Master Thesis

Programme Behavioural Economics

Cognitive load and social planning decision-making

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Abstract

Recently, evidence has shown that feeling to have less than one needs impairs an individual's cognitive resources and in turn, influences how we decide on others. Motivated by the breadth of the concept of scarcity, this experimental study assesses the effect of cognitive depletion on inequality preferences of social planners and how losses and gains affect our decisions on others. In their role as social planners, participants were asked to redistribute a previously incurred gain or loss between two parties. How subjects redistribute the gains or losses gives valuable insights into their inequality preferences. In two treatments, a cognitive depletion task preceded the allocation decision. The study finds no evidence for an effect of cognitive depletion on the inequality preferences of social planners. Moreover, it seems that social planners show an increased tendency toward inequality when they decide on losses, as compared to when they decide on gains. However, this effect is sensitive to cases of extreme reallocation.

Keywords: Scarcity, cognitive depletion, bandwidth, social planning, social preferences, valence

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1. Introduction

Presumably, everybody has faced a situation in which the deadline of a project or a report was approaching far too early and thoughts like "Oh dear if I could just postpone the deadline to gain more time." or "Why did I not start earlier?" run through the mind. Striving to meet the deadline and simultaneously delivering a decent performance, we fully concentrate on the urgent task and try to squeeze other activities to a minimum to gain more time and increase efficiency. Such behaviour is called tunnelling. The term tunnelling is coined by Mullainathan and Shafir (2013) and describes the (over-) focusing on the domain of life where we experience scarcity. Tunnelling has its downsides. If we tunnel, we neglect or do not adequately consider other aspects in life: "Scarcity in one walk of life means that we have less attention, less mind, in the rest of life" (Mullainathan & Shafir, 2013, p. 41). We engage in tunnelling behaviour whenever we *feel* that we do not have enough of something – when we take on a scarcity mindset. Thereby, the scarcity mindset does not restrict itself to lack of time but is a phenomenon that encompasses any domain where we feel our needs are unfulfilled: Money, food, social relations et cetera.

Scarcity is seemingly omnipresent in our lives and particularly at work. In Switzerland, more than 25% of all employees suffer from stress at work (Galliker, Igic, Elfering, Semmer, Brunner & Wieser, 2018). One can observe similar trends in other parts of the world. In 2004, 53% of US workers stated that they are overwhelmed by their work (Schwartz, 2004). A recent publication of the International Labour Organization corroborates these findings by claiming that there is an upward trend of stress at the workplace since 1990 (International Labour Organization, 2016). Even though the concepts of stress and scarcity are only associated, the above-stated developments suggest that forms of scarcity and the entailed behaviour increasingly dominate work life. This is problematic because individuals then designate less attention to other decisions outside the domain of scarcity. Various research on individual behaviour and decision-making has shown that we act and choose differently if we have less mind, also how we decide on others (Achtziger, Alós-Ferrer & Wagner, 2015, Baumeister, Vohs & Tice, 2007). This may have far-reaching consequences. For example, a study by Danziger, Levav, and Avnaim-Pesso (2011) has shown that judges' decisions on prisoners strongly depend on their spare mental resources. What if people in other central functions are affected by a lack of mental resources too? Think about managers that decide who of their employees receives a promotion between other pressing tasks. Or how may a minister's decisions be affected by the abundance of other urgent affairs she has to deal with?

The present study investigates how having "less mind", a significant consequence of scarcity, affects decision-making when people decide on others. The associated research question is:

What is the effect of cognitive depletion on the decision-making of social planners when they are confronted with inequality, compared to when social planners have more cognitive resources and what role does valence play?

By answering the afore-mentioned research question, the present research contributes to the relatively sparse literature on the decision-making of social planners. To the best of my knowledge, no prior study has investigated the effect of cognitive depletion in a social planning setting. Furthermore, the effect of outcome valence on social preferences has received only little attention yet. It is therefore in the interest of the present research to shed light on these rather unexplored aspects and to fill the present void in the scientific literature on social preferences and cognitive depletion. Aside from this, the investigation also seems to be of practical relevance. The breadth of the concept of scarcity implies that most of the people operate in a scarcity mindset from time to time. If scarcity leads to reduced mental capacity, and in turn influences how individuals decide on others, it may be desirable to develop tools that prevent us from the scarcity mindset and help us to make better decisions.

The study at hand is structured as follows. First, it discusses related scientific literature on scarcity, cognitive depletion, and the decision-making of social planners. Moreover, the first section comprises the hypothesis derivation for this research. Secondly, it elaborates on the procedure and the experimental design. The following section presents the results of the study before they are set into context in the penultimate section. The report closes with a brief conclusion and recommendations for future research.

2. Literature review

This section provides an overview of the literature about the psychology of scarcity, cognitive depletion, and decision making as social planners. First, the chapter explains each of the concepts and how they link to each other. The final subsection condenses the insights from theory and presents the hypotheses for this research.

2.1. Taxed bandwidth

2.1.1. The psychology of scarcity and its effect on cognitive resources

The psychology of scarcity describes a mindset that emerges when people feel they act under limited resources. Take monthly rent payments as an example. For individuals that live in abundance of money, a monthly rent is nothing more than a basic, mundane expense, hardly capturing the minds. However, for an individual with scarce financial resources, paying the monthly rent becomes something very different. As opposed to more wealthy individuals, more impoverished people may have a hard time to meet their expenses, making this monthly rent a problem that requires greater attention – usually at the cost of other essential affairs. More generally, Shah, Shafir, and Mullainathan (2012) state: "Having less elicits greater focus." (p. 682). This holds not only for monetary scarcity. According to Mullainathan and Shafir (2013), the concept of scarcity is observable in other forms such as scarcity of time or scarcity of food. Correspondingly, research has shown that people shift their attention toward the domain where scarcity is most prominent. (Aarts, Dijksterhuis & De Vries, 2001, Karau & Kelly, 1992, Radel & Clément-Guillotin, 2012).

Increased focus comes at a price. Shah et al. (2012) suggest that there exists a strong link between the perception of scarcity and cognitive load. A study by Mani, Mullainathan, Shafir, and Zhao (2013) underpins this conjecture. The authors confronted mall shoppers with different financial scenarios. For instance, they asked participants how they would deal with a high car repair bill. Other participants were asked how they would deal with a reasonable car repair bill. After the participants answered the scenario-related questions, their cognitive ability was measured. Interestingly, for the high-bill scenario, lower-income participants displayed a significantly lower cognitive score than higher-income participants. In the reasonable-bill situation, however, no differences in the cognitive scores were observed. As an explanation for these findings, the authors state that lower-income participants focus much more on the high bills than participants with higher income. This rise in attention consumes mental resources and negatively affects their cognitive ability scores.

The study of Mani et al. (2013) impressively demonstrates how scarcity affects an individual's cognitive capacity. The findings of Mani et al. (2013) are in line with prior results by Spears (2011), who suggests that economic decision-making affects poor people's behavioural control. Mullainathan and Shafir (2013) describe the negative effect of scarcity on an individual's mental functioning with the term bandwidth tax. They state: "It (the bandwidth tax) leaves us handicapped in other aspects of our lives. It makes us dumber. It makes us more impulsive" (p. 66).

Even though previous research indicates that scarcity affects cognitive resources, it remains unclear what the exact mechanism behind the relation is. Mani et al. (2013), the authors of the mall-experiment, suggest that cognitive load arises from attentional capture that emerges under scarcity. However, Spears (2011) investigates potential mental mechanisms in more detail. He concludes that scarcity may affect cognitive load through limited attention, limited cognition, and limited willpower simultaneously. Given these diffuse linkages between scarcity and cognitive load, for the sake of clarity, this research concentrates on the most prominent of these concepts, the concept of limited willpower.

2.1.2. Limited bandwidth and decision-making

The effect of reduced willpower on decision-making has received a lot of interest in the literature. Within the literature, willpower is often referred to as self-control. Reduced willpower induces a state which is called ego-depletion. (Achtziger et al., 2015). In the present research, the terms willpower and self-control, as well as the terms ego-depletion and cognitive depletion, are used interchangeably.

The so-called 'resource model' or 'strength model' is the most prominent model in the literature on self-control (Inzlicht & Schmeichel, 2012) and has been promoted by Baumeister and colleagues (Baumeister et al., 2007). According to this model, the basic principle behind self-control is comparable to physical fatigue. You have more physical resources at the beginning of a gym session than in the end, because the effort you exert draws on your physical resources. Similarly, your cognitive resources can become exhausted by tasks that require a lot of thinking, such as difficult math questions (Baumeister et al., 2007).

If we lack self-control, we make different decisions compared to the state of full mental capacity. For instance, authors found that ego-depleted individuals tend to shop more impulsively (Vohs & Farber, 2007) or are more likely to give up in tasks requiring persistence (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Cognitive depletion also seems to affect

how we make decisions about others. Accordingly, people with more self-control report better interpersonal relationships (Baumeister 2002), describe themselves as less egoistic (Vohs, Baumeister & Ciarocco, 2005), and show increased helping behaviour (De Wall, Baumeister, Gailliot & Maner, 2008) compared to ego-depleted individuals. Recent research tested how ego-depletion affects behaviour in popular bargaining games such as the dictator game and the ultimatum game. In doing so, researchers wanted to find out whether cognitive depletion leads to more selfish or more prosocial behaviour. Results of these studies display mixed evidence. Some authors argue that when individuals operate under limited cognitive resources, they act more prosocially (Schulz, Fischbarcher, Thöni & Utikal, 2014, Halali, Bereby-Meyer & Meiran, 2014) whereas others state that cognitive depletion leads to more selfish behaviour (Achtziger et al., 2015, Piovesan & Wegström, 2009).

But why do our choices depend on our cognitive resources? An explanation provides an approach called dual-process theory. According to the dual-process theory, humans broadly exhibit two kinds of decision processes: One of the two processes is automatic, impulsive, fast, unconscious, and effortless. The other is controlled, slow, deliberate, and effortful (Achtziger et al., 2015). Now, when individuals operate under limited cognitive capacity, they more often engage in the former process and make decisions less deliberately. This because they lack the cognitive resources needed to perform effortful and deliberative thinking. Think again in terms of the gym example before. Would you go for a one hour run after two intense hours in the gym? A similar mechanism underlies our cognitive energy: “If people are depleted of energy, it should be more difficult for them to reflect on their behaviour (and) to re-examine the decision process.” (Xu, Bègue & Bushman, 2012, p. 1183).

2.1.3. Status quo bias and decision-making

A way to avoid effort in decision-making is to go with the status quo. People’s tendency to stick with the status quo when confronted with a choice is called the status quo bias and has been proven to apply to various decision contexts (Samuelson & Zeckhauser, 1988). The fact that people stick to the status quo can have far-reaching consequences. In their paper “Extraneous factors in judicial decisions”, Danziger et al. (2011) investigated how judges decide on a sequence of parole requests – legal cases that require careful deliberation, objective evaluation and judgement as it is law that is applied. They showed that as judges advance through the sequence of cases, they become more prone to accepting the status quo outcome and hence, deny prisoner requests. The explanation for these findings is that with every case that the judges evaluate, their cognitive resources deplete, and they become more likely to stick with the status

quo "denial". Interestingly, decisions of cognitively depleted individuals in the bargaining games mentioned before also seem to hinge on the status quo bias. In a recent study, Gärtner (2018) tried to elicit what drives the conflicting conclusions discussed earlier and finds that a presented status quo allocation has an effect on whether people intuitively choose prosocial behaviour or selfish behaviour: "Prosocial choices are found to be faster than selfish choices under a prosocial status quo, while selfish choices are faster than prosocial choices under a selfish status quo." (p. 133). In line with this are the findings of Banker, Ainsworth, Ariely, Baumeister, and Vohs (2017) which state that limited willpower is positively related to an individual's tendency to stick with the status quo in dictator games.

2.2. Social planning

A social planner is a third-party decision maker that makes choices about others that do not affect his own payoff (Dickinson & Tiefenthaler, 2002, Traub, Seidl & Schmidt, 2002). There is an abundance of situations in which individuals take the role of social planners. Social planning contexts may come in the form of parents deciding how much food to give to their children (Farmer & Tiefenthaler, 1995), judges deciding on prisoner requests (Danziger et al., 2011), or individuals deciding on the rollout of a vaccine that could be lethal to some patients but cure the majority (Ritov & Baron, 1990). Within this paper, the individuals that decide on others are coined with the term social planner. The subjects about which the social planner decides are called recipients, beneficiaries, or parties.

2.2.1. A window on fairness preferences

Whereas bargaining games such as the dictator game, the ultimatum game or the trust game have received considerable scientific attention in the past decades, literature remains unexpectedly silent on individual's behaviour as social planners (Dickinson & Tiefenthaler, 2002). Studying social planners' decision-making provides a valuable window of opportunity to study fairness perceptions and equality preferences because contrary to bargaining games that involve a decision-maker's own stake, social planning games eliminate confounding effects of self-interest motives (Dickinson & Tiefenthaler, 2002, Traub et al., 2002). Still, eliciting fairness preferences of social planners is a tricky affair. Decisions of social planners are impacted mainly by features that occur before (*ex-ante*) they decide as well as by elements that occur after (*ex-post*) their choices.

When one makes judgments on the fairness of a particular state, it is of importance to evaluate what led to the state. Consider a mother who has one candy to distribute among her son and her daughter. The mother is indifferent between giving the candy to the son or the daughter. Hence,

she decides to flip a coin to determine who receives the candy and, in turn, gives the candy to the daughter. The son complains about his sister getting candy while he does not. In reply to her son's complaints, the mother emphasises that the procedure that led to the outcome was fair (Machina, 1989). The example of the mother and her children illustrates two different concepts of fairness. The son bases his notions of fairness on the *outcome* of the mother's choice. The mother, on the other hand, bases her notion of fairness on the *process* that led to the outcome Within literature these two concepts of fairness are referred to as *outcome fairness* and *process fairness* (Trautmann, 2009).

Process fairness is a robust ex-ante determinant of social-planning decision making. A social planner who is confronted with inequality and has the choice to redistribute money between two recipients is influenced by the way inequality emerged. Whether the inequality emerged through pure luck or whether inequality is a result of the effort expended by the recipients affects distributional choices. Accordingly, studies have shown that among others, decisions of social planners are affected by risks beneficiaries take (Cappelen, Konow, Sørensen & Tungodden, 2013) and the effort of beneficiaries to reach an outcome (Dickinson & Tiefenthaler, 2002). More generally, the study of Cappelen, Fest, Sørensen, and Tungodden (2016) indicates that already minimal room for choice affects social planners' decision-making process. They investigated how social planners restore inequality in the case where the involved recipients could not influence the outcome as compared to when they have the choice between a lottery and an unreasonably small save alternative. Their results suggest that the slightest presence of choice on the side of the recipients decreases the social planner's willingness to restore inequality. This is because the already small room for choice makes recipients responsible for their actions.

Besides ex-ante features, social planners also consider the allocational consequences of their decisions. Accordingly, Cettolin, Riedl, and Tran (2018) demonstrated that uncertainty influences giving behaviour of social planners. Moreover, Dickinson and Tiefenthaler (2002) have presented evidence for the multifaceted nature of fairness preferences of social planners by adding a second layer in the form of a production function to a social planning setting. In their experiment, social planners were asked to divide tokens among two beneficiaries with different utility functions U(x), where x is the number of tokens assigned to the beneficiaries. Through the additional production function the authors could make inferences on a broader spectrum of fairness concepts such as input equality (giving each beneficiary the same amount of tokens), outcome equality (distributing the tokens in a way that the beneficiaries derive equal

utility), and maximum social welfare (distributing the tokens in a way that maximises total utility). The findings of the study indicate that social planners show an increased tendency toward outcome fairness but more importantly, that social planners consider the allocational consequences of their decisions.

2.2.2. Cognitive depletion and social planning

Despite these various influences on how social planners make choices, I am not aware of any study that has yet investigated the effect of cognitive depletion on the decision-making of social planners. Given the various studies on cognitive depletion in bargaining games, it is most likely that cognitive depletion affects the behaviour of social planners. The study of Danziger et al. (2011) on the judges mentioned earlier probably comes closest to a setting were social planners are exposed to mental depletion, and the results are suggestive that limited cognitive resources change the choices of social planners.

2.2.3. Losses and gains

Apart from cognitive depletion, there may be another subtle factor that influences the decision-making of social planners. In their seminal work, Kahneman and Tversky (1979) showed evidence for the principle of loss aversion. They show that losses are experienced more intensely than gains of similar magnitude and hence, drastically influence individuals' decision-making. Yet, despite the great impact loss aversion has on individual decision-making it has seldom been applied to bargaining games and social planning settings: "few studies have focused on how people respond to an unfair division of loss between individuals" (Zhou & Yu, 2010). Followingly, Zhou, and Wu (2010) have investigated how people respond to sharing losses in an ultimatum game compared to sharing gains. They found evidence that people in the face of adversity and having to share a loss with others exhibit an increased demand for fairness. These findings are in line with a study by Leliveld, Beest, Dijk, and Tenbrunsel (2009), who found that fairness becomes important in the face of losses and self-interest becomes less important. Leliveld et al. (2009) further found evidence that fairness is more cognitively accessible and more likely to be the norm in the negative valence bargaining game than in the positive valence scenario. In settings where self-interest is not involved, research showed that subjects show a stronger preference for equality in negative valence scenarios as compared to positive valence scenarios (Törnblom & Jonsson, 1985).

2.3. Hypotheses development

From the outlined theoretical framework, the following hypotheses are derived for the research at hand.

H1: Social planners demonstrate an increased tendency toward inequality when they operate under limited cognitive resources as compared to when social planners operate at full mental capacity.

Furthermore, it is presumed that the valence of allocations influences the decisions of social planners. As previous studies demonstrated, negative valence scenarios invoke an increased tendency toward equality. In the case of the social planner, this would manifest in more equal allocations. Therefore, I postulated:

H2: Social planners demonstrate an increased tendency toward equality when they are confronted with a negative valence scenario as compared to when they are confronted with a positive valence scenario.

Finally, from the underlying reasoning for the first and second hypothesis, I arrive at the third hypothesis for this research. As the effect of negative valence and the impact of cognitive depletion point in opposite directions, it is to assume that social planners under the influence of both aspects display a mixed tendency toward equality:

H3: Cognitively depleted social planners confronted with a negative valence scenario show a higher tendency toward equality as compared to cognitively depleted social planners in the positive valence scenario but a lower tendency toward equality as compared to non-depleted social planners confronted with a negative valence scenario.

3. Methodology

This section discusses the experimental design of the research at hand and states how treatment and outcome variables are defined. Furthermore, it elaborates on the procedure of how the research was conducted.

3.1. Experimental design

3.1.1. General setup

The experimental design is set up in two stages. The first stage consists of an ego-depletion task or a respective control task. In the second stage, participants take on the role of social planners and complete an allocation task where they can redistribute money among two beneficiaries. However, the allocation task varies in valence with one task requiring a decision on losses and the other one on gains. This two-stage design translates into a total of four treatments with each one representing a combination of the ego-depletion treatment and the valence treatment. .The combinations are “no depletion and gain”, “no depletion and loss”, “depletion and gain”, and “depletion and loss”. To avoid selection bias, participants are randomly assigned to the four treatments. Figure 1 provides a rough sketch of the experimental setup.

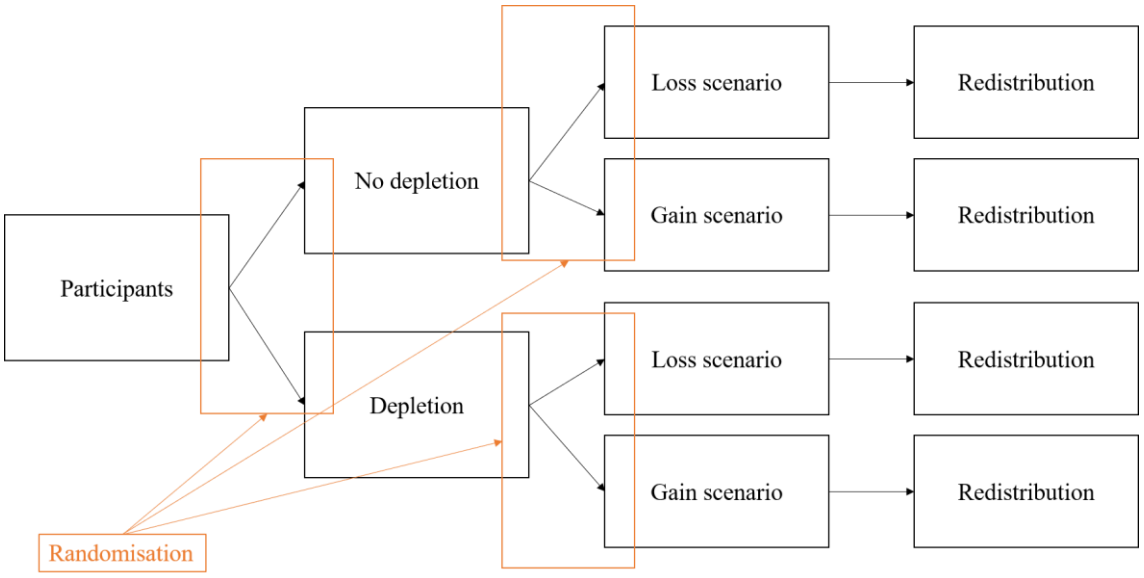

Figure 1: Sketch of the experimental setup

To assess the stated hypotheses, I chose a one-shot between-subject design. Despite the advantages of a within-subject design that manifest in the lower number of participants required and in a higher power of statistical tests (Charness, Gneezy, & Kuhn, 2011), a between-subject design seems more appropriate. One primary reason that speaks for a between-subject design is the recovery from cognitive depletion. According to the strength model, and in line with its

muscle analogy, individuals recover from cognitive depletion. Findings from Tyler and Burns (2008) suggest that already a three-minute relaxation period leads to higher replenishment than a one-minute break. It remains unknown whether the recovery of ego-depletion would manifest in this research if a within-subject design was chosen. However, if participants would recover, then this would systematically bias responses to tasks that do not follow directly after the depletion task. Secondly, within-subject designs are prone to learning confounds, which could lead to biased results. In view of these arguments, I decide to choose the more conservative variant of a between-subject design and follow the argument of Charness et al. (2011, p.2): "We ourselves tend to prefer between designs whenever these are practical, as we believe these represent more conservative tests and we would rather err on the side of caution."

3.1.2. Incentives and precepts

The provision of incentives is crucial to gain control in an experiment. However, given the limited monetary resources, the present investigation does not pay out every subject but makes use of a variant of the random lottery incentive. Accordingly, after conducting the survey, one randomly drawn participant receives a prize in the form of 50 Euros. The introduction of a monetary compensation further ensures that the experiment at least partially suffices Smith's (1982) five precepts for a microeconomic experiment. In the following, the five precepts are briefly discussed and evaluated for the experiment at hand.

The precept of non-satiation states that utility should be a monotone and increasing function of the reward medium. As I use money as a reward medium in this experiment, the precept of non-satiation is fulfilled. Furthermore, according to the precept of dominance, subjects should be compensated for the (mental) effort they expend to complete the task. Albeit judgements on the precept of dominance are always subjective, it seems reasonable that the chosen payoff structure rewards participants sufficiently. The present experiment does not fulfil the precept of saliency. Even though people are not deceived in the experiment, it does not hold that good decisions of subjects translate into higher payoffs, and bad choices translate into lower payoffs. In the present experiment, payoffs are independent of the decisions undertaken by the subject. This implies a violation of the saliency precept. As each participant is given information only on his or her own reward, the precept of privacy holds. Lastly, the theoretical framework is indicative that the general qualitative behaviour of individuals in the lab also applies in nonlaboratory settings. Hence, the precept of parallelism is fulfilled.

Given the violation of the saliency precept, it is to state that, according to Smith, the present experiment is not a true economic experiment.

3.2. The treatments

3.2.1. Ego-depletion

The primary treatment in the research at hand is a manipulation task that simulates ego-depletion. Ego-depletion tasks have rarely been applied in online settings. Hence, the present study had to abstain from the most prominent depletion tasks such as the Stroop task (Stroop, 1935), the white bear task (Wegner, Schneider, Carter & White, 1987) and the video-watching task of Schmeichel, Vohs, and Baumeister (2003). The manipulation task used within this study is a variant of Schmeichel's story writing task (Schmeichel, 2007) that has found wide adaption in the literature (Giacomantonio, Jordan, Fennis & Panno, 2014, Schmeichel & Vohs, 2009, Sevincer Schlier, & Oettingen, 2015) and has been applied in an online setting (Derrick, 2012). Within the writing task, ego-depletion is simulated by writing a story under restricted use of letters. Accordingly, participants were randomly assigned to write a story in one of two ways. Participants in the *free writing* condition were instructed to write a story about a recent trip they have taken. It may be a trip to a store, to a city or another country. Participants in the *regulated-writing* condition received the additional instruction: "Very important! Please do not use the letters a or n anywhere in your story (Schmeichel, 2007). In line with Vohs and Schmeichel (2009), participants had precisely five minutes to complete the task. Please consult Appendix A for the exact instructions.

3.2.2. Valence

As a second treatment serves the valence of outcomes. Two kinds of stories were written to induce a gain and loss context, respectively. Please see section 3.3. as well as Appendix A for more detailed information.

3.3. Variable of interest

3.3.1. Preferences of social planners

The present research follows a study by Cappelen et al. (2016) to assess the preferences of social planners. Cappelen and others investigate how social planners restore inequality. In their experiment, social planners can redistribute money between a subject 1 who earned 800 NOK and a subject 2 who earned 0 NOK. For instance, a social planner could leave 500 NOK to subject 1 and give 300 NOK to subject 2. The chosen allocation then is transformed into a continuous measure of inequality by applying the following formula:

$$Inequality = \frac{|\ Income\ subject\ 1 - Income\ subject\ 2\ |}{Total\ Income} \in [0,1]$$

The formula yields an inequality score within the range of 0 and 1. The value 0 represents the highest degree of equality and value 1 the highest degree of inequality. Consequently, the variable of interest in this research is continuous and represented by the inequality score.

For the research at hand, a slight change in the terminology is necessary to avoid any later confusions. As we confront participants with situations where luck is the determinant of inequality as well as with situations where adversity determines inequality, it is not always straightforward which party is the lucky one. Hence, we use a more general terminology and denote the party exposed to luck or adversity as the exposed party, and the other unaffected party as the unexposed party. The corresponding formula writes as follows:

$$Inequality = \frac{|\ Income\ exposed\ party - Income\ unexposed\ party\ |}{Total\ Income} \in [0,1]$$

3.3.2. Social planning context

As mentioned in the literature review, the decision-making context profoundly affects the choices of social planners (Cappelen et al., 2016, Cettolin et al., 2018). To properly test for the effect of ego-depletion on the decision-making of social planners, it is crucial that ex-ante and ex-post features are held constant across treatments. Therefore, the research at hand uses events of mere luck or adversity as the only source for inequality, leaving the beneficiaries with no influence on the outcome. Furthermore, the allocation chosen by the social planner is directly forwarded to the recipients and not affected by any other factors.

In contrast to the original paper by Cappelen et al. (2016), due to budgetary constraints, this research cannot implement the decisions of social planners in reality. This poses a threat to the dominance of this experiment, as participants may not think hard enough about the decisions they make (Smith, 1982). To address this issue, I created two scenarios. One story depicts a negative valence context, and one describes a positive valence context. The stories should help to make the social planning context more tangible for the participants and in turn, foster higher engagement. Figure 2 displays the social planning context for the case of the negative valence scenario. For the positive valence scenario consult Appendix A.

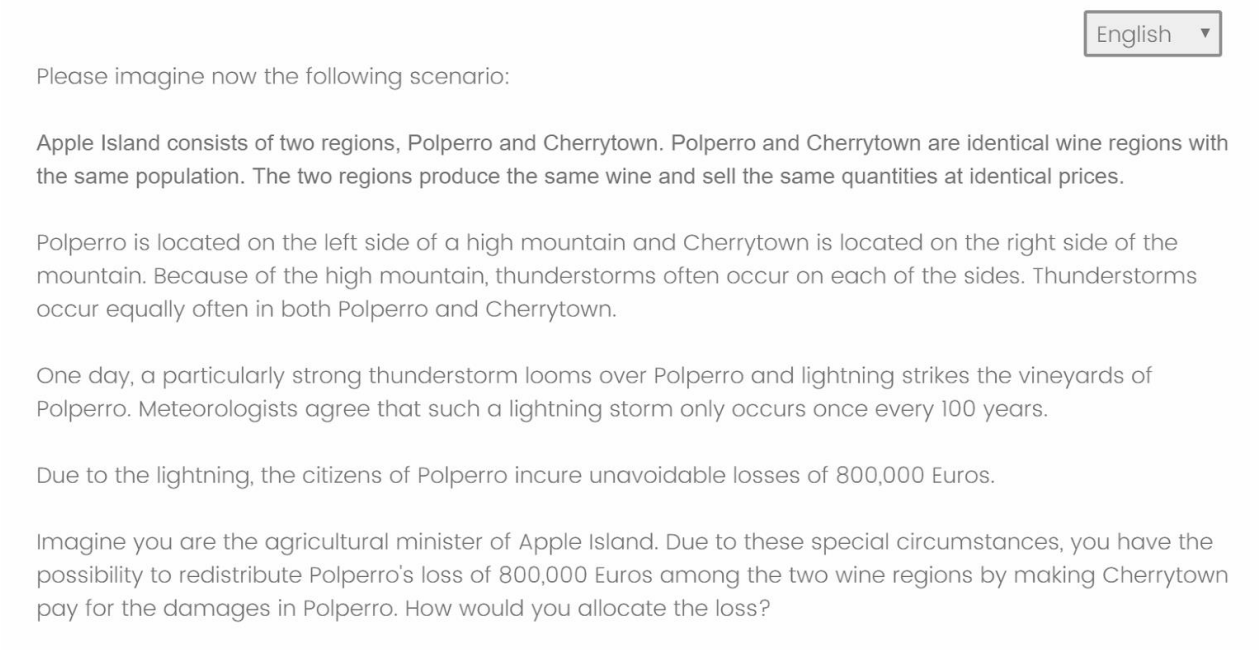

Figure 2: Excerpt survey: Negative valence scenario

The scenes provided to the participants invoke inequality as the present status quo, as one party incurs a loss (gain) before the social planner redistributes. Also, to further strengthen the perception of the status quo, the input fields were pre-set to the current circumstances. Figure 3 presents the input fields that correspond to the above-stated negative valence scenario. Please find the input fields for the positive valence scenario in Appendix A.

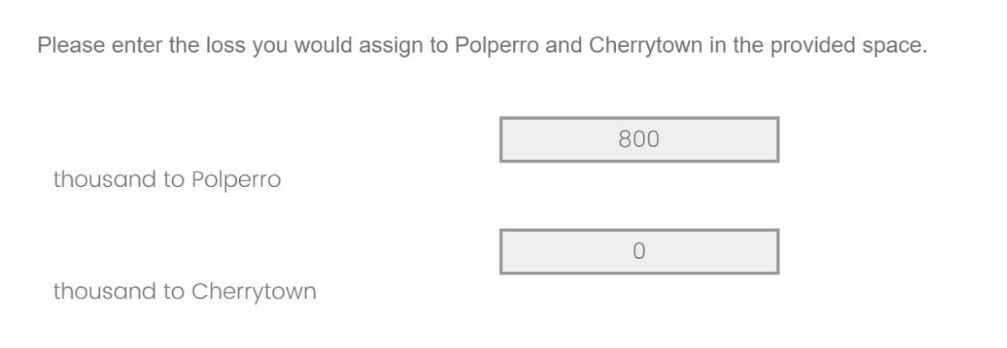

Figure 3: Excerpt survey: Input fields for the negative valence scenario

3.4. Manipulation check and control variables

To check whether the ego-depletion task fulfilled its aim, I perform a manipulation check. To do so, subjects report how much effort they expended in the free writing and the restricted writing task, respectively. To assess the perceived level of effort expended, a 7-point Likert scale is used ranging from 0 (None) to 7 (A lot). This sort of manipulation check is in line with manipulation checks used by Vohs and Schmeichel (2009) and Derrick (2012).

The set of control variables used in the present research consists of demographic controls such as gender, age, educational level, and whether the subject is a student or not. Furthermore, data on the last meal intake was elicited, as blood glucose levels affect cognitive depletion (Gailliot & Baumeister, 2007). Finally, it is possible that the writing task is perceived easier if done on a computer than on a smartphone. Consequently, an indicator variable that denotes the kind of device that was used to check for such potential effects.

3.5. Procedure

3.5.1. Pilot study and a priori power calculations

Before the actual survey, I conducted a pilot study. The pilot study consisted of 10 subjects. This is in line with the research of Isaac and Michael (1981) and Hill (1998), who denote pilot studies with 10-30 participants as suitable. With the help of the pilot study, potential sources of misunderstandings on the subjects' side could be detected and addressed. Furthermore, the preliminary survey allowed to estimate the possible sample size required for the present research. Knowing the ideal sample size is advantageous as it ensures to achieve the desired power and can help to reduce costs for both – researcher and participants.

	Control - No depletion	Treatment - Depletion
N	3	7
Mean inequality score	0.583	0.5
Standard deviation	0.382	0.5

Table 1: Descriptive statistics pilot study

Table 1 depicts the descriptive statistics for the pilot study. One observation was deleted for this power calculation since one subject completed the pilot study twice. Followingly, the control group that represented non-depleted individuals consisted of 3 subjects, and the treatment group contained 7 subjects. The power calculations are only approximations. First, they base on the assumption that a t-test is used for the later analysis. Secondly, the power analysis only discriminates between individuals in the depletion and the no-depletion treatment. Accordingly, the input data does not distinguish between valence because the sample size of the pilot study is too small for a further division along with the valence treatment. Given the data from the pilot study, the optimal total sample size would equal 898 participants.[1] Such a number of participants seems unlikely to attain within the scope of this research. Nonetheless, I acknowledge that the statistical power is positively related to the number of participants, and

[1] Power calculations were performed with the software GPower (Faul, Erdfelder, Lang & Buchner, 2007).

hence, the study aims to collect as many respondents as possible. Please find the exact calculations for the power analysis in Appendix B.

3.5.2. Data collection

Data was collected through the online survey tool Qualtrics. Participants were recruited through the experimenter's social network. Also, the link for the survey was posted on survey sharing websites. All subjects filled in the survey in the absence of the experimenter and received access to the survey via an anonymous link. For participants outside the Netherlands, the survey was distributed on the 23rd of April 2019. The data collection in the Netherlands started on the 29th of April because Dutch students were in the middle of an exam period. This circumstance may cause systematically higher levels of cognitive depletion and therefore, may bias the results. Data collection collectively ended on the 7th of May 2019. There were no particular restrictions on the data collection process. Upon clicking on the anonymous link, subjects were guided to an introducing text, that briefly elaborated on the payoff structure and the major tasks in the survey. The idea behind the experiment was neither mentioned to the subjects nor was a false purpose stated. On average, it took subjects approximately 9.8 minutes to fill in the survey. After the survey closed, one winner was randomly drawn and paid out the promised reward.

4. Results

4.1. Descriptive statistics

4.1.1. Demographics

The survey reached a total of 717 potential participants. However, 315 respondents could not be considered for the analysis because they did not finish the survey. The vast majority did not proceed further as to the introductory text. Potential reasons for their drop out may be the length of the survey or the writing task that may seem tedious. Another 5 participants were omitted from the analysis, as they were younger than 18. A total of 25 participants were excluded because of their performance in the depletion task.[2] Consequently, the total sample for this experiment consists of 372 observations. As shown in Figure 1, this translates into four subgroups that denote whether people were exposed to the depletion treatment or not and whether they decided on gains or losses. Henceforth, I refer to these subgroups as "No-depletion & gain", "No-depletion & loss", "Depletion & gain", and "Depletion & loss". The distribution of subjects across the four subgroups is as follows: "No-depletion & gain" consists of 93 subjects, "No-depletion & loss" contains 92 participants "Depletion & gain" comprises 88 respondents and "Depletion & loss" consists of 99 subjects. Table 2 depicts a detailed overview of the demographics within the individual groups and the whole sample.

	Total	No depletion & gain	No depletion & loss	Depletion & gain	Depletion & loss
N	372	93	92	88	99
Female	52.15%	54.84%	46.74%	57.95%	49.49%
Age (in years)	Min 18 Max 88 Ø 34.39	Min 18 Max 76 Ø 35.28	Min 18 Max 88 Ø 34.91	Min 20 Max 70 Ø 33.08	Min 18 Max 85 Ø 34.23
Student	40.59%	39.79%	31.52%	46.59%	44.44%

Table 2: Demographics of total sample and subsamples

Despite a quite balanced gender-ratio overall, the table indicates that there exist some differences in the distribution of gender across the subsamples. Moreover, it becomes apparent that the participants are predominantly non-students. This is not only apparent in the last row of the table that depicts the share of students within the respective samples but also finds expression in the age of the participants. With a maximum age of 88 and a minimum age of 18,

[2] Data were omitted in cases where participants obviously disobeyed the task.

the sample exhibits a broad age range. Nonetheless, the table shows that the average age of the subjects does not vary remarkably across the single subsamples. For further demographics, please see Appendix C.

4.1.2. Decision-making as social planners

Figure 4 provides an overview of how social planners decide on the two parties. All histograms display a frequency distribution of the choices made by the social planner. The first row of histograms provides insights into the total sample. The remaining rows illustrate social planning decisions for the individual subsamples. The histograms represent the allocational preferences of social planners by showing the amount of money they redistributed to the unexposed party.

Considering the histogram for the total sample, one can observe that many subjects choose an equal split of income between the two parties (48.12%). This tendency is in line with similar research by Cappelen et al. (2016), where a majority of 67% chose to equalize the income of the two parties. However, the share is remarkably lower in the present experiment. Furthermore, the histogram shows that besides the case where no redistribution takes place (13.44%), subjects choose to partially restore inequality by allocating 200.000€ (14.52%), or 300.000€ (13.71%) to the unexposed party. Lastly, it is to note that the cumulative frequency of cases where subjects allocate a higher gain or loss to the unexposed party than to the exposed party equals 4.03%. This represents 16 subjects.

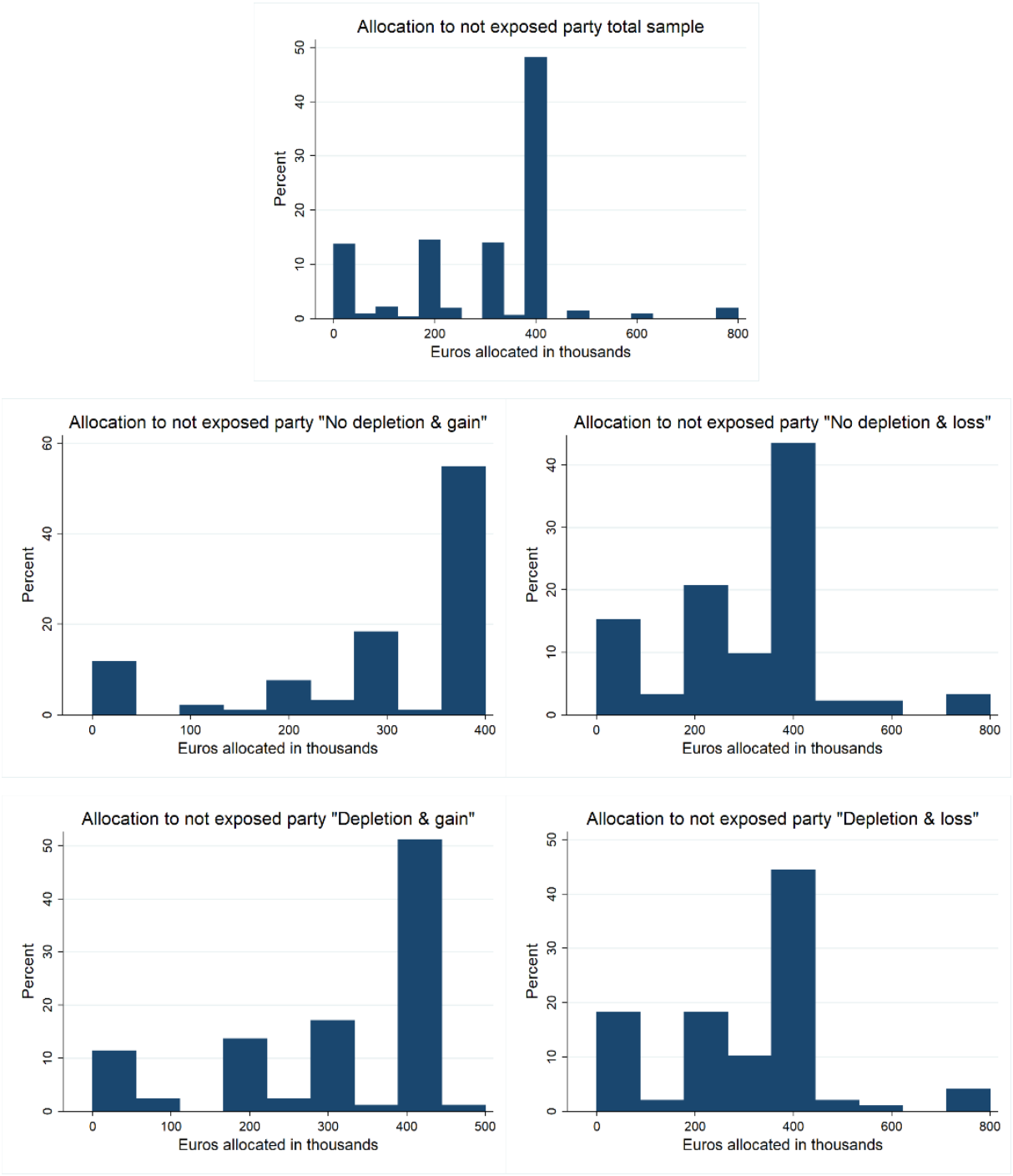

Figure 4: Overview of allocation decisions of social planners across all subsamples

A closer look at the graphs for the individual subsamples reveals that preferences to restore equality dominate the allocational decisions. However, one can observe that there exists a remarkable difference in the frequency of cases between gain and loss scenarios, irrespective of cognitive depletion. Whereas an equal split of income between the two parties can be observed in 53.76% of the cases in the "No depletion & gain" group and 51.14% of the cases in the "Depletion & gain" group, these numbers are remarkably lower for the groups that were confronted with the loss scenario ("No depletion & loss": 43.48%, "Depletion & loss": 44.44%). Instead of preferring an equal split of the losses, people in the "No depletion & loss" scenario show an increased tendency to allocate smaller fractions of the loss to the unexposed party. This finds expression in higher frequencies for the allocation of amounts of 200.000€ and 300.000€ while there is a relatively small change in the frequency where no money is redistributed, as compared to the subgroups where gains are involved. The same does not hold for the subgroup "Depletion & loss". There we can observe a remarkable increase in the frequency of cases where no money is redistributed (18.18%).

Table 3 displays how allocational preferences of social planners translate into inequality scores across the different samples. It states the average amount of money allocated to the unexposed party, the respective average inequality scores, and in parentheses, the corresponding standard deviations. In addition, the table exhibits the average inequality score for the case where extreme cases of reallocation are omitted. Extreme cases of reallocation denote occurrences where social planners redistributed more than half of the gain or loss to the unexposed party. In line with Cappelen et al. (2016) these cases are treated carefully, as the motivations for such behaviour remain unknown.

	Ø Allocation to unexposed party (in thousands of €)	Ø Inequality score	Ø Allocation w/o cases of extreme allocation
Total sample	299.9435 (161.13)	0.3022 (.3653)	0.2879 (.359)
No depletion & gain	304.3548 (134.79)	0.2391 (.337)	0.2391 (.337)
No depletion & loss	299.1304 (179.01)	0.35 (.3751)	0.3259 (.3688)
Depletion & gain	300.9091 (134.69)	0.2534 (.3324)	0.2534 (.3344)
Depletion & loss	295.697 (187.98)	0.3605 (.3978)	0.3342 (.3888)

Table 3: Allocation decisions of social planners and respective inequality scores

Overall, the graphs as well as table 3 hint at some unexpected findings. First, it seems as if cognitive depletion has little effect on the decision-making of social planners. Secondly, as

hypothesised, valence presumably influences the behaviour of social planners. However, the descriptive statistics suggest that social planners exhibit a decreased tendency toward equality when they are confronted with negative valence scenarios, as compared to when they are confronted with a positive valence scenario. This is the exact opposite of what was originally hypothesised.

4.2. Analysis

The sample used for this experiment consists of 372 independent observations at the individual level and 1 independent observation at the session level. Data created through experiments often violate the assumptions that are necessary for parametric tests. Thereby, a major concern is that the underlying distribution of the data is not known. Consequently, even though parametric tests generally are more powerful than non-parametric tests, the following section restricts the use of statistical tests to non-parametric tests.

4.2.1. The effect of cognitive depletion on the decision-making of social planners

First, a brief analysis of the variable that measures the effort subjects expended in the writing task is conducted to check whether the simulation of cognitive depletion through the two different writing tasks succeeded. The results of the Mann-Whitney-U test are indicative that the depletion manipulation worked as assumed *(No depletion: Mean = 2.849, Depletion: Mean = 5.465, N1 = 185, N2 = 187, $p < 0.01$).*

To assess the effect of cognitive depletion on inequality preferences, the subgroups that were exposed to gain scenarios are compared to each other, and the subgroups that faced the loss scenario are compared to each other. This allows isolating the effect of the cognitive depletion treatment on inequality preferences. In line with the first hypothesis, figure 5 illustrates that the average inequality scores for subjects in the depletion treatment are higher (0.2534 and 0.3605, respectively) than those for subjects in the control groups (0.2391 and 0.35).

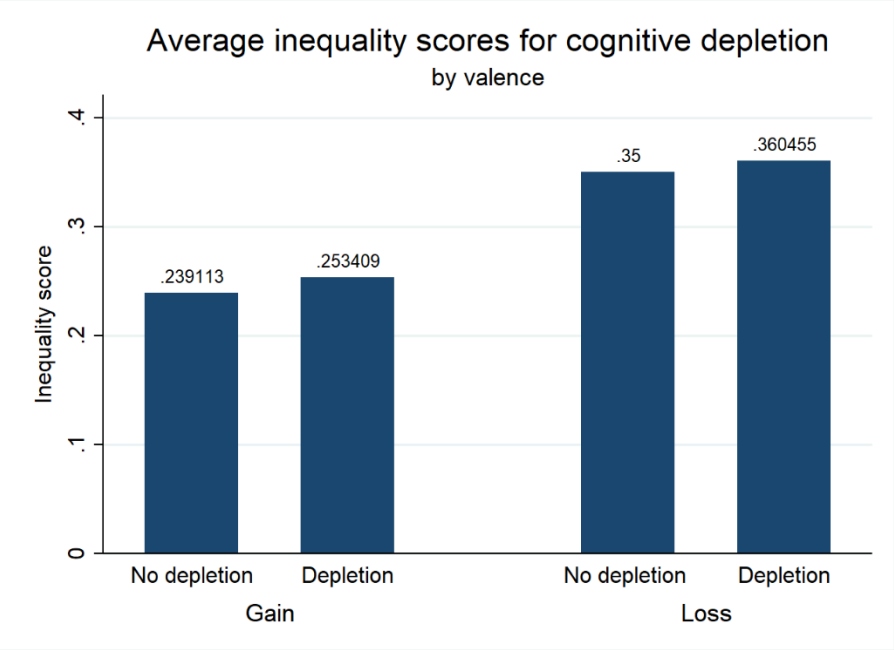

Figure 5: Average inequality scores for cognitive depletion, sorted by valence

Test H1: To statistically test the effect of cognitive depletion on inequality preferences of social planners, the Mann-Whitney-U test and the Fisher Exact test are used. The Mann-Whitney-U test is a commonly used test to examine whether two independent samples come from the same distribution. It is suitable for between-subject designs and provides information on whether the means of two samples are significantly different from each other or not. Because the Mann-Whitney-U test bases on ranked outcomes, it deals poorly with ties. This may be a major concern as the descriptive statistics revealed that many individuals redistribute exactly half of the gain or loss to the unexposed party. In these cases, it may be better to rely on tests that are insensitive to ties such as the Fisher Exact test.

As the Mann-Whitney-U test, the Fisher Exact test is a popular two-sample test. The 2x2 Fisher Exact test examines whether two samples are evenly distributed over two classes and hence, requires a transformation of the continuous variable that represents the inequality score into a binary variable. Accordingly, for the later application of the Fisher Exact test, the variable that denotes the inequality score is once separated in a class where no money is redistributed, and a class where the money is redistributed. Additionally, the inequality score is split into a class where money is equally distributed compared to unequally. Lastly, a 2x4 Fisher Exact test is used. For that, the inequality score variable is divided into four categories. The definition of categories corresponds to the focal points of redistribution observed in figure 4 and cover the following spectra of the inequality score (in brackets): Category 1 [0], category 2 (0,0.25], category 3 (0.25, 0.5], category 4 (0.5,1]. The advantage of the Fisher Exact test is not only that

it deals better with ties, but also that it helps to localize where differences in distributions exist. For instance, by grouping all cases where no money is redistributed vs. where the money is redistributed, one can find out whether depleted social planners more often refrain from redistributing than their non-depleted equivalents.

Result H1: The Mann-Whitney-U test shows that the average inequality score of individuals that were in the depletion treatment and were confronted with a positive valence scenario is not statistically different from the average inequality score of individuals that were not in the depletion treatment and were confronted with a positive valence scenario. The effect of cognitive depletion on inequality preferences is not significant at 10% significance level *(N1 = 93, N2 = 88, p = 0.69).* Similar results are found for the negative valence scenario *(N1 = 92, N2 = 99, p = 0.97).* The Mann-Whitney-U test further confirms the initial assumption that the data consists of a notable number of ties and raises the demand for a more insensitive test. As table 4 shows, by using the Fisher Exact test, one arrives at parallel conclusions, irrespective of how classes are constructed. All the results obtained by the tests are robust if cases of extreme allocations are omitted. Please consult Appendix C for further details.

	2x2 FE (equal split)	2x2 FE (no distribution)	2 x 4 FE (categories)
Positive valence	FE 0.419	FE 0.459	FE 0.796
Negative valence	FE 0.505	FE 0.219	FE 0.931

Table 4: Summary of Fisher Exact tests performed to assess the effect of cognitive depletion on inequality preferences, sorted by valence

In general, the above-stated results are indicative that social planners do not demonstrate an increased tendency toward inequality when they operate under limited cognitive resources as compared to when social planners operate at full mental capacity. Hence, the data lend no support for the first hypothesis of the present research.

4.2.2. The effect of valence on the decision-making of social planners

The examination of valence effects closely follows the previous analysis of cognitive depletion. To detect the effects of valence on the decision-making of social planners, we compare the subsamples that faced the same depletion treatment. Figure 6 describes the average inequality scores for the individual subsamples. As opposed to the case of cognitive depletion, I observe notable differences in average inequality scores across the valence treatments. The average inequality scores for the negative valence treatment exceed the scores for the positive valence treatment by more than 0.1 points, irrespective of the depletion treatment.

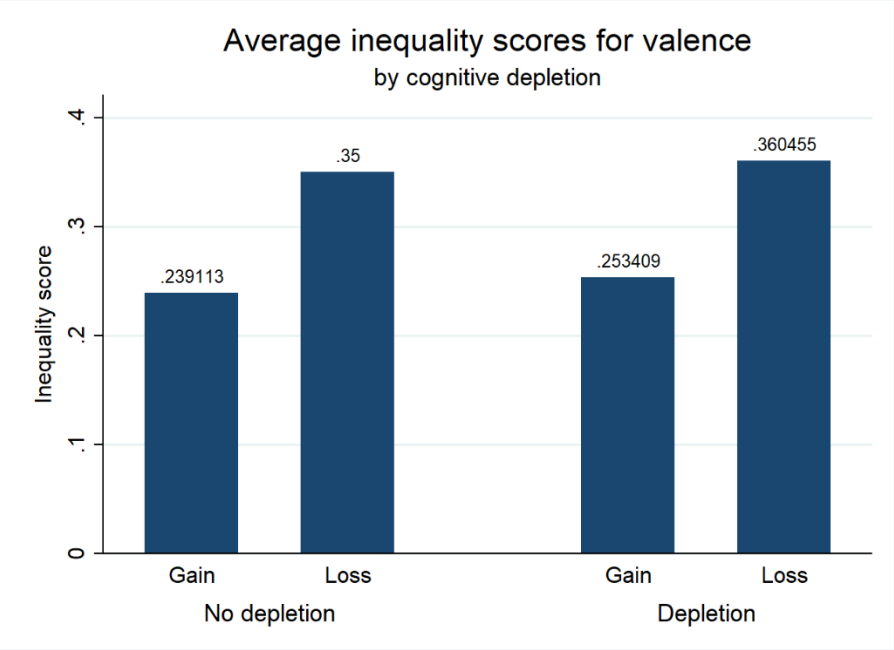

Figure 6: Average inequality scores for valence, sorted by cognitive depletion

Test H2: The effect of valence on the decision behaviour is examined with the same statistical tests that were used in the previous subsection. Correspondingly, first, a Mann-Whitney-U test is used to test differences in means between the groups. Because ties may pose a problem, the Mann-Whitney-U test is again followed by the three variations of the Fisher Exact test.

Results H2: Using the Mann-Whitney-U test, one finds that the average inequality scores for groups in the negative valence treatments are statistically different from the average inequality scores for groups in the positive valence treatments. For the groups in the no depletion treatment, the test is significant at a 5% significance level *(N1 = 93, N2 = 92, p = 0.042)*. For the groups in the depletion treatment, the test is significant at a 10% significance level *(N1 = 88, N2 = 99, p = 0.097)*. However, these findings are sensitive to cases of extreme reallocations. If observations of extreme reallocations are excluded, both tests become insignificant. *(No depletion: N1 =93, N2 = 85, p = 0.13, Depletion: N1 = 87, N2 = 92, p = 0.23).* These results emerge because in both groups where individuals decide on losses, an unneglectable share *(No depletion: 7.6%, Depletion: 7.07%)* of subjects choose to allocate more than 400.000€ to the not exposed party. This also translates into higher inequality scores and influences the results of the Mann-Whitney-U test.

Table 5 indicates that the 2x4 Fisher Exact test is significant for the group that was not depleted. Hence, the null hypothesis that the two samples are evenly distributed over the four classes is rejected at a 5% significance level. Excluding cases of extreme reallocation from the sample slightly affects this result, but the test remains significant at a 10% significance level *(FE*

0.061). Moreover, a 2x2 Fisher Exact test where observations are grouped in classes of no distribution vs. any distribution is significant for the case where individuals were in the depletion treatment *(FE 0.09).* This finding is robust if extreme allocations are omitted, and the test remains significant at a 10% significance level *(FE 0.064).* All other tests are insignificant. These findings are robust when observations that denote extreme reallocation are not considered.

	2x2 FE (equal split)	2x2 FE (no distribution)	2 x 4 FE (categories)
No depletion	FE 0.105	FE 0.489	FE 0.043
Depletion	FE 0.221	FE 0.090	FE 0.175

Table 5: Summary of Fisher Exact tests performed to assess the effect valence on inequality preferences, sorted by cognitive depletion

So far, it one can state that there presumably exists an effect of valence on inequality preferences of social planners. Social planners show a lower tendency to redistribute if they decide on losses as compared to gains and lack of mental resources. Moreover, social planners exhibit a lower tendency to restore equality if they are confronted with losses as compared to gains and are not cognitively depleted. However, at that point, it has not been tested whether the findings are robust to other factors that may affect inequality preferences. Therefore, the following subsection studies the data with the help of an OLS regression. Doing so permits to study the data more holistically by integrating variables that control for other influences on the inequality preferences of social planners.

4.2.3. Other influences on inequality preferences

Lastly, an OLS regression is conducted to study the previously discussed effects in the presence of the control variables mentioned in section 3.4. Table 6 reports the regression output. The regression results corroborate the findings from the previous analyses. There is no significant effect of cognitive depletion on allocation decisions of social planners. This conclusion is robust to the incorporation of control variables as well as to the case where decisions of extreme reallocations are neglected (column (3) and (4)). Moreover, the results indicate that valence has a significant effect on inequality preferences. On average, deciding on losses, ceteris paribus, increases the inequality score by 0.111 points, compared to deciding on gains. This effect is significant at a 5% significance level *($t = 2.11$, $p = 0.035$).* However, as in the previous analysis, these findings are sensitive to the omittance of cases of extreme reallocations. If cases of extreme allocations are excluded, the effect of valence becomes insignificant at a 10% significance level *(Column 3: $t = 1.63$, $p = 0.103$, column 4: $t = 1.46$, $p = 0.146$).*

Result H3: The third hypothesis of this research is stated as a logical consequence of hypotheses one and two. This study has not found an effect of cognitive depletion on the decision-making of social planners. Furthermore, its results are indicative that if valence influences inequality preferences, it does so positively. Accordingly, there is no evidence in support for the third hypothesis, as stated in section 2.

Table 6: Regression analysis: Depletion and valence on inequality preferences

	Inequality		Inequality w/o extreme reallocation	
	(1)	(2)	(3)	(4)
Depletion	0.014	0.013	0.014	0.012
	(0.05)	(0.05)	(0.05)	(0.054)
Loss	0.111**	0.102**	0.087	0.078
	(0.052)	(0.053)	(0.053)	(0.054)
Depletion * Loss	-0.004	0.007	-0.006	0.004
	(0.075)	(0.076)	(0.076)	(0.077)
Age		-0.003		-0.003
		(0.002)		(0.002)
Gender		-0.044		-0.047
		(0.041)		(0.041)
High school degree		-0.03		-0.017
		(0.069)		(0.071)
Bachelor's Degree		-0.032		-0.038
		(0.058)		(0.058)
Master's degree		-0.073		-0.065
		(0.068)		(0.069)
Doctorate		-0.147		-0.13
		(0.144)		(0.142)
Student		-0.026		-0.013
		(0.053)		(0.054)
Device		-0.018		-0.02
		(0.04)		(0.04)
Constant	0.239***	0.393***	0.239***	0.399***
	(0.035)	(0.105)	(0.035)	(0.107)
Observations	372	372	357	357
R2	0.023	0.036	0.014	0.03

Note: The table reports the outputs of linear regressions of the variable "Inequality Score" for all observations (columns (1) and (2)) as well as if cases of extreme reallocation are omitted (columns (3) and (4)). "Depletion": Indicator variable that takes on the value one if the social planner was in the depletion treatment. "Loss": Indicator variable that takes on the value one if the social planner was in the negative valence treatment. "Depletion*Loss": Interaction term of the two indicator variables "Depletion" and "Loss". "Age": Continuous variable that denotes the age in years of the social planner. "Gender": Indicator variable that takes on the value one if the social planner is female. Education: Categorial variable with 5 categories. The educational levels are compared to the baseline category "Less than a high-school degree". "Device": Indicator variable that takes on the value one if the social planner filled in the survey with a smartphone. Robust standard errors are reported in parentheses (* : $p < 0.1$, ** : $p < 0.05$, *** : $p < 0.01$).

4.3. Statistical power

A post hoc power analysis is used to evaluate the statistical power of the tests used. It provides insightful information on how likely it is to accept a false null hypothesis (Type-II error). The post hoc power analysis is performed for the effect of valence and again assumes that a t-test was used. The power analysis shows that the statistical power (1-β) is 0.557. As this value is considerably lower than the conventional level for statistical power (0.8), we can conclude that this study is underpowered. Please see Appendix B for more details.

5. Discussion

5.1. General discussion

The present research lacks evidence to show that cognitive depletion affects inequality preferences of social planners. Hence, it finds no evidence for the first hypothesis of this research. This finding is unexpected. Despite displaying mixed evidence on how cognitive depletion affects social preferences, numerous studies agree that a lack of mental resources influences the way we decide on others (Achtziger et al., 2015, Piovesan & Wegström, 2009, Gärtner, 2018). Furthermore, the manipulation check indicates that the cognitive depletion simulation was successful.

An explanation for the results may lie in the inconstant nature of the ego-depletion concept. By controlling for various potential influences on the effect of ego-depletion such as the nature of the depletion task, individual differences and other moderators, Lurquin et al. (2016) finds no evidence for an effect of ego-depletion on a subsequent outcome task. The authors suggest that the concept of ego-depletion is unreliable. Similarly, Cappelletti, Güth, and Ploner (2011) find no evidence for an effect of cognitive depletion on decisions in an ultimatum game.

The present study exhibits some difficulties to provide a definite conclusion about the effect of losses and gains on inequality preferences. The reason for this is that the motivation of social planners for allocating more than half of the gains or losses to the unexposed party remains unknown. If it was the case that these subjects intentionally selected to choose such allocations because it reflects their notion of equality, then one may say that valence has a significant effect on inequality preferences: When social planners decide on losses, they display significantly higher preferences for inequality as compared to when gains are involved. However, if the motivation to choose such extreme forms of redistribution based on other factors such as a potential misunderstanding of the task, then the effect of losses and gains should be interpreted very carefully. It can be argued that concerns of a possible misunderstanding can be eliminated since a pilot study has been conducted to make sure this is not the case. Furthermore, the random allocation of subjects to the different treatments should ensure that motivations for the allocation behaviour should be equally distributed across the subsamples. Still, as the true motivations remain unknown, this study concludes that social planners demonstrate an increased tendency towards inequality when they are confronted with losses as compared to when they are faced with gains. Yet, this finding is sensitive to cases of extreme reallocation.

Regardless of the significance, social planners seemingly gravitate more towards decisions that promote inequality when they decide on losses, as compared to when they decide on gains. These results compare to previous research of Baron (1995) who supports his findings with the do-no-harm principle. The do-no-harm principle denotes a distributional principle and implies that it is wrong to harm individuals to benefit others. It finds application in the domain of aid ethics and health economics. For example, Ritov and Baron (1990) asked people on their opinion about the introduction of a medical treatment. They asked the subjects to imagine that 10 out of 10'000 children die from the flu. Now, a medical treatment could be introduced that prevents from the death of the flu but by itself may be lethal for some children. Given this setting, the subjects were asked to state the maximum death rate for which they would tolerate the introduction of the medical treatment. The results of the study show that most of the participants only tolerate the medical treatment if its death rate is below 9 per 10'000. Some participants even do not tolerate any risk at all. This illustrates that many people are more reluctant to deaths from the intervention than deaths caused by inactivity. More generally, Baron (1995) states that "This (the do-no-harm) principle can be understood as an application of a rule against taking an action that leads to a worse outcome for someone than would have occurred with no action." (p. 72). Therefore, in application to this research, the do-no-harm principle may explain why people do redistribute less to the unexposed party. Allocating loss to the unexposed party is perceived as harming it. One could argue that the same principle may apply in the gain scenario, whereas a reallocation is equal to harming the exposed (winning) party. Why this is not the case can again be explained by the concept of loss aversion that states that monetary gains leave people less affected than financial losses (Kahnemann & Tversky, 1979).

Lastly, the third hypothesis in this research depicts a synthesis of the first and the second hypothesis. Accordingly, given the evaluation for hypothesis 1 and 2, the present study finds no support for the third hypothesis, as stated in section 2.

5.2. Limitations

The major limitation of this research is that it does not elicit subjects' motivations for the allocation choice. Eliciting the motivation of participants, for example, with the help of a post-survey questionnaire, could provide insights on why people redistribute money the way they do. Most importantly, by knowing the drivers of individual redistributing behaviour one could draw a definite conclusion on why people opt for extreme reallocations and in turn, provide evidence for the effect of valence on inequality preferences of social planners. However,

eliciting beliefs can be problematic. Asking participants about the motivation for their choice may invoke their desire to be consistent with their actions and therefore, only may unravel parts of the truth.

Secondly, the study lacks statistical power. Thus, the statistical tests performed in this study are prone to type-II errors and lack the power to reject the null hypothesis when it is incorrect. Possible means to enhance the statistical power provide the increase of the sample size, an increase of the treatment level variance or a reduction of the error variance. For instance, the latter may be achieved by using a within-subject design instead of the applied between-subject design. Within-subject designs have the advantage that they offer perfect control for unobserved individual fixed effects. However, it is questionable whether this advantage outweighs the costs. As indicated earlier, by using a within-subject design one would need to cope with confounding learning effects and potential recovery from cognitive depletion.

Lastly, it remains not entirely clear how much effort individuals spent in the cognitive depletion task. Subjects performed the cognitive depletion task in the absence of the experimenter. Arguably, the presence of the experimenter during the cognitive depletion task may have enhanced the effort of individuals. Moreover, the evaluation of the texts written in the depletion treatment may pose a problem. It seems hard to draw a clear line between people who really tried hard in the task and who did not. Excluding observations based on text length lack the considerations that participants may display different literacy skills. On the other hand, dropping observations based on an error count would not be appropriate as mistakes can happen to everybody, and particularly when one is exhausted from trying hard. Future research may want to incorporate restrictions in the entry field. Such that texts cannot be submitted if it contains letters that are not permitted.

6. Conclusion

All of us have eventually acted under a scarcity mindset. May it have emerged through monetary constraints, time pressure, or other factors that made us feel having less than we need. Recent studies on stress suggest that this holds true more than ever. Because of the breadth and saliency of the scarcity concept for our lives, the present research was motivated to study cognitive depletion as a major consequence of scarcity, and how it affects individual's decision-making about others. In doing so, it tried to answer whether a lack of mental resources affects people's inequality preferences and what role valence plays.

The research indicates that cognitive depletion does not influence inequality preferences of social planners. This finding is unexpected but may find an explanation in the growing critique on concepts of ego-depletion. If it comes to valence, this study joins the rich array of literature which verifies that individuals behave differently when confronted with gains than with losses. Individuals who decide on losses show an increased tendency toward inequality as compared to when they decide on gains. Such behaviour may result from an inherent desire not to harm a party to benefit another, and assumingly is intensified by individuals' higher sensitivity to losses. However, the effect of valence seems debatable, as it is sensitive to cases of extreme allocation.

The present research bridges the concept of scarcity to social planning decision-making. In doing so, it simultaneously contributes to the mature literature on cognitive depletion and the yet largely unexplored field of decision-making as social planners. Given the plenitude of social planning decision-frameworks in the real world and the far-reaching consequences that come with it, I believe that future research on this topic is of high scientific as well as practical relevance. Thereby, this study may serve as an initial steppingstone. Potential research topics can encompass belief elicitation methods to gain a deeper understanding of the motivations behind the decisions of social planners. Furthermore, it could be of interest to perform more close-knit research that studies the effect of scarcity on social planning decision-making in a more linear fashion and abstains from focusing solely on one consequence of the psychology of scarcity.

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Appendices

Appendix A – Survey

The survey was available in English and German. Followingly, excerpts of the English version are depicted.

Introduction

Dear participant,

Welcome to this small survey!

I am a student at Erasmus University in Rotterdam. The present survey is part of my master thesis. It will take approximately 9 minutes to complete this survey and all information is confidential.

By completing this survey, you can enter into a lottery for the chance to win 50 Euros.

This survey consists of two parts:

1. A brief text typing task.

2. An allocation task, where you are confronted with a specific situation. In the scenario provided, you decide if and how to redistribute money. Your decision remains anonymous and it does not affect your chances of winning the lottery.

In case of any questions, contact me via email: sandro.zuppiger@hotmail.com

Thank you for participating. Please feel free to forward the survey to your friends.

Control group: No depletion – task description

Please write a story about a recent trip you have taken. It may be a trip to a store, to a city or to another country - wherever! Please write as precisely as possible. You have 5 minutes. After the 5 minutes the survey will automatically advance to the next question.

Enter your story in the designated field below:

Treatment group: Depletion – task description

Please write a story about a recent trip you have taken. It may be a trip to a store, to a city or to another country - wherever! Please write as precisely as possible. You have 5 minutes. After the 5 minutes the survey will automatically advance to the next question.

Very important! Please do not use words that contain the letters 'a' or 'n' in your story.

Enter your story in the designated field below:

Gain scenario – task description

Please imagine now the following scenario:

Apple Island consists of two regions Eastpine and Strongbarrow. Eastpine and Strongbarrow are two identical regions that grow flowers. The two regions have identical populations. They grow the same flowers and sell them at the same quantities and at identical prices.

Eastpine is located on the left side of a high mountain and Strongbarrow is located on the right side of the mountain. Every year, two swarms of bees of the same size fly to Apple Island. They split in front of the mountain with one swarm flying to Eastpine and the other swarm flying to Strongbarrow. Bees are crucial for growing flowers.

One day, a third swarm of bees flies to Apple Island and chooses to collect nectar on the flowers of Eastpine. Biologists agree that it had never been the case that three bee swarms traveled to Apple Island and estimate that such an event occurs once every 100 years.

Due to the additional bee swarm, the citizens of Eastpine incure additional gains of 800,000 Euros.

Imagine you are the agricultural minister of Apple Island. Due to these special circumstances, you have the possibility to redistribute Eastpine's gains of 800,000 Euros among the two flower regions, Eastpine and Strongbarrow. How would you allocate the gain?

Please enter the gain you would assign to Eastpine and Strongbarrow in the provided space.

800 thousand to Eastpine

0 thousand to Strongbarrow

Loss scenario – task description

Please imagine now the following scenario:

Apple Island consists of two regions, Polperro and Cherrytown. Polperro and Cherrytown are identical wine regions with the same population. The two regions produce the same wine and sell the same quantities at identical prices.

Polperro is located on the left side of a high mountain and Cherrytown is located on the right side of the mountain. Because of the high mountain, thunderstorms often occur on each of the sides. Thunderstorms occur equally often in both Polperro and Cherrytown.

One day, a particularly strong thunderstorm looms over Polperro and lightning strikes the vineyards of Polperro. Meteorologists agree that such a lightning storm only occurs once every 100 years.

Due to the lightning, the citizens of Polperro incure unavoidable losses of 800,000 Euros.

Imagine you are the agricultural minister of Apple Island. Due to these special circumstances, you have the possibility to redistribute Polperro's loss of 800,000 Euros among the two wine regions by making Cherrytown pay for the damages in Polperro. How would you allocate the loss?

Please enter the loss you would assign to Polperro and Cherrytown in the provided space.

800 thousand to Polperro

0 thousand to Cherrytown

Control questions

Q. How much effort do you feel you put into completing the essay?

__ None

__ Almost none

__ Little

__ Some

__ Rather much

__ Considerable

__ A lot

Q. How many hours ago did you have your last meal? (Please enter the number of hours e.g. 2)

Q. What is your gender?

__ Male __ Female __ Other

Q. What is your age? (Please enter your age as a number e.g. 25)

Q. What is the highest degree or level of school you have completed? (If currently enrolled, please state highest degree received)

__ Less than a high school degree

__ High school degree or equivalent

__ Bachelor's Degree

__ Master's Degree

__ Doctorate

Q. Are you a student?

__ Yes __ No

Q. What device did you use to fill in this survey?

__ Phone __ Computer

Survey end

Thank you for completing this survey! If you do not wish to leave your email, please click on the arrow down below one more time to end the survey.

Please leave your email if you want to have a chance at winning a prize. The winner will be contacted when the survey closes. This information will not be used in any other way.

Appendix B – Power Calculations

All power calculations are approximations as they base on the assumption that the data is analysed with a two-sample t-test.

A priori power calculation

For the a priori power calculation conventional levels for alpha ($\alpha = 0.05$) and 1-β ($1-\beta = 0.8$) were used. Values for the mean of group 1 and group 2 as well as the respective standard deviations were derived from a pilot study that was performed in advance. The groups are separated based on depletion treatment. Discrimination based on the valence treatment was not possible, as the sample size of the pilot study was too small. An allocation ratio of 1 is assumed.

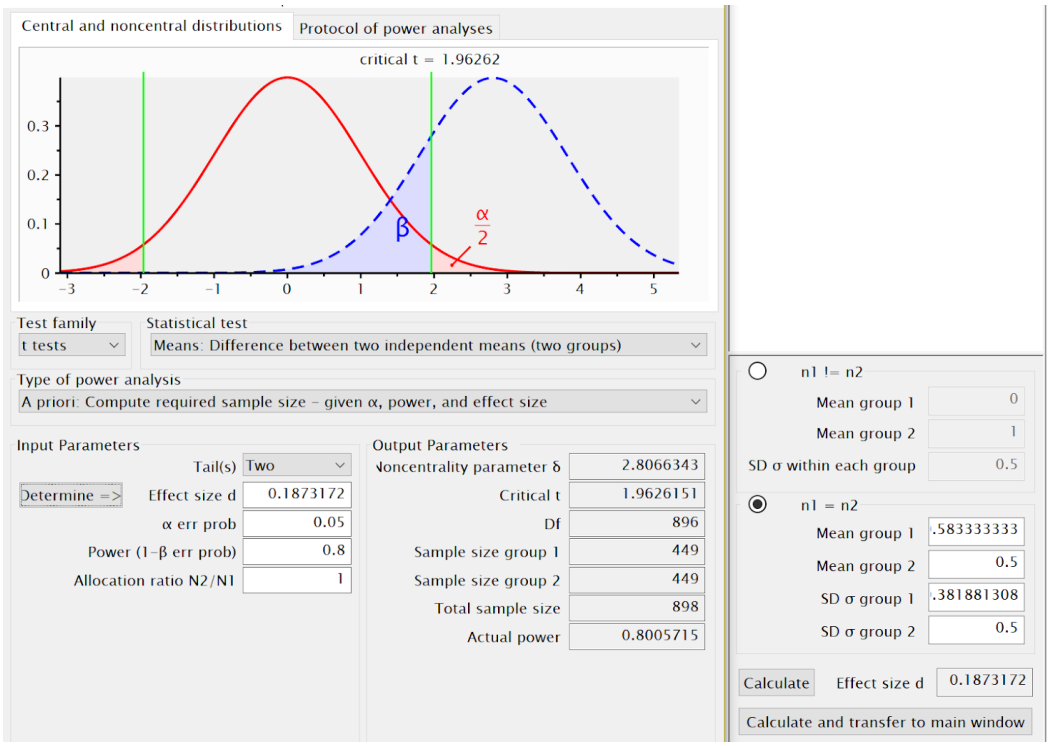

Figure 7: GPower a priori power analysis

Post hoc

For the post hoc power analysis considers “no-depletion & gain” as group 1 and “no-depletion & loss” as group 2. Conventional levels for alpha ($\alpha = 0.05$) and 1-β ($1-\beta = 0.8$) were used. An allocation ratio of 1 was assumed.

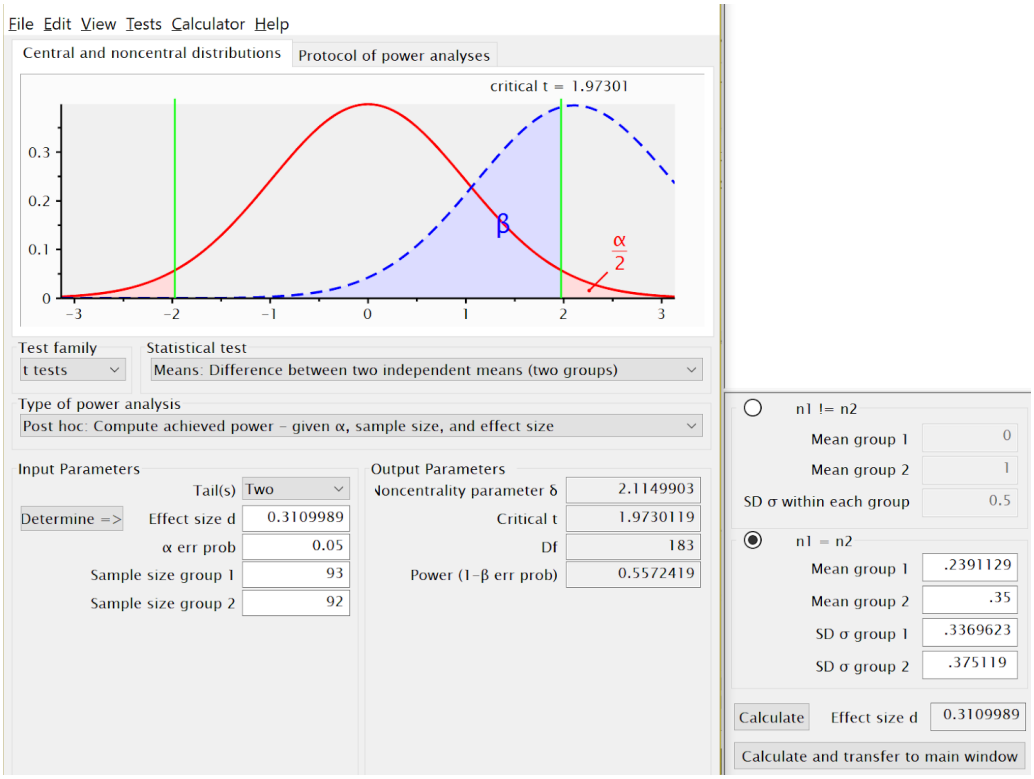

Figure 8: GPower post hoc power analysis

Appendix C – Supplementary analysis

Supplementary demographics

	Total	No depletion & gain	No depletion & loss	Depletion & gain	Depletion & loss
N	372	93	92	88	99
Less than high school	95 (25.54%)	26 (27.96%)	24 (26.09%)	24 (27.27%)	21 (21.21%)
High school	61 (16.40%)	12 (12.90%)	21 (22.83%)	11 (12.50%)	17 (17.17%)
Bachelor	157 (42.20%)	40 (43.01%)	37 (40.22%)	41 (46.59%)	39 (39.39%)
Master	51 (13.71%)	13 (13.98%)	9 (9.78%)	9 (10.23%)	20 (20.20%)
Doctorate	8 (2.15%)	2 (2.15%)	1 (1.09%)	3 (3.41%)	2 (2.02%)

Table 7: Supplementary demographics

Statistical tests without extreme reallocation – effect of cognitive depletion

	Mann-Whitney-U	2x2 FE (equal split)	2x2 FE (no distribution)	2 x 4 FE (categories)
Positive valence	p = 0.714	FE 0.450	FE 0.469	FE 0.783
Negative valence	p = 0.975	FE 0.519	FE 0.223	FE 0.987

Table 8: Statistical tests without cases of extreme reallocation. Effect of cognitive depletion by valence

Statistical tests without extreme reallocation – effect of valence

	Mann-Whitney-U	2x2 FE (equal split)	2x2 FE (no distribution)	2 x 4 FE (categories)
No depletion	p = 0.13	FE 0.229	FE 0.408	**FE 0.061**
Depletion	p = 0.23	FE 0.355	**FE 0.064**	FE 0.294

Table 9: Statistical tests without cases of extreme reallocation. Effect of valence by cognitive depletion