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Keeping others in our mind or in our heart? Distribution games under cognitive load

Karen Evelyn Hauge[1] · **Kjell Arne Brekke**[2] · **Lars-Olof Johansson**[3] · **Olof Johansson-Stenman**[4] · **Henrik Svedsäter**[5]

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Abstract It has recently been argued that giving is spontaneous while greed is calculated (Rand et al., in Nature 489:427–430, 2012). If greed is calculated we would expect that cognitive load, which is assumed to reduce the influence of cognitive processes, should affect greed. In this paper we study both charitable giving and the behavior of dictators under high and low cognitive load to test if greed is affected by the load. This is tested in three different dictator game experiments. In the dictator games we use both a give frame, where the dictators are given an amount that they may share with a partner, and a take frame, where dictators may take from an amount initially allocated to the partner. The results from all three experiments show that the behavioral effect in terms of allocated money of the induced load is small if at all existent. At the same time, follow-up questions indicate that the subjects' decisions are more impulsive and less driven by their thoughts under cognitive load.

Keywords Dictator game · Charity game · Lab experiment · Cognitive load

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✉ Karen Evelyn Hauge
k.e.hauge@frisch.uio.no

[1] Ragnar Frisch Centre for Economic Research, Gaustadalléen 21, 0349 Oslo, Norway

[2] Department of Economics, University of Oslo, Postboks 1095 Blindern, 0317 Oslo, Norway

[3] Department of Psychology, University of Gothenburg, Box 500, 405 30 Göteborg, Sweden

[4] Departement of Economics, School of Business, Economics and Law, University of Gothenburg, Box 640, 405 30 Göteborg, Sweden

[5] Glaxo Smith Kline, Stockley Park West, Blg 10 1-3 Iron Bridge Road, Uxbridge UB11 1BT, UK

1 Introduction

Is moral behavior largely a result of cognitive or affective processes? Alternatively speaking, are we spontaneously selfish but can use cognitive reasoning to become more altruistic, or is it perhaps the other way around such that we are automatically fair-minded but can use cognitive reasoning to become more selfish? The answer is far from self-evident. For example, within psychology Kohlberg (1969) suggests that moral judgments are reached primarily through reasoning and reflection, whereas Haidt (2001, 2012) argues that moral evaluations are intuitively driven by effortless processes. We find similar discussions in economics where for example van Winden (2007) argues that emotions are more important than cognition in individual enforcement of norms like fairness, whereas Moore and Loewenstein (2004) consider self-interested behavior as automatic and viscerally tempting while the concern for others is more cognitive in nature. To shed light on this issue, one may in an experimental framework reduce people's cognitive capacity and observe whether this makes them more or less selfish. This is the task of the present paper. Yet, there are other papers with similar aims with different methodologies and experimental setups.

Rand et al. (2012) conducted several public good games and prisoners' dilemma experiments related to response time. First they compared subjects who decided faster than the median with those who decided slower. They also compared imposed time constraints and imposed time delay, and used varieties of the games with and without punishment. The faster decisions were significantly more cooperative in all cases. They also primed subjects to either use intuition or deliberation and found that intuitive priming led to more cooperative responses. However, Tinghög et al. (2013) challenged their interpretation of the time constraint experiments and conducted a series of similar experiments with no effect. Moreover, Piovesan and Wengström (2009) find that shorter decision time is actually correlated with more egoism in dictator games, which would suggest that egoism is the intuitive response.

In the present paper we focus on cognitive load manipulations, where we use a common method of asking the subjects to memorize a series of numbers and letters. The task of memorizing numbers and its link to cognitive load can be traced back at least to Kahneman and Beatty (1966).[1] Yet, there are rather few cognitive load studies on generosity and social preferences.

Benjamin et al. (2013) is the study closest to ours since they study contributions in dictator games under a cognitive load treatment similar to the one we use. Based on a small sample (37) of people, where dictators also acted as recipients, they found that dictators under cognitive load were slightly, but not statistically significantly, less generous. Schulz et al. (2012) also analyze a version of the dictator game, although based on a cognitive load manipulation in terms of an *n*-back task, where subjects hear a series of letters and have to press a button whenever a letter matches the one from two steps earlier in the sequence. The subjects in the

[1] Several authors have used memorization of numbers to create cognitive load; see, e.g., Swann et al. (1990), Gilbert et al. (1995), Trope and Alfieri (1997), Shiv and Fedorikhin (1999), and Shiv and Nowlis (2004).

high-load treatment were, in contrast to Benjamin et al. (2013), found to choose the fair allocation (equal split) more often.

Cappelletti et al. (2011) studied the effect of cognitive load in an ultimatum game and found no significant effect of cognitive load on either proposer or responder behavior. However, they found that proposers offered more under a treatment with time pressure but argue that this seems to be due to strategic considerations rather than other-regarding concerns. Respondents were found to be more likely to reject offers under time pressure, which may be interpreted as a greater concern for fairness.

Both Roch et al. (2000) and Cornelissen et al. (2011) used deception, implying that the results may be less straightforward to interpret. Roch et al. found that subjects took half as much from a common pool under high cognitive load, suggesting that cognitive load leads to more generous behavior. However, if the subjects wanted to share equally, they had to compute 60 divided by 8 and pick the closest integer; thus equal sharing may require cognitive capacity. Cornelissen et al. (2011) combined dictator experiments under cognitive load with survey data on social value orientation and found that pro-socials become more generous under cognitive load whereas pro-selves become less generous.

Overall, previous studies thus point in opposite directions regarding the effects of cognitive load. Since several of the previous studies used rather complex designs, and are sometimes confounded by strategic elements and/or deception, we believe it is worthwhile to utilize an as simple design as possible, a simple dictator game, where strategic considerations are minimized. The dictator game has previously been used extensively to study moral behavior; see for example Engel (2011) for a comprehensive meta-analysis on the effects of incentives, social control, distributive concerns, framing, social distance and demographics (but not cognitive load) in dictator game experiments. The present paper reports the results of three dictator game experiments with slightly different designs. In each case we obtain no significant effect of cognitive load on the amount given. Thus, if such effects exist, they seem to be small.

However, one may conjecture that the effects of cognitive load may differ depending on how a situation or decision is framed.[2] We therefore compare two frames: In the conventional *give treatment*, the individual decides how to split a certain amount of money that is given to him/her with an anonymous co-player, whereas in a *take treatment* the task is to take money initially given to the co-player. Yet, we obtain no significant differences here either.

Finally, we also analyze how the manipulation of cognitive load affects the emotions of subjects, based on a post-experiment survey used to measure emotions in two of the experiments. We find that subjects under high cognitive load are less driven by thoughts and are more impulsive compared with those under low cognitive load, indicating that the memory task did in fact induce a high cognitive load. In light of the results from previous studies pointing in opposite directions regarding the effects of cognitive load, and the results of no significant effect of cognitive load on generosity from this study, it seems as the cognitive load

[2] Framing effects in dictator games are analyzed by Bardsley (2008) and Dreber et al. (2013), and in public good games by Andreoni (1995), Sonnemans et al. (1998), and Cubitt et al. (2011).

technique does not give consistent results across studies. The experimental designs are presented in Sect. 2 and the results in Sect. 3, while Sect. 4 concludes the paper.

2 The experimental design

2.1 Experiment 1

Experiment 1 was conducted at the Stockholm School of Economics in April 2008. In total 57 subjects recruited from the School participated. There were 4 sessions, each involving 22, 9, 21, and 5 subjects. In the first three sessions every second subject received the low and high cognitive load treatment, respectively, while in the last session all 5 subjects received the high cognitive load treatment, yielding 25 subjects in the low cognitive load treatment and 32 subjects in the high cognitive load treatment.

The purpose of this experiment was to examine the effect of cognitive load on the willingness to donate money to a charity. Experiment 1 essentially was a dictator game experiment with a charity as the receiver; cf. Eckel and Grossman (1996). The design largely followed that used by Shiv and Fedorikhin (1999), with the important modification that we measured the difference in generosity rather than self-control under cognitive load. In Experiment 1, subjects were asked to divide SEK 100[3] between themselves and a charity (the Red Cross), after having memorized a 7-digit number. The treatment variable was the complexity of the memory task. In the low cognitive load treatment, the 7-digit numbers were easy to memorize (9999999 or 1234567), while in the high cognitive load treatment, the 7-digit numbers were more difficult to memorize (9824672 or 1642753). Memorizing the more difficult numbers presumably required much more of a person's cognitive resources than memorizing the simple numbers. While Shiv and Fedorikin (1999) used a 2-digit number in their low cognitive load treatment and a 7-digit number in their high cognitive load treatment, we chose to use 7-digit numbers in both treatments to avoid any anchoring effects (Tversky and Kahneman 1974). A second measure to avoid anchoring effects was to let the first digit of the 7-digit numbers within each session be identical (for instance 9999999 vs. 9824672). To avoid the possibility of subjects learning the memory task before the experiment started from subjects who participated in earlier sessions, the memory task was different on every new day of the experiment. The experiment was conducted as described below.

All subjects met in a common room where oral instructions were provided. They were informed that part of the experiment would take place in a different room, and that they therefore would be asked to go to another room during the experiment. They were told that they would be given a choice of payment for participating in the experiment. Further, they were told that they would be asked to memorize some numbers, and that later in the experiment they would be asked to report the numbers they had memorized. Reporting the numbers correctly increased their total payoff by SEK 50. In addition, all subjects received a show-up fee of SEK 50.

[3] One USD was equivalent to roughly SEK 7 at the time of the experiment.

Subjects were instructed to come forward one by one. Each subject then was asked to memorize a 7-digit number shown on a card. Similar to Shiv and Fedorikhin, there was no time limit for the memorization task. After memorizing the numbers, each subject left the first room and proceeded to a booth situated in the hallway between the two rooms. On the wall inside the booth, there was a poster informing subjects that their choice was to divide SEK 100 between themselves and the Red Cross. The SEK 100 could be divided in intervals of SEK 20. On a table inside the booth there were 6 piles of paper slips, one pile for each of the 6 possible alternatives. Subjects were informed that they should pick the paper slip that indicated their choice and hand it over at their arrival in the second room. The piles of paper slips were such that subjects were not able to infer the choice of previous subjects.

Upon arrival to the second room, each subject delivered the paper slip indicating his/her chosen payoff, reported the memorized numbers, and accordingly received payment in cash. Each subject then received a questionnaire,[4] which s/he completed in private before leaving the experiment. The complete instructions and post-experiment survey can be found in the Online Appendix.

2.2 Experiment 2

Due to the limited effect of cognitive load in Experiment 1, and given the mixed findings reported in the literature, we decided to improve the design and increase the number of subjects. The settings were therefore simplified to a well-established experimental setup in which we examined the effect of cognitive load on behavior in a standard dictator game where the receiver, instead of being a charity as in experiment 1, now was a subject in the experiment. In addition, we decided to increase the level of difficulty of the cognitive load task since most subjects succeeded in the memory task in Experiment 1. Instead of memorizing 7 digits, subjects now memorized a combination of 7 digits and letters.

Experiment 2 was conducted at the University of Oslo in October 2008. Students were recruited at various large lectures for first-year students. A total of 122 subjects participated, 61 as dictators and 61 as receivers. In total four sessions were run, each with 32, 30, 36 and 24 subjects. There were two different manipulations: high versus low cognitive load and a give versus take framing of the dictator game. The low cognitive load task was to memorize a simple combination of 7 digits and letters (AAAA111 or BBBB111), while the high cognitive load task was to memorize a more difficult randomly generated combination (1GT6N58 or 3H4BS92). Subjects were given 15 s to memorize the memory task. The second manipulation was the framing of the dictator choice. In both framings, dictators were given two envelopes, one marked "For me" and the other marked "For my partner," where one of the envelopes contained 10 small sheets of paper each worth NOK 30 (about $5) and the other envelope was empty. In the give frame, the paper slips were placed in the envelope marked "For me," while in the take frame the paper slips were

[4] The questionnaire consisted of questions adopted from Shiv and Fedorikhin (1999) and Bosman and van Winden (2002).

placed in the enveloped marked "For my partner." Each dictator could divide the NOK 300 between himself and the receiving partner by moving the preferred number of paper slips between the envelopes.

The procedure of the experiment was as follows. After arriving at the experiment, all subjects drew a number indicating their seat number. In each session all subjects were first gathered in a common room where the initial instructions were presented orally, informing them that their payoff would depend on decisions made by half of the subjects present, in addition to an individual memory task. After the initial instructions were given, all subjects who had drawn an odd number were asked to go to a second room. The subjects who left the room were assigned the role as receivers, while the subjects who remained in the first room were assigned the role as dictators. The random draw of seat numbers ensured that subjects were assigned randomly to the roles as dictators and receivers. Gathering all subjects in a common room at the beginning of the experiment also demonstrated to the dictators that the receivers were real subjects in the experiment. All subjects completed two memory tasks and two decisions. The procedures were similar for both these parts of the experiment. In both parts, the memory task was shown on the screen for 15 s, the instructions for the dictator choice were read out loud, and then subjects made their decisions and handed in their envelopes before receiving pen and paper for reporting the memory task. In part 1, all subjects also made a decision regarding the timing of payment before reporting the memorized sequence. The timing decision is described below.

The memory tasks were identical for dictators and receivers participating in the same treatment, while the decisions were different. Subjects were not allowed to have any belongings on their desk. This was to avoid subjects writing down the memory task on paper, phones, or computers. For all dictators regardless of cognitive load manipulation, decision 1 was a dictator choice with a take frame while decision 2 was a dictator choice with a give frame. Thus, the cognitive load manipulation implies between-subject comparisons, while the framing manipulation implies within-subject comparisons.

After completing decision 1 and before reporting the first memory task, all subjects were given the choice between receiving their payoff today and receiving 33.3 % more if paid one month after the experiment. This enables us to measure whether cognitive load may have an effect on patience. As this decision was made while subjects were under cognitive load, subjects used stickers (and not pens) to indicate their choices on the answering sheet in order to avoid subjects writing down the memory task before they were asked to report it.

Only one of the dictator choices was actually paid out, and a dice roll determined which of the two rounds would determine payments. After determining which round should be used for payment, the receivers received the envelope marked "For my partner" from their partner in the corresponding round. All payoffs were transferred to the subjects' bank account either on the day of the experiment or 1 month later according to the request of each subject.

In the post-experiment survey, subjects were asked to rate to what degree[5] they experienced several emotions while making the last dictator choice in the experiment. The selected emotions were both positive and negative emotions taken from a question battery well-known within psychology called the PANAS-X (Watson and Clark 1994). We also revised one of the questions from Shiv and Fedorikhin (1999). Instead of forcing subjects into a dual mind by putting word pairs against each other on a 7-point scale (for instance "My decision was guided by: my emotions (1)/my thoughts (7)"), subjects were asked to rate each word by itself on a 5-point scale.[6] Dictators were also asked to report what they personally found to be morally right behavior in the dictator game (receivers answered this question during the experiment). The complete instructions and post-experiment survey can be found in the Online Appendix.

2.3 Experiment 3

Experiment 3 was again set up as a simple dictator game. Our aim here was to simplify the experimental procedures even further. Compared with Experiment 2, we performed each experimental session in a single (large) room. Furthermore, in order to make it even more salient that the choices entailed real monetary trade-offs, subjects were now paid in cash. Moreover, while the envelopes contained play money (paper slips) in Experiment 2, they now contained real banknotes. Finally, whereas Experiment 2 used a lottery to determine which of the two choices would be paid out, in Experiment 3 subjects were only faced with one choice of how to distribute money between themselves and a paired anonymous recipient, and money was paid out to both parties according to the distributive allocation made by the subject.

Experiment 3 was conducted at the University of Gothenburg, as four identically designed sessions, two in December 2008 and two in March 2009, using different sets of student pools. Altogether 146 students participated in the experiment. Students were first contacted via e-mail, asking them whether they were interested in participating in an experiment conducted at the university. Interested students were randomly divided into four groups and were then given a time and location for the experiments.

As in Experiment 2, we used two different manipulations: high versus low cognitive load and a give versus a take framing. The low cognitive load task was to memorize a simple combination of 7 letters (AAAAAAA), while the high cognitive load task was to memorize a more difficult combination of 7 digits and letters (8Z3QC9S). In both cases, subjects were given 15 s to memorize the combination. Subjects who remembered the combination correctly at the end of the experiment were paid SEK 50. The decisions in Experiment 3 were, as in Experiment 2, framed

[5] Five-point scale: (1) Very slightly or not at all, (2) a little, (3) moderately, (4) Quite a bit, (5) extremely.

[6] Five-point scale where 1 corresponds to "Does not coincide" and 5 corresponds to "Coincides very well".

as either give or take scenarios. While dictators in Experiment 2 made one dictator decision for each of the framing scenarios, in Experiment 3 each dictator only made one decision. This implies a between-subject comparison for both manipulations in Experiment 3. For half of the subjects the envelope marked "For me" contained eight SEK 20 notes, i.e., in total SEK 160, whereas the envelope marked "For my partner" was empty (give scenario). The subject could then move as many SEK 20 notes as s/he wished to the partner's envelope. For the remaining subjects, the envelope marked "For my partner" contained eight SEK 20 notes, whereas the envelope marked "For me" was empty (take scenario), whereby the subject could move as many SEK 20 notes as s/he wished between the envelopes. They were finally told to keep the envelope marked "For me" and leave the envelope marked "For my partner" on their desk to be collected by us later.

The subjects in the first treatment were dictators under low cognitive load, while those in the second treatment were dictators under high cognitive load. The dictators were told that the partner was a randomly selected individual who was to conduct a similar task in a later session the same day.

In the remaining two sessions, conducted the same day, subjects were receivers, in the third treatment under low cognitive load and in the fourth under high cognitive load. As such, they made no consequential decisions. Instead, they were instructed to make an allocation decision in a hypothetical dictator game, with the only difference being that they used (obviously) fake SEK 20 notes. They were explicitly instructed to make their decisions as if the notes were real, but were also told that the choice was hypothetical. At the very end of the experiment, receivers were given an envelope with the real SEK 20 notes according to the decision made by a randomly paired dictator in one of the previous sessions. The results from the follow-up questions are reported in Sect. 4.

The post-experiment survey in Experiment 3 is, with a few small exceptions, identical to the survey in Experiment 2. The complete instructions and post-experiment survey are given in the Online Appendix.

3 Results

In this section we present our results. When presenting the results below, we include data from all the dictators who participated in our experiments, both the dictators who reported the memory task correctly and those who did not.[7] Figure 1 and Table 1 below summarize the main results of the (real money) dictator games in all experiments. In Experiment 1, the average donation under high cognitive load (28 % of the endowment) is smaller than under low load (30 % of the endowment),

[7] In contrast, Rand et al. (2012) exclude subjects who did not reach a decision within the given time limit, with the argument that these subjects were not under cognitive load. In this paper, we argue that mistakes in the reported memory task can happen in two cases; when the subject has tried hard but does not succeed in reporting the correct numbers, and thus being under cognitive load, or when the subject disobeys the treatment and does not try to memorize the task, and thus is not under load. Since perfect recall has several possible interpretations concerning the effect of cognitive load in the setting of our experiment, we find it inappropriate to exclude some subjects from our analysis on that basis. Our results stay essentially the same when excluding dictators who did not remember the task correctly.

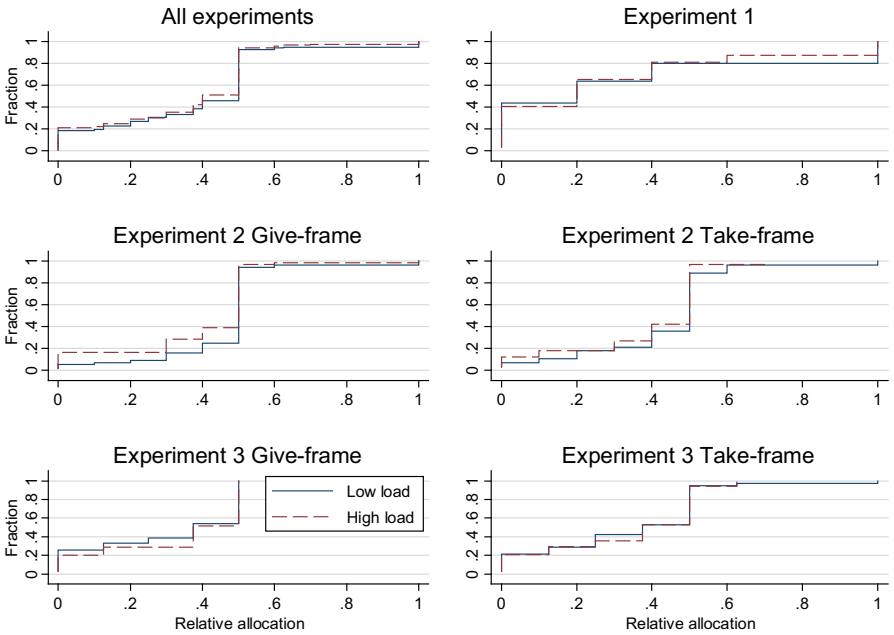

Fig. 1 Cumulative distribution of allocations in share of endowment, by experiment and treatment

Table 1 Average share of endowment allocated by the dictators under low and high cognitive load, respectively, for the different experiments

	Low cognitive load	High cognitive load	*t* test	WMW test
Experiment 1				
	0.30 (n = 25)	0.28 (n = 32)	0.761	0.9933
Experiment 2				
Give treatment	0.46 (n = 28)	0.42 (n = 33)	0.2838	0.4188
Take treatment	0.43 (n = 28)	0.39 (n = 33)	0.3734	0.3887
Both treatments	0.45 (n = 28)	0.41 (n = 33)	0.1730	0.2342
Experiment 3				
Give treatment	0.29 (n = 20)	0.32 (n = 19)	0.6744	0.8144
Take treatment	0.29 (n = 17)	0.28 (n = 18)	0.9114	0.7265
Both treatments	0.29 (n = 37)	0.30 (n = 37)	0.8433	0.9142

but the difference is not statistically significant according to either a *t* test or a Wilcoxon-Mann–Whitney (WMW) test. The median donation is 20 % under both high and low cognitive load. All subjects in the low cognitive load task remembered the 7-digit sequence correctly, while all but one in the high cognitive load task did. Hence, it may be questioned whether memorizing the 7-digit number indeed induced cognitive load.

In Experiment 2 we similarly find small effects of cognitive load. In this experiment, subjects under high cognitive load are slightly more selfish than those under low cognitive load, but again the differences between treatments are not statistically significant.

In Experiment 3, there are again very small differences between high and low cognitive load across all treatments, neither of which are statistically significant. All subjects remembered the easy sequence (low cognitive load), whereas 42 and 67 % remembered the difficult sequence (high cognitive load) correctly among dictators and recipients, respectively, thus indicating the intended effect of cognitive load.

In the comparisons above, data from each experiment is compared separately. The lack of significant differences across treatments could be due to the small number of observations in each of the experiments (n = 17–37). In Table 2, data from the different experiments have been pooled, and analyzed, together. The first column of Table 2 shows the results from all three experiments. The results confirm the pattern from Table 1. Cognitive load has a small negative effect on the relative amount that the dictators allocate to others, but the effect is not significant.

As experiments 2 and 3 are more similar in terms of experimental design (dictator game with an anonymous recipient versus dictator game with a charity recipient in experiment 1) and post-experiment questionnaire, the four last columns of Table 2 use data from these two experiments only. Column 2 shows the results from the same regression as in column 1, but now using data from experiment 2 and 3 only. In column 3, relative dictator allocations are regressed on a dummy variable for the framing (taking the value 1 in the give frame), and on an interaction variable between load and frame, in addition to controls for age and gender.

Figure 1 illustrates the cumulative distribution of allocations by experiment and treatment. As can be seen, dictator allocations follow the typical pattern observed in dictator games in the literature, where a large share of the subjects give either nothing or split the endowment equally. From a dual process perspective, typical allocation behavior such as sharing equally or taking everything could be seen as heuristic strategies that require no, or very little, conscious effort. However, it is also possible that sharing equally or taking everything is based on deliberation and thus can be affected by cognitive load. To check this, we constructed two dummy variables intended to represent these two typical allocations. The variable *equal* is one if the person allocated 50 % to the receiver, otherwise zero. Similarly, *egoist* is equal to one if the dictator allocated zero to the other.[8] The results based on data from Experiments 2 and 3 are provided in Table 2, columns (4) and (5). There is no significant effect of cognitive load, neither on *equal* nor on *egoist* choices. Thus, our results do not support the claim in Rand et al. (2012) that giving is spontaneous and greed is calculated.

One possible reason for finding no effect of cognitive load on dictator allocations is that the cognitive load manipulation did not work. Firstly, the memory task might have been too simple to cause the intended cognitive load, and secondly subjects might disobey the treatment by not putting effort into the cognitive load task, as argued by

[8] 45 % of the subjects gave exactly 50 % of the endowment while 20 % of the subjects gave nothing. We have also tried to define *equal* as giving between 40 and 60 % of the endowment and *egoist* as giving less than 10 %, arriving at similar results.

Table 2 Regressions on relative allocations, equal and egoist choices

	(1) Relative allocation	(2) Relative allocation	(3) Relative allocation	(4) Equal	(5) Egoist
Load	−0.0220 (−0.65)	−0.0171 (−0.52)	−0.0297 (−0.69)	−0.0547 (−0.54)	0.0437 (0.56)
Give frame			0.0207 (0.59)	0.0465 (0.54)	−0.0832 (−1.18)
Load × frame			0.0167 (0.36)	0.0258 (0.23)	−0.0167 (−0.18)
Experiment 2			0.151*** (4.52)	0.262*** (3.19)	−0.263*** (−4.09)
Age			0.00210 (1.18)	0.00756* (1.78)	−0.00293 (−0.78)
Female			0.0301 (0.81)	0.0953 (1.02)	−0.0978 (−1.54)
Constant	0.367*** (14.23)	0.384*** (15.29)	0.210*** (2.76)	0.0904 (0.52)	0.476*** (3.18)
Experiment 1	Yes	No	No	No	No
Experiment 2	Yes	Yes	Yes	Yes	Yes
Experiment 3	Yes	Yes	Yes	Yes	Yes
N	253	196	194[a]	194	194
R2	0.00202	0.00185	0.121	0.0602	0.133

[a] One subject in Experiment 2 did not report gender. As each subject made two dictator allocations each, the regressions including the variable Female (column 3–5) have two missing observations, giving N = 194 in column 3–5, compared to N = 196 in the regressions without this variable (column 1–2)

t statistics in parentheses

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

Tinghög et al. (2013). Consider first the possibility that the memory tasks might have been too easy to cause the intended cognitive load. If all subjects reported the memory tasks correctly, this could indicate that the memory tasks indeed were too simple. In experiment 1, 56 out of the 57 subjects (98 %) reported the task correctly indicating that the memory task indeed was too simple. In experiment 2 and 3, therefore, the difficulty level of the memory task was increased from memorizing 7 digits to memorizing a combination of 7 letters and digits. In experiment 2, 107 of the 122 subjects (88 %) reported the memory task correctly, while in experiment 3, 57 of the 74 subjects (77 %) reported correct answers. This can indicate that the level of difficulty in the memory tasks was more difficult in these two experiments and that the level of difficulty was more appropriate for causing cognitive load.

Observing that some subjects did not report the memory task correctly is, however, not sufficient for being sure that the cognitive load manipulation indeed did give the intended cognitive load. As argued by Tinghög et al. (2013), it is possible that subjects did not put effort into the cognitive load task and therefore disobeyed the treatment. As presented in the previous paragraph, a majority in all three experiments put enough effort into the memory task to succeed in recalling it correctly. Among the subjects with incomplete recall in Experiment 3,[9] 55 %

[9] The number of correct digits was only recorded in Experiment 3, not in Experiment 1 and 2.

reported more than 4 correct digits in the right sequence, while only two of the subjects failed to report any of the seven digits correctly. Our interpretation of the data on recall is therefore that almost all subjects seem to have put considerable effort into the memory task, indicating the disobeying the treatment is not a problem in our data.

The survey completed after the experiment can shed further light on whether the cognitive load manipulation worked. The survey consisted of selected items from Panas-X as well as questions related to the choices made in the experiment.[10] Interestingly, as may be seen in Table 3, subjects under high cognitive load report that their choices are less driven by thoughts and more impulsive than subjects under low cognitive load. It does therefore seem like the memory tasks have created cognitive load. However, as discussed above, we find no significant effect of cognitive load on real allocations.

4 Conclusion

In this paper we have presented the results of three experimental distribution games under cognitive load. We used memorization tasks to induce cognitive load on our subjects. In all three experiments, cognitive load had no effect on generosity. The responses to the post-experiment questionnaires indicated that harder memorization tasks did in fact induce higher cognitive load, as the subjects under high cognitive load stated that their decisions were more impulsive, while also being less driven by thoughts. In spite of this, we found no robust effect of cognitive load on generosity in the distribution games, neither in any of the single experiments or when pooling the data. One way of interpreting these results, is that self-interest and concern for others seem to be equally close to our heart, and neither of them is more prominently in the mind.

The results from our dictator games are otherwise in line with typical results in the literature, e.g., we found the typical two-humped shape of allocations where a majority of subjects in the dictator games were either greedy (allocating nothing of the endowment) or fair (allocating half the endowment). Rand et al. argue that, "we propose that cooperation is intuitive because cooperative heuristics are developed in daily life where cooperation is typically advantageous." If greed indeed is calculated, and cognitive load reduces the impact of cognitive processes (such as calculations) on decisions, one would expect a lower frequency of greedy dictator allocations under cognitive load. In our experiments, cognitive load did not affect the existence of greedy or fair allocations. So in contrast to Rand et al. (2012), we have not found support for the claim that greed is calculated, nor have we found the opposite.

As discussed above, other authors have found significant effects of cognitive load on pro-social behavior in lab experiments, although these effects are not consistently in the same direction. One possible explanation for the differences in results may be the nature of the decision tasks studied. While others have used

[10] We found a negative correlation between negative emotions and dictator allocations. The results of these regressions can be obtained from the authors on request.

Table 3 Regressions on whether decisions were…

	Driven by thoughts	Driven by feelings	Emotional	Rational	Considerate	Impulsive
Load	−0.343**	0.429*	−0.175	−0.400*	−0.223	0.525**
	(−2.09)	(1.68)	(−0.70)	(−1.82)	(−1.28)	(2.15)
Give frame	−0.0537	0.105	0.237	−0.0901	−0.220*	0.244
	(−0.40)	(0.69)	(1.31)	(−0.66)	(−1.74)	(1.56)
Load × frame	−0.0215	0.0186	−0.139	0.0789	0.00165	−0.118
	(−0.12)	(0.09)	(−0.58)	(0.41)	(0.01)	(−0.53)
Age	−0.0142*	−0.00388	−0.00604	−0.0136	−0.00874	−0.00916
	(−1.70)	(−0.33)	(−0.48)	(−1.40)	(−0.99)	(−1.06)
Female	−0.269*	0.586**	0.133	−0.479**	−0.0473	−0.0643
	(−1.97)	(2.34)	(0.55)	(−2.47)	(−0.30)	(−0.27)
Constant	4.998***	2.730***	2.416***	4.585***	4.546***	1.976***
	(22.84)	(6.68)	(5.40)	(14.70)	(17.28)	(5.75)
N	194	194	194	194	194	194
R2	0.0814	0.0870	0.0205	0.0772	0.0330	0.0455

t statistics in parentheses

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

prisoners' dilemma and public good game experiments, we used simple distribution games. Cooperation in prisoners' dilemma and one-shot public good games involves elements of strategic choice, whereas positive allocations are not confounded by strategic elements, hence potentially providing a closer representation of "pure" generosity.

A second explanation for the null result could be that there is heterogeneity as to whether equality or egoism is intuitive. For some people equality might be intuitive and egoism deliberative, while for others it may be the other way around. On the aggregate, egoism and equality therefore might appear equally intuitive.

A third explanation behind the different conclusions concerning whether pro-social behavior is the result of intuitive or calculated processes may lie in how the choices themselves and the conditions under which they are made are interpreted. Whereas some authors, as us, use cognitive tasks to induce cognitive load, others use the speed at which decisions are made to infer whether the decisions are driven by intuition or deliberation. Indeed, most of the experiments on which Rand et al. (2012) based their conclusion use decision time. However, Piovesan and Wengström (2009) also considered decision times and arrived at the opposite conclusion of Rand et al. (2012).

A fourth explanation behind different conclusions may be that the cognitive load technique itself may not be strong enough to generate consistent results. We have found that subjects under high cognitive load were significantly less likely to report that their decisions were driven by thoughts; still we have found no effect of cognitive load on generosity. This may suggest that feelings and cognition play an

equal or un-distinguished role in driving generosity. On the other hand, previous studies on cognitive load have found significant effects of cognitive load; however, these effects were in opposite directions. Together these results suggest the cognitive load technique does not give consistent results across studies. We encourage future research based on different experimental set-ups to shed further light on these issues.

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