. Colum 3: for each game with an equal split we included one with an almost equal split. Column 4: for each game with a pie-size of 100 we included an otherwise identical one with a pie-size of 94. Colum 5: amount of points to the Dictator and Receiver in the Fair-Allocation. Colum 6: amount of points to the Dictator and Receiver in the unfair Allocation.

Cognitive load task

Our cognitive load task consists of an n-back task. In our n-back task subjects hear a new letter over headphones every three seconds. In the high-load condition, subjects are incentivized to press a key every time they hear a letter that resounded two letters before (2-back condition). In the low-load condition (0-back) subjects had to indicate every time they heard the letter "L". Altogether the sequence consisted of 10 different letters (D,F,K,L,N,P,Q,R,S,T) and 25 percent were targets, that is, letters that had to be indicated. The letters were recorded in one female and one male voice and sounded in randomized order. The sequence was constructed such that in both load conditions the targets occurred at the same time. For every correct indication of a target subjects received 0.5 points. If subjects indicated incorrectly, 0.25 points were deducted. Parallel to the cognitive load task they completed the social decision task. Jaeggi et al. (2003) have shown that subjects are capable of completing two parallel tasks - in their study two 2-back tasks - and perform well above chance.

Procedures

We conducted 5 sessions with 136 participants in June and July 2010 at the LakeLab of the University of Konstanz. Participants were students of the University of Konstanz and were recruited using the online recruiting system ORSEE (Greiner, 2004). None of the subjects participated in more than one session. Each subject sat at a randomly assigned PC terminal and was given a copy of instructions (see the appendix for the instructions). The experiment was programmed with *z-Tree* (Fischbacher, 2007). A set of control questions was provided to ensure the understanding of the game. The experiment did not start until all subjects had answered all questions correctly. In order to ensure the understanding of the n-back task participants took part in an unpaid practice round for 90 seconds.

The order of the 20 mini-DGs was randomized. Subjects had 20 seconds to decide in a mini-DG followed by a 7 seconds break before a new game started. Parallel to it they took part in the cognitive load task. All subjects took decisions as a Dictator. Only at the end of the experiment the actual role of a participant (either Dictator or Receiver) was randomly determined. Further, only one randomly determined game was paid out. Thus, 50 percent of (randomly determined) participants were paid according to their decision in one (randomly determined) mini-DG as the Dictator. The other 50 percent were Receivers of the corresponding games. One point of the randomly chosen game translated into 0.22 €. At the end of the experiment subjects filled out a socio-economic questionnaire. Average income amounted to about 21 €(10.5 €for the social decision task, 4.5 €for the n-back task, 7 €for show-up and completion of the questionnaire). The experiment including the questionnaire lasted about 75 minutes.

Results

Our cognitive load treatment is only effective if subjects actually exert effort in our n-back task. We find that this is indeed the case: altogether the performance (percentage of non-missed targets and no wrong indication) was 97.8, 99.6 percent in the 0-back and 96.0 percent in the 2-back condition. This suggests that the 2-back task is more demanding, but people still complete it well above chance. Taken together these results indicate that subjects were successfully put under cognitive load.

Focusing on the treatment differences we find that subjects in the high-load condition are more generous on average. They choose the fair allocation 43.3 percent of the cases compared to 30.9 percent in the low-load condition. This treatment difference suggests that once the affective system is mediated to a lesser extent by the deliberate system, choices are more generous.[8]

Looking at core games reveals interesting heterogeneity in the treatment effect. The games vary in their extent of inequality (and hence payoff) of the two allocations. Figure 1 displays the fraction of fair choices for every core game by cognitive load (bars). Dots show the results of the four individual games. In almost every game the fraction of fair choices is larger in the high-load condition. Most pronounced are the treatment differences in games exhibiting only a small level of inequality. Wilcoxon rank-sum tests reveal that the differences are highly significant in the games leaving the Dictator a share of either 60 or 70 percent in the unfair allocation.

[8]Altogether, only in 2.6 percent of the cases individuals did not make a choice in the social decision task. In the high-load condition this was the case 4.3 percent of the time reflecting that one subjects in the high load condition did not make a choice at all.

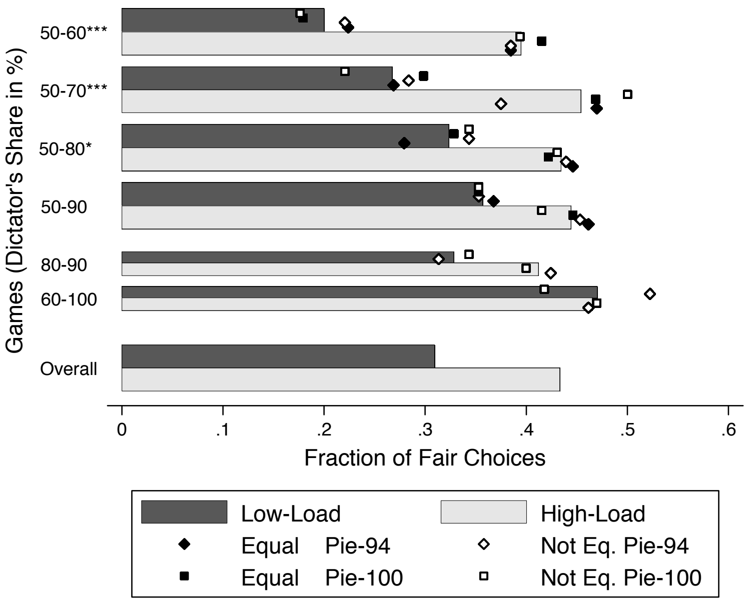


Figure 1: Fraction of fair choices by load and game. The first number on the y-axis refers to the (rounded) Dictator's share in the fair-allocation, the second number to the share in the unfair allocation. Thus, Games with the same (rounded) fraction of the unfair allocations are pooled (those that differ only in pie-size and whether or not fair allocation is equal or almost equal split). The asterisk denote the significance levels of Wilcoxon rank-sum tests, where *** denotes significance at $p < 0.01$ and * significance at $p < 0.1$.

As it is apparent from Figure 1, individuals in the low-load condition react stronger to the incentives posed by the different games. The larger the inequality of the unfair allocation, the more likely are low-load subjects to choose the fair allocation. For example, only 20 percent of low-load subjects decide for the fair allocation when the unfair allocation leaves the Receiver 40 percent of the pie. However, 35.7 percent choose the fair allocation, when the choice is between the equal split and leaving 10 percent for the Receiver.

The probit regression in table 2 corroborates these findings. Without controlling for the inequality of the different allocations, high-load subjects choose weakly significantly more often the fair allocation (column 1). Conditioning on the degree of inequality reveals that the two load conditions are highly significantly different: low-load subjects react significantly stronger to the incentives posed by the inequality of the unfair allocation (column 2). An increase in the dictator's share in the unfair allocation by 10 percentage points leads to an increase in the probability of a fair choice by 6.6 percentage points. Even though high-load subjects react significantly less, an F-test of joint significance reveals that they also weakly significantly react to the inequality of the unfair allocation (p=0.087). As a result, cognitive load is more effective in situations where the unfair allocation exhibits a relative small degree of inequality. Our findings therefore suggest that subjects under low-load on average take the situation more fully into account. If the unfair allocation leads to only a small degree of inequality, they behave in a self-interested way. However, in more extreme instances, in particular when the unfair allocation leaves nothing for the other individual, the treatment difference vanishes.

Table 2: Probit regression of fair choices on load

	(1)	(2)	(3)	(4)
	Fair Option	Fair Option	Fair Option	Fair Option
Load	0.139* (0.074)	0.507*** (0.106)	0.481*** (0.107)	0.498*** (0.107)
Fraction Dictator Unfair Allocation		0.659*** (0.113)	0.656*** (0.112)	0.659*** (0.113)
(Fraction Adv) x Load		-0.516*** (0.139)	-0.509*** (0.138)	-0.516*** (0.139)
Fraction Dictator Fair Allocation		-0.15 (0.108)	- 0.163 (0.111)	-0.149 (0.108)
(Fraction Fair.) x Load		0.018 (0.131)	0.054 (0.134)	0.018 (0.131)
Equal Option			-0.007 (0.02)	
(Equal Option) x Load			0.018 (0.024)	
Pie-Size 100				-0.016 (0.017)
(Pie-Size 100) x Load				0.022 (0.021)
Period	0.002 (0.002)	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)
Period x Load	-0.001 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)
N	2650	2650	2650	2650
Pseudo R^2	0.013	0.024	0.024	0.023

Note: Marginal effects of probit estimation with robust standard errors clustered on subjects in parenthesis. The dependant variable is a dummy indicating a fair choice. x denotes interaction terms. 'Fraction Dictator Unfair Allocation' denotes the number of points to the Dictator in the unfair allocation. The dummy 'Equal Option' denotes whether the fair allocation is an equal split. 'Pie-Size 100' indicates whether the pie-size is 100. 'Fraction Dictator Fair Allocation' denotes the number of points to the dictator in the fair allocation. *** Significant at p < 0.01; ** at p < 0.05; * at p < 0.1.

Equality heuristic & pie size

In our experiment we do not find evidence for an equality-heuristic. There appears to be no systematic differences whether the fair allocation is the equal split or the almost-equal split (see table 2 column 3). This is also the case when focusing on high-load subjects only. If the equality-heuristic exists, we would expect a more pronounced effect when subjects are cognitively busy. However, as Figure 1 and Table 2 (column 3) reveal, high-load subjects are also not more likely to choose an equal split over an almost-equal split. This suggests that the equal split does not constitute a focal point in our experiment. Compared to the study by Güth et al. (2001), our social decision task is non-strategic. In a strategic setting such as the Ultimatum Game the equal split might be an attractive choice due to the (beliefs about) behavior of second movers. Similarly, we do not find an effect of the different pie-sizes (Table 2, column 4). Thus, whether the actual points coincide with the percentage distribution or not seems to have no effect on the outcome. In our regression we also controlled for the rank order of a particular mini-DG. As table 2 reveals we do not find a time trend in our data: decisions do not systematically vary with the variable 'Period'.

Individual decisions

Individuals under high-load are more generous and react less to the incentives posed by the different games. Does this simply reflect a higher degree of randomness in subjects' decisions? That is, if individuals in the high-load condition are more likely to make random decisions, the mean will be closer to the expected random outcome of 0.5.

To test whether high-load individuals exhibit a higher degree of randomness we consider individual decisions. A benchmark for consistency has to specify the impact of own and the others payoff on utility in a coherent way. In our non-strategic setting outcome based models of inequality aversion offer a point of departure. In the Fehr and Schmidt (1999) model utility depends linearly on advantageous inequality. Therefore, depending on the weight individuals put on advantageous inequality (the beta), the model predicts that subjects either always choose the fair allocation or always choose the unfair allocation. While it is evident to call someone consistent, who either never or always chooses the fair allocation, it is implausible to define all subjects, who switch between the fair and unfair allocation as inconsistent. In fact, Fehr-Schmidt are aware that their assumption of linearity is not fully realistic - especially in the DG. They acknowledge that a non-negligible fraction of people exhibit nonlinear inequality aversion in the domain of advantageous inequality.

In the Bolton and Ockenfels (2000) model utility is nonlinear in inequality aversion. Utility is convex in inequality and as a result the model exhibits an increasing marginal sensitivity towards inequality. Thus, in the standard DG it does not restrict optimal choices to the equal split or the pure selfish allocation, but supports all allocations in between. What are the implications for the mini-DGs? It is straightforward that individuals, who either always or never choose the unfair allocation, reveal consistent behavior. For "always-fair" individuals in each binary game the monetary gain of the unfair allocation is lower than the implied (psychological) loss due to inequality. Due to increasing marginal sensitivity towards inequality, someone who chooses 'fair' in the game that includes the unfair allocation with the lowest inequality (50/50 vs. 60/40), will also choose 'fair' in all other mini-DGs.

For individuals who switch between fair and unfair allocations, Bolton-Ockenfels gives straightforward predictions if we solely focus on the 16 allocation decisions with an equal (and almost-equal) split.[9] Restricting the analysis to these 16 games allows us to focus on the varying degree of inequality of the unfair allocation: at a certain threshold - as the inequality of the unfair allocation increases - individuals previously choosing the unfair allocation switch to the fair allocation. Up to the threshold the monetary gain dominates the (psychological) losses from inequality. Past the threshold, as inequality increases, inequality aversion dominates the monetary gains (in an unrestricted choice set their DG choice would lie somewhere close to this threshold).

The increasing marginal sensitivity towards inequality of Bolton-Ockenfels implies this pattern where individuals switch from the unfair allocation to the fair allocation as inequality gets larger. However, it also seems plausible that individuals exhibit decreasing marginal sensitivity, that is, subjects consistently switching from the fair to the unfair allocation as inequality gets larger. We therefore included this possibility in our analysis.

[9] For our consistency-measure we only focus on the degree of inequality of the unfair allocation. That is we neglect differences in the fair allocation stemming from equal split and almost equal split. Additionally, we focus only on the relative distribution of the advantageous allocation, that is, we neglect the minor differences stemming from the two different pie-sizes. Incorporating these differences does not lead to any qualitative changes of the results.

Table 3: Number of subjects by (consistent) strategies and treatment condition (in the 16 games with equal or almost equal split).

	Number of Subjects Low-Load		Number of Subjects High-Load	
Always Fair	4	(5.9%)	12	(17.9%)
Never Fair	33	(48.5%)	27	(41.8%)
Become Fair as unfair allocation exhibits higher inequality	9	(13.2%)	7	(10.3%)
Become Egoistic as unfair allocation exhibits higher inequality	1	(1.5%)	1	(1.5%)
Rest	21	(30.9%)	19	(27.9%)
Mean pseudo- R^2 (Rest)	0.12		0.10	
Mean pseudo- R^2 (All Subjects)	0.73		0.74	

Note: Mean pseudo- R^2 (Rest) denotes the mean of pseudo- R^2s obtained from individual Probit estimations on the subject level of those that do not have a consistent strategy. To calculate Mean pseudo- R^2 (All Subjects) the R^2 of subjects exhibiting a consistent strategy were set to 1.

According to this measure 70.6 percent of the individuals in the high-load condition and 67.1 percent in the low-load condition behave consistent with Bolton Ockenfels utility functions. Thus, there are almost no differences in our consistency measure of the two treatment groups. The largest fraction consists of individuals, who never choose the fair allocation in the 16 games with an equal or almost-equal split. As table 3 reveals "never-fair" makes up a larger fraction (48.5 percent) in the low-load condition compared to the high-load condition (41.8 percent). In the high-load condition by contrast a considerable larger amount of subjects always choose the fair allocation (17.9 percent) compared to (5.9 percent) in the low-load condition.[10] To get a measure for consistency of the remaining subjects we estimated individual probit-regressions. This was done by regressing the individual's 20 choices on the extent of inequality (that is, the dictator's share) of the unfair allocation. The resulting individual pseudo-R^2 gives an indicator of consistency. There are only minor differences in the two means of the pseudo-R^2s (see table 3) of the subjects, who do not exhibit a consistent pattern. A Wilcoxon Ranks Signed test reveals that they are not significantly different (p=0.85). This suggests that individuals in the high-load condition exhibit behavior that is as consistent as in the low-load condition. Therefore, the finding that high-load subjects are more generous is unlikely to reflect a higher degree of randomness in subjects' choices. Our result rather shows that a higher fraction of high-load subjects always chooses the fair allocation, whereas low-load subjects are more likely to never choose the fair allocation.

[10] As we randomized the appearance of the fair and advantageous allocations (up or down), always choosing the fair or advantageous allocation does not constitute an easy heuristic like "always choose the upper allocation".

Conclusion

The role of affect and emotions in social dilemmas has received increasing attention in economics (see e.g. Bechara and Damasio, 2005; Loewenstein, 2000; Elster, 1998). Utilizing a dual task technique we find that individual's choices are more generous when taken under high cognitive load. This finding underscores the importance of affect in the decision process. Our evidence suggests that the affective system steers behavior towards altruistic choice. This finding conforms with the studies by Kogut and Ritov (2005) and Small, Loewenstein, and Slovic (2007), who find that subjects exhibit a higher willingness to donate to identifiable victims. They attribute these to the role of affect and emotions. In fact, Small et al. (2007) show that inducing people to deliberate about the discrepancy in giving towards identifiable and statistical victims, results in an overall reduction in donations.

We find no indication for an equality heuristic in our experiment. Individuals are just as likely to choose an equal split or an almost-equal split. Thus, in our study the affective system more generally steers towards altruistic behavior and this is not reflected by the focal point of an exact equal split.

Our study supports the notion that basic social preferences are fundamental: the affective system, associated with evolutionary older parts of the brain, mediates decisions towards altruistic choice. This suggests that basic morality is an (older) product of evolution and not just a "thin layer of civilization covering the wild animal within". While evolutionary theory posits a selfish gene (Dawkins, 1976) that does not lead as a consequence to selfish behavior. Kin-selection (Hamilton, 1964), reciprocity (Trivers, 1971), indirect reciprocity (Alexander, 1987; Nowak and Sigmund, 1998), costly signaling (Gintis, Smith, & Bowles, 2001) and gene-culture coevolution (Gintis, 2003) can explain cooperative behavior. Affective reaction might be an important proximal mechanism to support cooperative behavior in these instances.

Further, our experiment highlights the importance of the deliberate system. In the low-load condition individuals react stronger to incentives posed by differences in the inequality of the different games. Thus, while the deliberate system adjusts behavior in a self-serving manner, it also moderates the immediate affective reaction in a way that is more tailored to the situation at hand. For example, in the case that the unfair allocation does not leave any points for the other person, the low-load subjects are just as likely to choose the fair allocation. In our non-strategic experiment subjects were confronted with rather straightforward social dilemmas. How our results extend to more complex moral settings or situations that trigger emotions like anger or envy might be a worthwhile area for future research.

References

Alexander, R.D. (1987). *The biology of moral systems*, New York: Aldine De Gruyter.

Baddeley, A. & Hitch, G. (1974). Working memory. In G. Bower (Ed.), *The Psychology of Learning and Motivation: Advances in research and theory* (pp. 47-89). New York: Academic Press.

Barnes, C. M., Schaubroeck, J., Huth, M. & Ghumman, S. (2011). Lack of sleep and unethical conduct. *Organizational Behavior and Human Decision Processes*, 115, 169-180

Bechara, A. & Damasio, A. (2005). The somatic marker hypothesis: A neural theory of economic decision. *Games and Economic Behavior*, 52, 336-372.

Benjamin, D. J., Brown, S. A. & Shapiro, J. M., (2006 May 5). *Who is "behavioral"? Cognitive ability and anomalous preferences*. Retrieved from http://ssrn.com/abstract=675264.

Bolton, G. E. & Ockenfels, A. (2000). ERC - A theory of equity, reciprocity and competition. *American Economic Review*, 90, 166-193.

Cappelletti, D., Güth, W. & Ploner, M. (2008 June 18). *Being of two minds: An ultimatum experiment investigating affective processes*. Jena Economic Research Papers, No. 2008-48. Retrieved from http://zs.thulb.uni-jena.de/receive/jportal_jparticle_00102474.

Cornelissen, G., Dewitte, S., and Warlop, L. (2011): "Are social value orientations expressed automatically? Decision making in the dictator game," *Personality and Social Psychology Bulletin*, forthcoming.

Darley, J. M. & Batson, C. D. (1973). "From Jerusalem to Jericho": A study of situational and dispositional variables in helping behavior. *Journal of Personality and Social Psychology*, 27, 100-108.

Dawkins, R. (1976). *The selfish gene*, Oxford: Oxford University Press.

de Waal, F. (2006). *Primates and Philosophers. How Morality Evolved,* Princeton: Princeton University Press.

Elster, J. (1998). Emotions and economic theory. *Journal of Economic Literature*, 36, 47–74.

Evans, J. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, 59, 255-278.

Father risks his life to save man in sea (2010 October 1). *Exmouth Journal 24*. Retrieved from: http://www.exmouthjournal.co.uk/news/father_risks_his_life_to_save_man_in_sea_1_659849. Retrieved 29. July 2011.

Fehr, E. & Schmidt, K. M. (1999). A theory of fairness, competition and cooperation. *Quarterly Journal of Economics*, 114, 817-868.

Fischbacher, U. (2007). Z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics*, 10, 171-178.

Fletcher, P. & Henson, R. (2001). Frontal lobes and human memory: Insights from functional neuroimaging. *Brain*, 124, 849-881.

Gevins, A. S. & Cutillo, B. C. (1993). Neuroelectric evidence for distributed processing in human working memory. *Electroencephalogr. Clin. Neurophysiol.*, 87, 128-143.

Gilbert, D. T. & Hixon, J. G. (1991). The trouble of thinking: activation and application of stereotypic beliefs. *Journal of Personality and Social Psychology*, 60, 509-517.

Gintis, H. (2003). The hitchhiker's guide to altruism: Gene-culture coevolution, and the internalization of norms. *Journal of Theoretical Biology*, 220, 407-418.

Gintis, H., Smith, E. A. & Bowles, S. (2001). Costly signaling and cooperation. *Journal of Theoretical Biology*, 213, 103-119.

Ghiselin, M. T. (1974). *The economy of nature and the evolution of sex*, Berkeley, CA: University of California Press.

Greiner, B. (2004 November 13). *The online recruitment system Orsee 2.0- A guide for the organization of experiments in economics*. University of Cologne, Working Paper Series in Economics, No. 10. Retrieved from: http://sourceforge.net/projects/orsee/files.

Güth, W., Huck, S., Müller, W. (2001). The relevance of equal splits in ultimatum games. *Games and Economic Behavior*, 37, 161-169.

Güth, W., Schmittberger, R. & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior and Organization*, 3, 367–388.

Haidt, J. (2001). The emotional dog and its rational tail: A social intuitionist approach to moral judgment. *Psychological Review,* 108, 814-834.

Hamilton, W. D. (1964). Genetical evolution of social behavior I, II. *Journal of Theoretical Biology*, 7, 1-52.

Hauge, K. E., Brekke, K. L., Johansson, L.-O., Johansson-Stenman, & Svedsäter, H. (2009 July). *Are Social Preferences Skin Deep? Dictators under Cognitive Load*. University of Gothenburg, Working Papers in Economics, No. 371. Retrieved from: http://gupea.ub.gu.se/bitstream/2077/20768/1/gupea_2077_20768_1.pdf.

Hinson, J. M., Jameson, T. L. & Whitney, P. (2003). Impulsive decision making and working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 29, 298-306.

Jaeggi, S. M., Seewer, R., Nirkko, A. C., Eckstein, D., Schroth, G. & Groner, R. (2003). Does excessive memory load attenuate activation in the prefrontal cortex? Load-dependent processing in single and dual tasks: Functional magnetic resonance imaging study. *NeuroImage*, 19, 210-225.

Kahneman, D. (2003). Maps of bounded rationality: Psychology for behavioral economics. *American Economic Review*, 93, 1449–1475.

Kirchsteiger, G., Rigotti, L. & Rustichini, A. (2006). Your morals might be your moods. *Journal of Economic Behavior & Organization*, 59, 155-172.

Knoch, D., Pasqual-Leone, A., Meyer, K., Treyer, V., Fehr, E. (2006). Diminishing reciprocal fairness by disrupting the right prefrontal cortex. *Science (New York, N.Y.)*, 314, 829-832.

Kogut, T. & Ritov, I. (2005). The singularity effect of identified victims in separate and joint evaluations. *Organizational Behavior and Human Decision Processes,* 97, 106-116.

Lieberman, M. (2003). Reflexive and reflective judgment processes: A social cognitive neuroscience approach. In J. P. Forgas, K. D. Williams, & W. von Hippel (Eds.). *Social Judgments: Explicit and Implicit Processes* (pp. 44-67). NewYork: Cambridge University Press.

Loewenstein, G. & O'Donoghue, T. (2007 June). *The Heat of the moment: Modeling interactions between affect and deliberation*. Retrieved from: http://www.arts.cornell.edu/econ/edo1/heat.pdf.

Messick, D. M. & Schell, T. (1992). Evidence for an equality heuristic in social decision making. *Acta Psychologica*, 80, 311-323.

Moll, J., Krueger, F., Zahn, R., Pardini, M., de Oliveira-Souza, R. & Grafman, J. (2006). Human fronto-mesolimbic networks guide decisions about charitable donation. *Proceedings of the National Academy of Sciences of the United States of America*, 103, 15623-15628.

Moore, D. A. & Loewenstein, G. (2004). Self-Interest, automaticity, and the psychology of conflict of interest. *Social Justice Research*, 17, 189-202.

Nowak, M. & Sigmund, K. (1998). Evolution of indirect reciprocity by image scoring. *Nature*, 393, 573-577.

Owen, A.M., McMillan, K.M., Laird, A.R. & Bullmore, E. (2005). N-back working memory paradigm: A meta-analysis of normative functional neuroimaging studies. *Human Brain Mapping*, 25, 46 -59.

Piovesan, M. & Wengström, E. (2009). Fast or fair? A study of response times. *Economics Letters*, 105, 193-196.

Preston, S. D. & de Waal, F. B. M. (2002). Empathy: its ultimate and proximate bases. *The Behavioral and Brain Sciences*, 25, 1-20, discussion 20-71.

Rachlin, H. (2002). Altruism and selfishness. *The Behavioral and Brain Sciences*, 25, 239-250, discussion 251-296.

Roch, S., Lane, J. A. S., Samuelson, C.D., Allison, S.T. & Dent, J. L. (2000). Cognitive load and the equality heuristic: A two-stage model of resource overconsumption in small groups. *Organizational Behavior and Human Decision Processes*, 83, 185-212.

Rubinstein, A. (2007). Instinctive and cognitive reasoning: A study of response times. *The Economic Journal*, 117, 1243-1259.

Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E. & Cohen, J.D. (2003). The neural basis of economic decision-making in the ultimatum game. *Science (New York, N.Y.)*, 300, 1755-1758.

Schopenhauer, A. (1851). *Essays and aphorisms (Parerga and Paralipomena)*, New York: Penguin Books.

Shiv, B. & Fedorikhin, A. (1999). Heart and mind in conflict: The interplay of affect and cognition in consumer decision making. *Journal of Consumer Research*, 26, 278–292.

Skitka, L. J., Mullen, E., Griffin, T., Hutchinson, S., & Chamberlin, B. (2002). Dispositions, scripts, or motivated correction? Understanding ideological differences in explanations for social problems. *Journal of Personality and Social Psychology*, 83, 470 - 487.

Small, D. A., Loewenstein, G. & Slovic, P. (2007). Sympathy and callousness: The impact of deliberative thought on donations to identifiable and statistical victims. *Organizational Behavior and the Human Decision Processes,* 102, 143-153

Stanovich, K. E. & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *The Behavioral and Brain Sciences*, 23, 645-665, discussion 665-726.

Strack, F. & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, 8, 220-247.

Trivers, R. L. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology*, 46, 35-57.

van den Bos, K., Peters, S. L., Bobocel, D. R., & Ybema, J. F. (2006). On preferences and doing the right thing: Satisfaction with advantageous inequity when cognitive processing is limited. *Journal of Experimental Social Psychology*, 42, 273-289.

van Winden, F. (2007). Affect and fairness in economics. *Social Justice Research*, 20, 35-52.

Williams, G. C. (1988). Reply to comments on "Huxley's evolution and ethics in sociobiological perspective". *Zygon*, 23, 437-438.

Appendix - Instructions

General Instructions

Today you are participating in an economic experiment. By carefully reading the following instructions, you can - depending on your decisions - earn money in addition to the show-up fee of **2 Euro.** It is, therefore, of importance that you accurately read these instructions. During the whole experiment it is not allowed to communicate with other participants. Therefore, we ask you to not speak with each other. If you do not understand something, please consult the instructions again. If you still have questions, please rise your hand. We will come to your place and answer your question individually.

During the experiment we do not speak of Euro, but points. The points you earn during the experiment will be converted at the following rate:

1 point = €0,22

The show-up fee of 2 Euro and the total amount of points you earned will be converted into Euro and paid out to you in cash at the end of today's experiment.

On the following pages we explain the course of the experiment in detail. First, we will familiarize you with the basic decision situation. When you are finished reading the instruction, you will find control questions on your screen. They are intended to help you understand the setting. The experiment only begins, when every participant is familiarized with the course of the experiment.

The experiment involves two types of participants: participant A and participant B. Participant A takes several decisions. Participant B makes no decision. Each participant takes on the role of a participant A and the role of a participant B. At the end of the experiment it will be randomly determined whether you will be paid out as a participant A or a participant B. At no point in time you will be informed about the identity of another participant. Likewise, the other participants will not be informed about your identity. Thus, all payments will be made anonymous. That is, the other participants do not learn, how much you earned in the experiment.

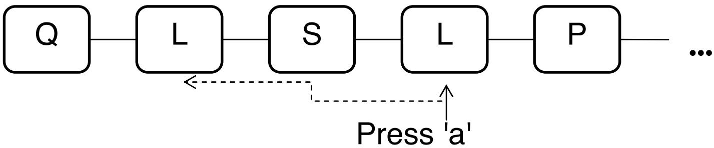
The Experiment

The experiment consists of two different tasks. The first task is a listening-task. Here you can earn points by responding in a correct manner to letters you hear over the headphones. The second task consists of a sequence of 20 decision situations. In each decision situation you decide on the distribution of an amount of money between you and participant B.

Listening-task

In the listening-task you hear letters over your headphones. Every three seconds you hear the next letter. Your task is to press the key 'a' whenever a letter resounds that sounded 2 letters before.

Assume, for example, you hear the following sequence of letters: Q, L, S, <u>L</u>, P, Q, <u>P</u> … When you hear one of the underlined letters, you should indicate that by pressing the key 'a'.



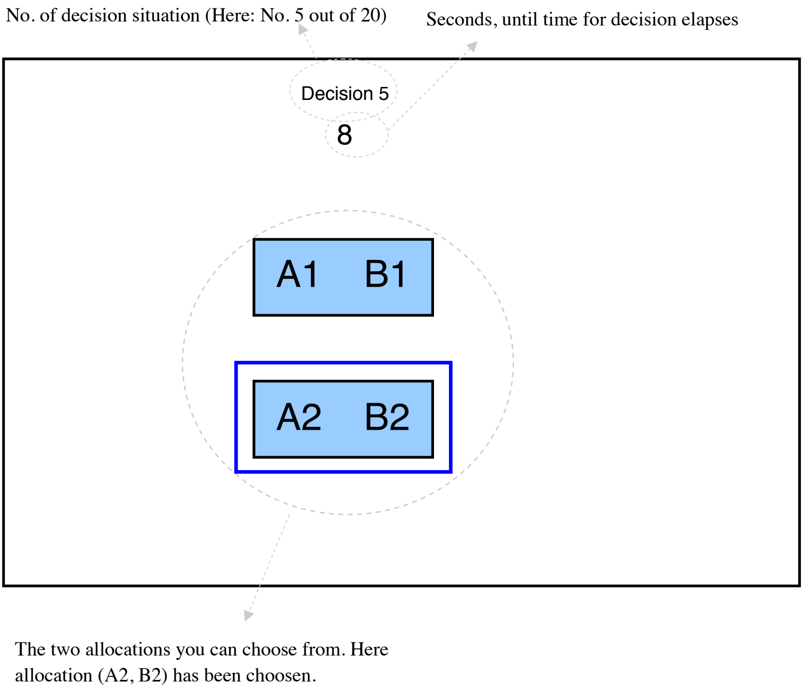
Every time you correctly identify a letter that sounded two letters before you earn 0.5 points. To press the 'a' key you have time until the next letter sounds (3 seconds). If you press 'a', even though the letter did not sound two letters before, 0.25 points are deducted.

Before the experiment starts, there will be a test-trial of two minutes so you can familiarize yourself with the task. The test trial lasts 90 sec. In this test-trial there are no points to be earned. If you have any question after the test-trial please do not hesitate to direct them to us by raising your hand. Please note that it is not allowed to use any writing utensils during the experiment.

Decision-situations

There are 20 decision-tasks. Your task is to decide on one out of two possible allocations. By deciding on one allocation, you decide how an amount is divided between you and another participant.

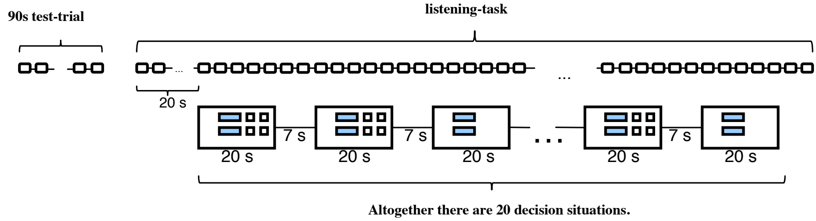
Display on the Screen



Instead of A1, B1, A2 and B2 you will find numbers, which correspond to the payments to A and B. You make your choice by clicking with the left mouse button on one of the two (light-blue) allocations. You have the choice between (A1, B1) and (A2, B2). If, for example, you choose (A1 B1), you propose an assignment of points in such a way that you get A1 points and participant B gets B1 points. (The left number will always refer to the number of points for you and the right number refers to the number of points to participant B). The allocation you have chosen will be highlighted with a blue rectangle. Participant B does not make a decision.

You have 20 seconds to make your choice. Within the 20 seconds you still have the opportunity to change your mind. After 20 seconds the highlighted allocation is taken as your choice. If you fail to make a choice in the given time, 1 point of your earnings will be deducted. How many seconds are left for your decision is shown on the screen. The number of the current decision situation is also displayed.

Sequence of the experiment



After you have read the instructions there will be a test-trial of the listening-task (90 sec.). During the test-trial you cannot earn any points. There will be also control questions with regard to the decision situations. Please do not hesitate to direct any question to us.

The study starts with the listening-task. The listening-task will continue throughout the study. For every correct hit you earn 0.5 points, while for every wrong hit 0.25 points are deducted. You get to know the amount of points only at the end of the study.

Shortly after the listening-task has started, the sequence of 20 decision situations begins parallel to it. In each decision situation you have 20 seconds to decide. Before the next decision situation starts, there is a seven seconds break. In each decision problem you are randomly rematched with a participant B.

Payment

At the end of the study you will be informed on the amount of points you get from the listening-task and the decision situations (as participant A and participant B). Your payment consists of your show-up fee (2 €), plus the amount of points from the decision situation and the listening task. At the end of the experiment it will be randomly determined which decision situation will be paid out. Further, it will be randomly determined whether you will be paid out in the role as participant A or participant B. The points you earned will be **converted into Euro.**

Control questions

Before we begin with the experiment please answer a few questions on the computer screen. These control questions do not influence your payments at the end of the experiment. First, there will be questions regarding the decision situations. When all participants have solved these questions, there will be the subsequent trial of the listening-task (90 sec.).

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