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BAD LUCK VS. SELF-INFLICTED NEEDINESS – AN EXPERIMENTAL INVESTIGATION OF GIFT GIVING IN A SOLIDARITY GAME

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Bad luck vs. self-inflicted neediness

An experimental investigation of gift giving in a solidarity game

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Abstract:
We experimentally examine the impact of self-inflicted neediness on the solidarity behavior of subjects. In one treatment in our solidarity experiment all subjects face the same probability of becoming needy, in the other treatment subjects have the choice between a secure payment and a lottery which includes a certain probability of becoming needy. Then all subjects are asked how much they will give to losers in their group to investigate if people are willing to give the same gifts whether or not subjects are responsible for inequality in payoffs. We found evidence for allocative as well as for procedural utility concerns.

Keywords: solidarity game, self-inflicted neediness, responsibility, procedural utility
PsycINFO classification: 2300
JEL classifications: C91, D63

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„So fühlt man Absicht, und man ist verstimmt."
J.W. von Goethe, Torquato Tasso II, 1

1. Introduction

Insurance is the upfront agreement that the 'lucky' compensate the loss of the 'unlucky'. Thus, in health insurance payment for the sick is provided by the healthy. For example, if a patient suffers from a cerebral tumor transfer payment hardly requires justification as contracting an illness is regarded as bad luck. But what happens if neediness is largely self-inflicted such as a smoker's leg or lung cancer of smokers? Now more people feel the limits of their solidarity reached. Hence, the question arises which premium rate in health insurances is considered as "fair": do insurants want other insurants, who consciously take greater risks (e.g. smokers, people practicing risky sports like paragliding, etc.), to pay for their risk-taking themselves (by paying higher premium rates)? Or would they rather deny coverage for these risks? Our experiment investigates how people with different levels of self-inflicted risks judge redistribution to needy subjects. In more general terms, we experimentally examine the impact of responsibility for one's own actions on the solidarity of others.

The concept of insurance i.e. the lucky compensating the loss of the unlucky in risk pools[1] is to a considerable extent driven by reciprocity considerations: as insurance is a repeated game, subjects agree to compensate people in need as they expect to be compensated themselves in case they will be in need some day as well. Reciprocity thus includes a time component or is at least contingent on the action others take with regard to oneself. Solidarity is different.[2] It is based on empathy with people in need, i.e. the ability to "put oneself in the other's shoes". "Solidarity means a willingness to help people in need who are similar to oneself but victims of outside influences such as unforeseen illness, natural catastrophes, etc." (Selten and Ockenfels 1998, p. 518).[3] When

[1] A broad body of literature exists about risk-sharing which deals for instance with situations in which individuals have joint ownerships of some uncertain financial prospect. Bone, Hey and Suckling (2004) conclude that less risk-averse partners should bear a greater share of the risk but also of the expected value. Closely related to the solidarity game experiment is Charness and Genicot's (2004) experimental test of risk-sharing arrangements. In their risk-sharing experiment without commitment using a solidarity game with positive continuation probability they find strong evidence of risk sharing in the laboratory – a higher continuation probability as well as a higher degree of risk aversion both considerably increase the level of risk sharing.

[2] It does not even seem that solidarity is driven by implicit reciprocity. Testing implicit reciprocity considerations, Büchner et al (2007) find out that most people just give a certain amount to other people (due to social preferences or altruism) as was already shown e.g. in dictator experiments, but not due to implicit reciprocity considerations.

[3] Büchner et al (2007, p. 294) use this definition of solidarity: "'Solidarity' […] means voluntary gift giving by lucky winners to needy losers in a group. The interaction is characterized by an unfavorable situation that could potentially affect everybody but will eventually affect only one part of the population (the needy person(s))."

compensation of people in need is neither enforced by society (like in compulsory insurance arrangements) nor contingent on personal ties to the needy person nor motivated by expectations of reciprocity, the question arises whether individuals agree at all to compensate others in need.

Selten and Ockenfels (1998) examined this question experimentally (later applied by Ockenfels, Weimann (1999) and Büchner et al (2007)). In a randomly composed group of three people the ex ante probability of becoming needy is the same for each participant. Winners in this one shot game are given the option to compensate needy losers, and indeed they do so. The experiment shows that winners express their solidarity with those in need, i.e. gain utility from a more equal distribution.

In this paper we explore whether solidarity is – at least partly – crowded out if neediness is self-inflicted. Do people perceive the necessity of compensation differently if a person suffering from lung cancer was a heavy smoker or not? Our experiment demonstrates that people do not only *judge* the same outcome distribution differently, but that they also *change* their action depending on the underlying process although the final decision they have to take is exactly the same. The three-person solidarity game of Selten and Ockenfels described above is our workhorse and used as a reference treatment. Additionally, we introduce another treatment in which subjects first have to choose between a sure payment and a risky lottery. Thus, when choosing the lottery, in this treatment a person's neediness is entirely self-inflicted, and a needy person is completely responsible for his state. In a dictator game experiment in which the distribution phase was preceded by a production phase, Cappelen et al (2005) demonstrated that people are held responsible for factors that are fully under individual control. Letting the subjects choose between two possibilities only, we create the simplest possible task in which people are held to be fully responsible as we exclude other factors like effort, ability, external factors etc. which could be – at least partly – beyond a subject's individual control. Then we compare the transfer payments subjects give to needy subjects between these treatments. We investigate if people are willing to donate the same transfer payments to needy people whether or not the inequality is self-inflicted. In general, our experiment provides a better understanding of how people evaluate the neediness of others depending on whether this neediness is self-inflicted or not.

It is a well-known fact that people do not act like a rational homo oeconomicus only taking into account their own monetary payoffs, but that they also have concerns for

fairness.[4] Latterly, a bulk of evidence exists indicating that people do not care exclusively about final monetary payoffs (their own and others), but that they are also strongly affected by the process and the conditions which lead to these final outcomes. The concept of procedural utility[5] tries to grasp the motivations which underlie individual decision making by incorporating that individuals do actually care about non-monetary procedures.[6] Closely related to the literature about procedural utility is an experiment run by Bolton, Brandts, Ockenfels (2005) investigating fair procedures. They studied biased and unbiased allocations and procedures in Ultimatum and Battle of the Sexes Games. Their experiment indicates a) that unbiased random procedures are deemed fair and b) that biased allocations are more acceptable if they are the result of an ex ante fair procedure. The pivotal point of fair procedures like lotteries is that they provide equal opportunity to everyone and that ex ante each player should have the same chance. We compare subjects' conditional gift giving in two treatments in which the ex post outcome is identical, but the ex ante processes differ. In the reference treatment subjects have equal probability of becoming needy, in the other treatment equal probability is ruled out by the subjects themselves. The following section 2 introduces the experimental design and procedures. The results are presented in section 3, with special emphasis on the impact of responsibility, which is followed by discussion and conclusions in section 4.

2. Experimental Design and Procedures

The experiment was conducted in the Cologne Laboratory for Economic Research using pen and paper in October 2005.[7] Subjects were undergraduate students from the University of Cologne and recruited with ORSEE (Greiner 2004). We ran two sessions with 24 subjects each.

[4] Fairness models can be subdivided in a) models with distributional concerns like the inequity aversion models of Bolton, Ockenfels (2000); Fehr, Schmidt (1999) and b) intention based models like the reciprocity models of Rabin (1993), Dufwenberg, Kirchsteiger (2004) and Falk, Fischbacher (2006). In contrast to the outcome-based inequality aversion models, reciprocity models also take into account the intentions underlying a decision process.

[5] "The economic concept of utility as generally applied today is outcome-oriented: individual utility is seen as a result of benefits and costs associated with instrumental outcomes. In contrast, procedural utility refers to the noninstrumental pleasures and displeasures of processes." Frey et al (2004, pp. 377 ff)

[6] Sen (1995, p. 12) stated that "it is hard to be convinced that we can plausibly judge any given utility distribution ignoring *altogether* the process that led to that distribution".

[7] We use pen and paper for comparability reasons, as the same experiment is to be run in an Indian University without laboratory and in rural India without access to computer facilities. In contrast to Selten et al (1998) and Büchner et al (2007) we do not apply a double-blind procedure in order to make the design as simple as possible.

Our design consists of two treatments. Due to a within subject design, each subject takes part in both treatments. To control possible order effects we alternate the order of the two treatments in both sessions. Furthermore, we use the strategy method as usual in the solidarity game.[8] Subjects have to take their decisions for both parts of the experiment without getting any feedback on the decisions of the others or their own payoffs until the end of the experiment. Learning or experience effects are thus excluded. Therefore, in the second part of the experiment subjects are influenced only by the first part, but not by the decisions made by other subjects.[9]

The procedure is the following: first we hand the subjects general instructions which explain a) that the experiment consists of two independent parts about which they will receive further information in later instructions; b) that only one part of the experiment will be paid with equal probability. Then the first part starts including instructions for the specific treatment, followed by a questionnaire to control whether each subject has understood the instructions. The experimenters check if the answers of each subject are correct. These control questions are followed by a decision form. Afterwards subjects have to fill in an expectation form. The second part is organized analogously. Finally subjects are asked to fill in a questionnaire.

In both treatments each subject is a member of a randomly formed three-person-group.[10] In each treatment of a session the random groups are formed anew.

In one treatment (solidarity treatment = ST) the original solidarity game is played as first introduced by Selten and Ockenfels (1998). In the ST each subject has a two-thirds probability of winning 10 € (winner) and a one-third probability of obtaining 0 € (loser). Before being informed whether they are winners or losers, subjects are asked how much they will give to losers in their group if they obtain 10 €. Two cases are distinguished: a) how much will they give to one loser in case only one group member loses; b) how much will they give to each loser in case both other group members lose.

In the other treatment (risk treatment = RT) we augment the solidarity game by letting each subject first decide whether to choose a secure payment of 10 € or whether to participate in a lottery. The decision of every subject only affects his own probabilities and

[8] Büchner et al (2007) discover that the strategy method does not lead to different results than the partial play method. We apply the strategy method nevertheless in our specific within subject design because it creates a no feedback design. Thus decisions of the subjects are independent from the decisions of their group members even in the second part of the experiment.

[9] This is very important as e.g. Charness, Genicot (2004) find that subjects adjust the size of their transfer payments to that of their partners (strong positive effect).

[10] Tajfel et al (1970) show that creating group identity works very well. They find that subjects treat people who have been defined to be members of their own "group" quite differently from 'outsiders'.

payoffs. As illustrated in Figure A1 in the appendix, the lottery entails a 50% probability of receiving 0 €, 40% to receive 10 € and 10% to win 60 €. Having made their decision concerning option *A* or *B*, the subjects are asked for their conditional gifts to group members who receive 0 €, only in case that they receive 10 € themselves. Subjects who receive 60 € cannot pay anything to other group members. That means only subjects who choose option *A* and receive 10 € for sure or subjects who choose option *B* and win 10 € can give money to those members of their group who choose option *B* and receive 0 €. Subjects choosing option *A* play a simple dictator game, knowing that they will receive 10 € and that they will definitely pay for losers in their group (although they do not know beforehand how many losers there will be in their group). Subjects choosing option *B* do not know if they will be a winner and pay a gift or a loser and receive a gift from other group members. Contrary to the ST subjects have to indicate their conditional gifts in the RT for three different cases regardless of the chosen option: How much money will a subject give to group members who receive 0 €, if this subject receives 10 € himself, and:

- *one* member of the group receives 0 € and the other member receives 10 € as well (i.e. the loser receives money from two group members),
- *one* member of the group receives 0 € and the other member receives 60 € (i.e. the loser receives money only from one group member),
- *both* group members receive 0 €.

In the RT each subject has to choose between a "safe" payment and a "risky" lottery.[11] If a subject chooses option *B*, he "damages" his group in so far as there is quite a high probability that he will lose and his group members will have to help him, but he creates no extra gains for his group (as the 60 € cannot be shared). A subject choosing option *A* "insures" for sure losers in his group, whereas a player choosing option *B* is less likely to win 10 € (only in this case he pays for losers in his group). That means that someone who chooses option *A* is likely to have to insure someone who chooses option *B*, whereas someone who chooses option *B* never pays for anyone who chooses option *A* (at most an option *B* chooser winning the small prize of 10 € pays for another needy option *B* chooser).

The difference between the RT and the ST is that losing in the ST is determined exclusively by chance whereas losers in the RT must voluntarily and consciously have chosen the risky lottery to become a needy person. Thus, in the RT losing could have been

[11] Note that the expected values are the same for both options.

prevented and subjects are responsible for their needy status, but in the ST losing is not self-inflicted and not the fault of the subjects. Nevertheless, the decisions subjects have to take are the same: What conditional gifts do I pay to needy persons (0 €) in my group in case I receive 10 €? Subjects face the same question, but the underlying process differs.[12]

In both sessions of the experiment, the RT is randomly chosen for payment. In session 1 14 subjects out of 24 decide in favor of option *A* and in session 2 13 subjects out of 24 choose option *A*. The remaining subjects choose option *B*. Subjects in session 1 receive average earnings of 10.83 €, and in session 2 average earnings amount to 14.58 € (including a show up fee of 2.50 €). A session lasts about one hour.

3. Results

This paper investigates whether the process which leads to a specific outcome matters. Especially, we focus on the question if different processes lead to different actions of players although they face the same decision situation.

The following investigation concentrates on the two comparable conditional gift giving situations in both treatments: a) the average gift giving in case there is one loser and the third member wins also 10 € and b) the average gift giving in case of two losers. So, for the time being, we neglect the conditional gifts paid in the RT in case of one member losing and one other member receiving the high prize of 60 €.

First we present a brief description of our data and the behavioral types as they were first classified in Selten and Ockenfels (1998). Then we discuss the impact of responsibility on the decision-making of subjects and compare gift giving behavior between and within sessions; finally, we analyze the expectations of participants regarding other subjects' gift giving behavior.

3.1 Gift giving and behavioral types – Allocation matters

The classic game theoretic solution for a risk-neutral homo oeconomicus is to give zero in both treatments. As it was already shown in numerous experiments before subjects do not behave purely egoistically, but allow fairness to play a part in their considerations. Our experiment confirms voluntarily gift giving in case of one loser as well as in case of two losers regardless of the treatment. Table 1 below shows the means of gift giving. In

[12] More precisely, point 1 and point 3 in the RT are absolutely identical to both questions in the ST. In the RT subjects have to answer additionally only the second point ("in case you win 10 € how much will you give to one loser in your group if the other subject receives 60 €?").

session 1, the RT was played first followed by the ST, whereas in session 2 the sequence was reversed. The positive gift giving in both treatments shows that subjects do care for their group members' final outcomes.

Table 1: Means of gift giving

	$x_{1/10}^{RT}$	$x_{1/60}^{RT}$	x_2^{RT}	x_1^{ST}	x_2^{ST}
Session 1	1.04	1.19	0.73	1.38	1.00
	(1.03)	(1.24)	(0.73)	(1.06)	(0.91)
Session 2	0.56	0.83	0.31	1.27	0.90
	(0.92)	(1.52)	(0.70)	(1.35)	(1.22)

$x_{1/10}^{RT}$: RT 1 loser (other winner: 10 €), $x_{1/60}^{RT}$: RT 1 loser (other winner: 60 €), x_2^{RT} : RT 2 loser, x_1^{ST} : ST 1 loser, x_2^{ST} : ST 2 loser, standard deviations in brackets

In session 1 gift giving is always higher than in session 2. We will deal with this session effect later in section 3.2 in more detail. In session 1 (session 2) in the RT one loser receives on average 1.04 € (0.56 €) from each winner in case he is the only loser and both others win 10 €. However, if he is the only one to lose, but the third group member wins the high prize of 60 € he receives from the 10 € winner on average 1.19 € (0.83 €). Of two losers in the group each loser receives 0.73 € (0.31 €). A loser receives most if he is the only loser in the group and if there are two members receiving 10 €, i.e. in total he receives a gift of 2.08 € (1.12 €) from both winners on average. In the ST one loser gets an average conditional gift of each winner of 1.38 € (1.27 €) in session 1 (session 2). Thus, in total a loser receives 2.76 € (2.54 €) if he is the only loser in his group. By contrast, if there are two losers, the transfer payment to each loser amounts to 1.00 € (0.90 €). Although using only single blind procedure the results for the ST were similar to those found in previous studies. E.g. Büchner et al (2007) – who were the first conducting a solidarity experiment since the introduction of the Euro – find a gift giving for one loser of $x_1^{ST} = 1.39$ and for each of two losers of $x_2^{ST} = 0.96$ in the "normal" solidarity game.

Tables A1 to A4 in the appendix show the individual gift giving of each participant in each treatment of each session for one loser (if two subjects win 10 €) and for two losers. The tables contain the number of subjects who chose a specific combination of conditional gifts for one loser and for two losers. Selten and Ockenfels (1998) distinguish the following types of conditional gift giving behavior: egoistic behavior, fixed total sacrifice, fixed gift to loser and intermediate behavior. We follow the classification used by Selten and Ockenfels (1998) and Büchner et al (2007) to categorize the behavioral types observed in each session. Table 2 shows the results. Egoistic behavior occurs if $x_1=x_2=0$. Fixed total sacrifice is defined by $x_1=2x_2>0$. The behavioral pattern $x_1=x_2>0$ is

called fixed gift to loser. If the level of the observed gifts lies between fixed total sacrifice and fixed gift to loser the behavior is classified as intermediate ($2x_2>x_1>x_2>0$).

Analyzing the two STs, our sample does not support a predominance of fixed total sacrifice behavior as was found by Selten and Ockenfels (1998) (see Table 2 below). Selten and Ockenfels (1998) find that 52% of subjects behave according to fixed total sacrifice. Our results are more balanced. In both STs the percentage of fixed total sacrifice is indeed higher than fixed gift to the loser or intermediate behavior, but these differences are quite small. However, in the RT the predominant type is egoistic behavior. Taken together with the fact that means of conditional gift giving are higher in the ST than in the RT, this observation already suggests that responsibility is a decisive factor in subjects' considerations.[13]

Table 2: Types of gift giving behavior

	egoistical	fixed total sacrifice	fixed gift to loser	intermediate	Other types
S1 – RT	8 (33%)	4* (16.6%)	6 (25%)	4 (16.6%)	2 (8.3%)[1]
S1 – ST	3 (12.5%)	8 (33.3%)	6 (25%)	6 (25%)	1 (4.2%)[1]
S2 – ST	11 (45.8%)	4 (16.6%)	3 (12.5%)	3 (12.5%)	2 (8.3%)[2] + 1 (4.2%)[3]
S2 - RT	16 (66.6%)	1 (4.2%)	1 (4.2%)	3 (12.5%)	1 (4.2%)[2] + 2 (8.3%)[3]

* 3 subjects behave exactly according to $x_1=2x_2>0$, 1 subject up to rounding according to the prominence theory (compare for example Keser, Vogt (2000)). Other types of behavior: [1] $x_1>2x_2>0$; [2] $x_1>0$, $x_2=0$; [3] $x_2=2x_1>0$

3.2 The impact of responsibility – Process matters

Both, the higher conditional gift giving in the solidarity treatment and the higher proportion of subjects behaving egoistically in the risk treatment indicate the influence of perceived self-inflictedness on the action of subjects. Now we examine the different levels of gift-giving contingent on the treatment. We expect subjects to be well aware of the fact that losing in the RT is someone's own fault. In the RT subjects who chose option *B* are

[13] Moreover, we consider the question if types of behavior remain stable over time. Table A5 in the appendix summarizes how many subjects of each type maintain their type or change to a specific other type during each session. The table shows that a certain percentage of subjects stick to their respective type. In our first session, 42% of the subjects always show the same type; in session 2, even 67% do not change their type. Note that we investigate only the *type* of behavior, not the *level* of gift giving. A subject's type remaining constant does not mean that the amount he gives to losers is the same. The type refers only to the relation between x_1 and x_2.
Let us now define consistent behavior in the following way: we call a behavior consistent over time if a subject either does not change his type at all or if he changes his type exclusively in so far as he does not give any amount to losers in the RT when losing is self-inflicted. We observe consistent behavior in session 1 for 62.5% of the subjects and in session 2 even for 91.7% of the subjects. So the remaining percentage of subjects changes its behavior dependent on the situation: 37.5% in session 1 as compared to only 8.3% in session 2. We do not have a satisfying explanation for the behavior of this percentage so far, but the great majority of subjects behaves consistently over time. So further research is necessary for yielding an answer to the question of how stable a "behavioral type" is, but this is beyond the scope of this paper.

perceived as selfish in the sense that they accept a high risk of becoming dependent on transfer payments from other group members. Thus, subjects' gift giving to group members who are responsible for their loss can be conjectured to be lower in the RT; whereas we suppose by contrast subjects being willing to give a needy person a much higher conditional gift if the person had no choice and just "bad luck" in the ST. The figure below illustrates the direction of the means in both sessions and applies to one as well as to two losers.

Figure 1: Directions of the means

	1st part		2nd part
Session 1:	RT	$<$	ST
	$\wedge$		$\vee$
Session 2:	ST	$>$	RT

The within subject analysis for both sessions shows that conditional gifts are significantly lower in the RT – in which losing is self-inflicted – than in the ST – in which losing is due to chance. This is valid for one loser as well as for two losers.[14] Significant lower gifts in the RT obviously indicate that subjects perceive losing being strongly self-inflicted in the RT.[15] Moreover, not only are the means significantly lower in the RT, but also a comparison of *each* subject's gift giving between the treatments yields that in session 1 (session 2) 14 subjects (8 subjects) give a higher gift in the ST. This proves that at least to a significant fraction of subjects considerations of responsibility and the underlying process matter.

A between subjects analysis of the first part of each session – namely a comparison of the gift giving in the RT (of the first session) and the ST (of the second session), always reveals higher means of gifts in the ST, but these differences are not significant (a one-tailed Mann-Whitney-U test delivers $p>0.1$ for one as well as for two losers). Why is the difference of gift giving in the RT and the ST in the within subjects analysis highly significant, but not in the between subjects analysis? One possible explanation is a reference point problem. In all theories of social preferences subjects need a reference

[14] Means are given in Table 1. The one-tailed Wilcoxon Signed Rank test provides for session 1 $p=0.019$ for one loser and $p=0.009$ for two losers. The p-values in session 2 are $p=0.003$ for one loser and $p=0.016$ for two losers.

[15] In the following we cannot join the data of the two sessions, because there is an order effect. The STs of both sessions are not significantly different (pair wise two-tailed Mann-Whitney-U test, $p>0.1$), but the RTs differ significantly (two-tailed Mann-Whitney-U test, $p>0.05$). A two-tailed Kolmogorov-Smirnov-Z test yields $p<0.1$ for all comparisons indicating that there exist differences between the means and distributions.

point to be able to evaluate their own standing. This might be either the payoffs of other players or an average of the payoffs or something else they can compare their own payoff with. Regarding our hypothesis of procedural utility it is therefore conceivable that subjects need a reference *situation* to judge whether the process was fair as compared to another situation underlying a different process. As shown above, subjects are willing on principle to transfer money to needy members of their group. In the first session, the first part is the RT. In this session subjects first experience the "unfair" treatment as a "neutral" starting point. In the second session, subjects first get to know the "fair" treatment. Without having any other experience the subjects' gifts to needy persons are positive. The means of gifts are lower in the RT than in the ST, but not significantly. In the second part of the experiment the subjects are now provided with a reference situation they can compare the new situation with. In session 1, subjects compare the "fair" treatment of the second part to the situation of the first part – the "unfair" treatment. Yet, we expect them to give much more as compared to the first part. In session 2, our considerations are the other way round: Subjects now experience a much more "unfair" situation than their reference situation. Thus, we expect them to give much less. If these considerations hold true we should observe a significant difference when comparing the second part of each of the two sessions (the ST of the first session with the RT of the second session). Indeed, the differences in gift giving for one as well as for two losers are highly significant in the second part of the experiment (*p*-values Mann-Whitney-U test: $p<0.01$ for one as well as for two losers).

However, our data sample does not fully permit to corroborate the existence of a reference situation as another explanation may be a simple session effect. Looking at how many subjects behave egoistically regardless of the treatment, we observe that there are only 3 persons (12.5%) in the first session, whereas there are 10 persons (41.6%) in the second session who never give anything to losers in their group. This is surprising, especially because in the first session the RT was played first and in the second the ST was played first. It has often been observed that the first round of an experiment has a strong influence on the following decisions of the subjects. Therefore, one could have expected a more egoistic behavior in the first sessions in which the RT was played first, but not in the second session in which the "normal" solidarity game was played first.[16] If

[16] This is even more surprising as Büchner et al (2007) and Selten, Ockenfels (1998) observed 27% and 21% egoistical behavior respectively, in their solidarity experiments. This is only about half of our observations of egoistical behavior in session 2 where the solidarity game was played first.

the insignificance of the differences in the first part of the two sessions is due to a session effect we should achieve significant differences when just analyzing our data excluding the totally egoistic types who do not pay any transfer regardless of the treatment. Analyzing the first parts of the two sessions (the RT of the first session and the ST of the second session) we get p=0.006 for one loser and p=0.050 for two losers (one-tailed Mann-Whitney-U test; average transfer payments in the first part, totally egoistic types excluded: x_1^{RT} = 1.19 €; x_2^{RT} = 0.83 € and x_1^{ST} = 2.18 €; x_2^{ST} = 1.54 €). Thus, the analysis supports the hypothesis that process-related fairness plays an important role for the gift giving behavior of subjects in a within subjects analysis as well as in a between subjects analysis: Subjects pay in principle lower gifts to losers who are responsible for their situation in the RT than to 'unlucky' losers in the ST.

3.3 The impact of responsibility on safety choosers and risk choosers

Having seen that the perception of responsibility influences conditional gift giving in the different treatments, we now examine the effects on subjects choosing the safe option *A* (safety choosers) and the risky option *B* (risk choosers) in the RT.

Safety choosers' behavior

Focusing first on subjects choosing the safe state in the RT, we inquire if those safety choosers transfer less to those who inflicted their damage on themselves in the RT than subjects in the ST in which losers just had bad luck. We suppose that subjects who choose option *A* in the RT deem it very unfair to "insure" other subjects who were not as cautious as themselves. Thus, we assume those subjects not to pay a high transfer to self-inflicted losers.

First, we consider the between subjects analysis of the first part of each session, i.e. we compare the gift giving of subjects choosing option *A* in the RT (in the first part of the first session) and of the gift giving of *all* subjects in the ST (in the first part of the second session). In session 1 subjects choosing option *A* in the RT (N=14) give on average x_1^{A-RT} = 0.93 € to one loser and x_2^{A-RT} = 0.64 € to two losers. Subjects in session 2 playing the ST (N=24) in the first part give on average x_1^{ST} = 1.27 € to one loser and x_2^{ST} = 0.90 € to two losers.[17] Although gift giving for one as well as for two losers is higher in the ST, these differences are not significant (one-tailed Mann-Whitney-U test results in p>0.1 for

[17] Note that in both sessions the average conditional gift giving of *A*-choosers is lower than the overall average gift in the RT.

one as well as for two losers). Taking into account our first consideration from above, that subjects need a reference situation, we analyze the second part of the experiment (means of gift giving in the RT (N=13) and in the ST (N=24): x_1^{A-RT} = 0.00 €; x_2^{A-RT} = 0.00 € and x_1^{ST} = 1.38 €; x_2^{ST} = 1.00 € for one loser and for two losers respectively). This yields highly significant results (one-tailed Mann-Whitney-U test: p<0.001 for one as well as for two losers). Our second consideration concerning a session effect leads to an exclusion of all subjects behaving egoistically regardless of the treatment. Taking again the data of the first part of both sessions without these types results in the following means of gift giving: x_1^{A-RT} = 1.00 €; x_2^{A-RT} = 0.69 € (N=13) and x_1^{ST} = 2.18 €; x_2^{ST} = 1.54 € (N=14). The higher gift giving in the ST is now significant (p=0.005 for one loser and p=0.04 for two losers). All in all, these results provide strong evidence that those who do not take risk are less willing to compensate self-inflicted risks of others.

Second, we conduct a within subject analysis which solely concentrates on safety choosers' gift giving. We compare gift giving of subjects choosing option *A* in the RT with their gift giving in the ST (excluding gift giving of subjects choosing option *B*). In session 1, those subjects choosing option *A* in the RT (N=14) give on average less in the RT than in the ST (means of gift giving in the RT and in the ST: x_1^{A-RT} = 0.93 € and x_1^{A-ST} = 1.25 € for one loser and x_2^{A-RT} = 0.64 € and x_2^{A-ST} = 0.96 € for two losers). In session 2, we observe x_1^{A-RT} = 0.00 € and x_1^{A-ST} = 0.92 € for one loser and x_2^{A-RT} = 0.00 € and x_2^{A-ST} = 0.88 € for two losers (N=13). The differences between the treatments are not significant in session 1 (a one-tailed Wilcoxon Signed Rank test yields p=0.13 for one loser and p=0.062 for two losers), whereas in session 2 the results are significant (p=0.031 for one as well as for two losers). Again taking into account the session effect and excluding all totally egoistic types[18] (N=18) we achieve highly significant p-values of p=0.005 and p=0.002 (one-tailed Wilcoxon Signed Rank test) for one and for two losers respectively for the joint data of both sessions (x_1^{A-RT} = 0.72 € and x_1^{A-ST} = 1.64 €; x_2^{A-RT} = 0.50 € and x_2^{A-ST} = 1.38 €). Thus, subjects choosing the safe option *A* give significantly more to losers in case their needy state is due to "bad luck" and not due to self-selected risk taking.

[18] First, we exclude all subjects giving nothing in both treatments to one as well as to two losers. Then we tested for order effects. A two-tailed Mann-Whitney-U tests provides p>0.1 in the ST and in the RT for one as well as for two losers leading to the conclusion that there are no order effects. Therefore we join the data of the RT of session 1 and session 2 and the data of the ST of both sessions.

Risk choosers' behavior

If we isolate the gift giving of subjects choosing option *B*, we observe higher means of gift giving in general.[19] Concerning the *B*-players only the difference between treatments for one loser in session 1 is significant (one-tailed Wilcoxon Signed Rank test p=0.031). If we take the session effect into account, the joint data for *B*-players become significant (one-tailed Wilcoxon Signed Rank: test p=0.006 for one loser and p=0.047 for two losers) indicating that *B*-players give also significantly less in the RT (x_1^{B-RT} = 1.50 € and x_1^{B-ST} = 2.01 €; x_2^{B-RT} = 0.94 € and x_2^{B-ST} = 1.21 €). This result is quite surprising. Although these subjects voluntarily take a higher risk themselves, they do not want to pay for others acting in the same way. Thus, a loser's responsibility for becoming needy plays an important role for gift giving behavior even of those subjects bearing the risk themselves.

Comparison of safety and risk choosers' behavior

But do people who choose risk themselves pay more to losers in the RT than people who choose the safe state in the same treatment? Subjects who choose the lottery and not the safe state are all in the same boat. There is an equal possibility of losing for all of them and after having decided in favor of the lottery, they play the "solidarity game" again. Table A6 in the appendix summarizes the means of gift giving for subjects choosing option *A* or *B* respectively for both sessions as well as for joint data without totally egoistic types. Subjects choosing option *B* give higher gifts in all cases except one than subjects choosing option *A*. In session 1, none of these differences is significant (one-tailed Mann-Whitney-U test provides p>0.1 for one loser as well as for two losers). In session 2, there is a significant difference between *A*- and *B*-players in the RT, but not in the ST. It might be the case that these differences are due to few observations. So again, we take the session effect into account and exclude subjects who belong to the totally egoistic type and join the data of session 1 and session 2. A one-tailed Mann-Whitney-U test yields mostly significant differences in the RT (p=0.008 for one loser and one other 10 €-winner, p=0.004 for one loser and one 60 €-winner and p=0.052 for two losers), but the differences in the ST are not significant (p=0.114 and p=0.355). Thus, we conclude that *A*-players give significantly less to losers than *B*-players in the treatment, in which losing is partly self-inflicted. However, if losing is only due to chance than there are no significant

[19] Session 1 (N=10): x_1^{B-RT} = 1.20 € and x_1^{B-ST} = 1.57 € for one loser and x_2^{B-RT} = 0.84 € and x_2^{B-ST} = 1.06 € for two losers. Session 2 (N=11): x_1^{B-RT} = 1.23 € and x_1^{B-ST} = 1.68 € for one loser and x_2^{B-RT} = 0.68 € and x_2^{B-ST} = 0.91 € for two losers.

differences in gift giving of *A*- and *B*-players. This is a very intuitive result. *A*- and *B*-players both give similar transfer payments to losers if they are not held responsible for their neediness (ST). However, if subjects are given the possibility of avoiding risk, subjects who choose a safe payment pay significantly less to losers who are responsible for their neediness whereas subjects taking the risk themselves pay significantly more (RT).[20] Thus, risk takers show a slightly higher solidarity with other risk takers than subjects having chosen the secure payment.

3.4 Impact of responsibility on expectations of actions

When subjects express their expectations regarding the gift giving behavior of others they implicitly estimate how the perception of responsibility influences their fellows' actions. If most subjects assume that others are as well sensitive to process-related fairness one can expect that one's expectations and one's own actions somehow correspond. First, we concentrate on the preciseness of expectations in the ST. Means of gift giving and means of expected gifts in the solidarity treatment are illustrated in Table 3.

Table 3: Means of gift giving and means of expected gifts in the ST

	N	x_1^{ST}	x_2^{ST}	e_1	e_2
Session 1 – ST	24	1.38 (1.06)	1.00 (0.91)	1.45 (0.87)	1.13 (0.81)
Session 2 – ST	24	1.27 (1.35)	0.90 (1.21)	1.73 (1.23)	1.35 (1.42)

Average gifts (x_1 and x_2) and expectations (e_1 and e_2) in €, standard deviations in brackets

The average of expected gifts is higher than the average of actual conditional gifts. Nevertheless, Spearman rank correlations show a strong and significant correlation (one-tailed $p<0.01$ for one as well as for two losers) among gifts and expected gifts for both sessions (session 1: $\rho = 0.76$ for x_1^{ST} and e_1; and $\rho = 0.79$ for x_2^{ST} and e_2; session 2: $\rho = 0.50$ for x_1^{ST} and e_1; and $\rho = 0.51$ for x_2^{ST} and e_2). One-tailed Wilcoxon Signed Rank tests yield no significant differences between conditional gifts and expectations in session 1 (p=0.32 for one loser and p=0.095 for two losers), whereas in session 2 there is a weak significance that expectations are higher than conditional gifts (p=0.051 for one loser and p=0.048 for two losers). These results correspond to the findings of Büchner et al (2007).

[20] Nevertheless, the means of *B*-players are almost always higher, albeit not significant in the ST. This might indicate that more risk averse subjects (*A*-players) are self-selecting and more egoistical.

Now, we consider gift giving and expectations in the RT of our experiment. First, we concentrate on gifts of subjects choosing option *A* and their expectations. Table 4 summarizes the results. Spearman rank tests show again a high and significant correlation among gifts and expectations for *A*-players in session 1 ($\rho = 0.75$ for $x_{1(A)}^{RT}$ and $e_{1(A)}$, p<0.01; and $\rho = 0.59$ for $x_{2(A)}^{RT}$ and $e_{2(A)}$, p<0.05). In session 2, there is no correlation, because none of the *A*-players contributes anything. One-tailed Wilcoxon Signed Rank tests show that in session 1 subjects do not expect higher gifts from others than they actually transfer themselves (p=0.42 for one loser and p=0.078 for two losers), whereas in session 2 expectations are significantly higher than conditional gifts (p=0.008 for one loser as well as for two losers).

Table 4: Means of gift giving and of expected gifts in the RT of *A*-players

	N	$x_{1(A)}^{RT}$	$x_{2(A)}^{RT}$	$e_{1(A)}$	$e_{2(A)}$
Session 1 –RT	14	0.93 (1.00)	0.64 (0.74)	0.93 (0.69)	0.86 (0.53)
Session 2 – RT	13	0.00 (0.00)	0.00 (0.00)	0.32 (0.42)	0.24 (0.33)

Average gifts (x_1 and x_2) and expectations (e_1 and e_2) in €, standard deviations in brackets

Table 5 contains the conditional gifts on average and the expected gifts of *B*-players. Spearman rank tests do not find a significant correlation (session 1: $\rho = 0.40$ for $x_{1(B)}^{RT}$ and $e_{1(B)}$, p>0.05; and $\rho = 0.50$ for $x_{2(B)}^{RT}$ and $e_{2(B)}$, p>0.05; session 2: $\rho = 0.56$ for $x_{1(B)}^{RT}$ and $e_{1(B)}$, p<0.05; and $\rho = 0.35$ for $x_{2(B)}^{RT}$ and $e_{2(B)}$, p>0.05). However, one-tailed Wilcoxon Signed Rank tests show that expectations are not significantly higher than actual gift giving (p>0.1 holds for all cases).

Table 5: Means of gift giving and of expected gifts in the RT of *B*-players

	N	$x_{1(B)}^{RT}$	$x_{2(B)}^{RT}$	$e_{1(B)}$	$e_{2(B)}$
Session 1 –RT	10	1.20 (1.11)	0.84 (0.74)	1.35 (1.08)	1.05 (0.84)
Session 2 – RT	11	1.23 (1.03)	0.68 (0.93)	1.51 (1.00)	1.15 (0.91)

Average gifts (x_1 and x_2) and expectations (e_1 and e_2) in €, standard deviations in brackets

In summary, the means of expectations predict quite well actual gifts[21] and thus indicate that subjects expect other individuals to be sensitive to allocative and process-related fairness as well.

All in all, additional to allocative fairness[22] we found strong evidence for our hypothesis that the responsibility of one's own actions plays an important role and actually has a strong influence on the solidarity of subjects. The questionnaire given out after the experiment further corroborates our assumptions: Many subjects state explicitly that they do not want to pay for others if losing is their own fault, whereas they are willing to help others if losing is only due to "bad luck". Some of their statements are given in the appendix.

4. Discussion and conclusions

We ran an experiment to examine the influence of responsibility on solidarity. The experiment provides strong evidence for our hypothesis that the process plays an important role in the decision-making process and obviously has a strong impact on the *actions* of subjects. We found conditional gift giving to be highly dependent on whether subjects are thought to be responsible or not.

There already exist some studies on distributive justice which deal with responsibility for one's own actions. Schokkaert, Devooght (2003) conclude that one has to distinguish "[…] between two sets of individual characteristics: those for which individuals have to be compensated and those for which they are to be held responsible. Differences in natural talent could be an obvious example of the former category, effort an example of the latter. […] (T)he degree of control is crucial: people can only be held responsible for (the consequences of) the individual characteristics which follow from

[21] Interestingly, this indicates that cheap talk does not influence the accuracy of expected means. Although we did not pay subjects for correct expectations and therefore these expectations are just cheap talk, the predictions in the ST of our experiment are as precise as in Büchner et al (2007) who paid the subjects for correct answers.

[22] We observe higher means of gift giving for one loser in the RT if the third group member wins the high prize of 60 € in both sessions *than if the third member also receives 10 €* (compare Table 1 from above). However, the differences are not significant (a one-tailed Wilcoxon Signed Rank test yields p=0.109 in session 1 and p=0.063 in session 2). If we consider again the session effect and take the joint data excluding the totally egoistic types a one-tailed Wilcoxon Signed Rank test (p=0.011) shows that subjects in the RT give more to one loser in their group if the third member of the group receives 60 € than if the third member also receives 10 € ($x^{RT}_{1/10}$ = 1.10 €; $x^{RT}_{1/60}$ = 1.39 €). Thus, the winner of 10 € takes into consideration that the loser gets money from one group member only if the third member wins 60 €, and therefore he will receive much less, because the winner of 60 € cannot pay anything to the loser. By contrast, if there are instead two winners of 10 €, the loser in the group receives from both and we observe less gift giving.

their own voluntary choice."[23] In our view this is the pivotal point. Subjects in our experiment pay significantly more money to losers in the treatment in which losers are not responsible for being in their state, while subjects who voluntarily choose a risk and thus are to be held responsible for losing receive significantly less. Many subjects even expressed these considerations in the questionnaire after the experiment explicitly. Does this mean for health insurances that people consider it as fair if e.g. smokers and people doing risky sports like paragliding should pay for themselves if they fall ill or are injured (e.g. by paying higher premium rates)? In our abstract experiment we found evidence that subjects' willingness to pay for others actually depends on whether need of others arouse from chance or a voluntarily taken risk. Schokkaert, Devooght (2003) achieved even more extreme results using specific questionnaires: "if our respondents really feel that individuals are responsible for their behavior (smoking and working hard are obvious examples) […] not only should people not be compensated for the consequences of this behavior, they should even be punished if they smoke or are lazy."[24, 25] Note that smoking and not working hard are examples in which also the payoffs of other people are reduced (passive smoking enhances health disadvantages and employees have to work for their free-riding colleagues). In our experiment, payoffs of *other* subjects were not reduced if one subject chose the risky option, but nevertheless we obtain significant results. This provides strong evidence for the impact of responsibility.

The procedural utility concept tries to take process-related fairness considerations into account. Procedural utility differs from intention-based reciprocity models in so far as in reciprocity models utility depends on outcomes (or, at least, the reference points depend on allocations). Intentions can be measured, but only in terms of payoffs. By contrast, in procedural utility concepts "utility is reaped from the process itself, over and above the outcome generated".[26] Thereby the *non-instrumental* aspect of procedural utility is emphasized, an aspect which is not covered by reciprocity models, although these do incorporate intentions (but only measured in terms of payoffs). Bolton et al and Sen also

[23] Schokkaert, Devooght (2003) p. 208.
[24] Schokkaert, Devooght (2003) p. 223.
[25] Other studies on distributive justice provide similar results. Fleurbaey, Maniquet (2003, p. 5) speak of a "sphere of individual responsibility" and Cohen (1989, p. 914) states "(w)e should […] compensate only for those welfare deficits which are not in some way traceable to the individual's choices". Arneson (1990, p. 176) says that "(d)istributive justice does not recommend any intervention by society to correct inequalities that arise through the voluntary choice or faulty behavior that gives rise to the inequalities." Yaari and Bar-Hillel (1984) already pointed to the impact of different processes by "showing that the traditional welfarist solutions perform badly because different contexts seem to call for different choices of allocation rules" Fleurbaey, Maniquet (2003, p. 72).
[26] Frey, Stutzer (2005), p. 91.

emphasize the importance of incorporating procedure-sensitive behavior in social utility models.[27]

Our experiment indicates that the impact of a reference situation is an important question in relation to process-related fairness and should be investigated in more detail. There is reason to suppose that subjects need a reference situation to be able to judge a specific situation. However, a clear answer to this question requires future research.

In summary, there is strong evidence for allocative fairness *and* for process-related fairness. Our experiment thus supports the statement of Frey, Benz, Stutzer (2004):

> "*procedural utility is an important determinant of human well-being that has to be incorporated more widely into economic theory and empirical research.*"

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[27] Bolton et al (2005, p. 1067): "Social utility models – whether distribution or attribution based or both – will not capture this sort of procedure-sensitive behavior so long as they only incorporate allocation-driven reference points." Bolton et al (2005, p. 1066): "[…] a satisfactory explanation of the experiment need incorporate elements of both procedural and allocation fairness". Sen (1995, p. 18): "Procedural concerns can, however, be amalgamated with consequential ones by recharacterizing states of affairs appropriately, and the evaluation of states can then take note of the two aspects together."

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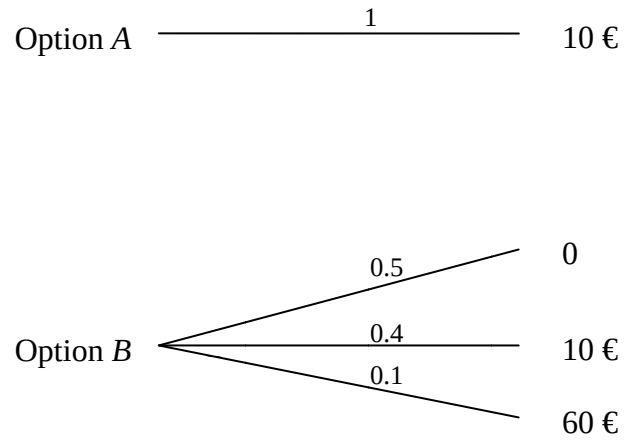
Figures and Tables

Figure A1



If option *B* was chosen we throw a ten-sided dice for each subject. The subjects who chose lottery *B* lose if the dice shows one of the numbers 1, 2, 3, 4 or 5, they win 10 € if one of the numbers 6, 7, 8 or 9 occurs and they win the big prize of 60 € if the number 0 occurs.

Table A1
Session 1 Part 1 (RT)

x_1^{RT*} / x_2^{RT}	0.0	0.2	0.5	1.0	1.2	1.5	2.0	2.5
0.0	8							
0.5		1	2					
1.0			2	3				
1.5			1					
2.0						3		
2.5					1			1
3.0						1	1	

*This is the conditional gift in case of one loser and one 10 € winner.

Table A2
Session 1 Part 2 (ST)

x_1^{ST} / x_2^{ST}	0.0	0.1	0.3	0.5	1.0	1.5	2.0	2.5	3.0
0.0	3								
0.1		1							
0.2		1							
0.4			1						
0.5				1					
1.0				5	1				
1.5					2				
2.0					2	1			
2.5							1	2	
3.0								1	1
3.5						1			

Table A3
Session 2 Part 1 (ST)

x_1^{ST} / x_2^{ST}	0.0	0.5	1.0	1.5	2.0	2.5	3.0	4.0
0.0	11							
1.0		2						
1.5			1					
2.0	1				1			1
2.5	1					1		
3.0				1	1	1	1	
4.0					1			

Table A4
Session 2 Part 2 (RT)

x_1^{RT*} / x_2^{RT}	0.0	0.5	1.0	1.5	2.0	2.5
0.0	16					
0.5	1					
1.0	1	1				
1.5			1			
2.0				1		
2.5	1				1	1

*This is the conditional gift in case of one loser and one 10 € winner.

Table A5: Behavioral types over time

S1: RT	→	ST	N	S2: ST	→	RT	N
e	→	e	3	e	→	e	10
fs	→	fs	3	fs	→	fs	1
fg	→	fg	2	fg	→	fg	1
i	→	i	2	i	→	i	2
e	→	fs	3	y	→	y	2
e	→	fg	2	fs	→	e	2
fg	→	fs	2	fg	→	e	2
fs	→	fg	1	z	→	e	1
fg	→	i	2	i	→	e	1
i	→	fg	1	fs	→	i	1
fs	→	i	1	e	→	y	1
x	→	i	1				
i	→	x	1				

e = egoistical, fs = fixed total sacrifice, fg = fixed gift, i = intermediate, x = $x_1>2x_2$; y = $x_1>0$, $x_2=0$; z = $x_2=2x_1$
Each session starts with the first part followed by the second with the corresponding types.

Table A6: Means of gift giving of *A*-players and *B*-players

	N	$x_{1/10}^{RT}$	$x_{1/60}^{RT}$	x_2^{RT}	x_1^{ST}	x_2^{ST}
S1*: *A*-players	14	0.93	1.04	0.64	1.25	0.96
		(1.00)	(1.26)	(0.74)	(0.93)	(0.89)
S1*: *B*-players	10	1.20	1.40	0.84	1.57	1.06
		(1.11)	(1.24)	(0.74)	(1.25)	(0.97)
S2*: *A*-players	13	0.00	0.00	0.00	0.92	0.88
		(0.00)	(0.00)	(0.00)	(1.38)	(1.39)
S2*: *B*-players	11	1.23	1.82	0.68	1.68	0.91
		(1.03)	(1.82)	(0.93)	(1.25)	(1.04)
S1+S2**: *A*-players	18	0.72	0.81	0.50	1.64	1.38
		(0.96)	(1.19)	(0.71)	(1.05)	(1.14)
S1+S2**: *B*-players	17	1.50	2.00	0.94	2.01	1.21
		(0.95)	(1.48)	(0.82)	(1.02)	(0.96)

$x_{1/10}^{RT}$: RT 1 loser (other winner: 10 €), $x_{1/60}^{RT}$: RT 1 loser (other winner: 60 €), x_2^{RT} : RT 2 loser, x_1^{ST} : ST 1 loser, x_2^{ST} : ST 2 loser, standard deviations in brackets

* All subjects are included.

** Subjects of the type "totally egoistic" behavior are excluded in the joint data.

Some selected statements from the questionnaire:[28]

RT:

"I decided to take possibility *A*. I give 0 € to other participants, because everybody had the free choice to choose the secure possibility. Those choosing possibility *B* nevertheless, have to bear their risk alone/themselves."

"I give less, because the others decided for the lottery and therefore choose the risk consciously."

"All participants wanting a secure payment could have chosen possibility *A*. All participants choosing *B* as myself, are soldiers of fortune and let luck/chance decide. Therefore they receive nothing."

"Those who are greedy and therefore take risks, have to take the responsibility for it."

"Choosing possibility *A* I have no chance to get something from others and therefore I do not give anything, too. Moreover, I do not want to support others' risk loving behavior, if I decided for the safe state."

"I give nothing to other participants choosing possibility *B*, because they took a chance by playing the lottery. Therefore it is their own fault."

ST:

"In this case one could not control his own risk and therefore I decided in case I win to pay an amount as consolation."

"Here I give more, because it is no one's fault if he loses."

"Game of chance, now I give a minimal amount to my group members."

"I want all three group members to receive similar amounts, because winning is only due to the dice."

"Because I also lose with a probability of 1/3, I am probably dependent on the pity of others and therefore I am also generous myself."

"I share, because everybody has the same chance."

[28] Translated from German.