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IMPRESSUM

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ISSN electronic edition 1619-4535

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The Effect of Self-Control and Financial Literacy on Impulsive Borrowing: Experimental Evidence*

Antonia Grohmann†and Jana S. Hamdan‡

May 31, 2021

Abstract

This paper examines the effect of reduced self-control on impulsive borrowing in a laboratory experiment. We manipulate self-control using an ego depletion task and show that it is effective. Following the ego depletion task, participants can anonymously buy hot drinks on credit. We find no significant average effects, but find that treated individuals that have low financial literacy are more likely to borrow impulsively. We complement our experimental analysis with survey evidence that suggests that people with low self-control have more problems with the repayment of consumer debt. This relationship is, in line with the experimental results, weaker for individuals with high financial literacy.

JEL classification: D14 (Personal Finance), G51 (Household Borrowing), C91 (Lab Experiments)

Keywords: Debt, Consumption, Borrowing, Self-Control, Ego depletion

*We thank colleagues at Technical University Berlin and WZB for support in the conduct of the experiment. We are also thankful for the comments by Anja Achtziger, Georg Weizsäcker, Dirk Engelmann, Jana Friedrichsen, Melanie Koch, Lukas Menkhoff, Johannes Seebauer and Renke Schmacker. The paper also benefited from discussions with other participants at the 2020 SABE conference (virtual), the IAREP Early Career Workshop 2020 (virtual), the Berlin Behavioral Group Seminar, and the DIW Winter Workshop 2020. Financial support by the German Research Foundation through CRC TRR 190 (project number 280092119) is gratefully acknowledged. This study was registered before the main sessions in the AEA RCT Registry and the unique identifying number is AEARCTR-0005185.5185-1.0.

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1. Introduction

About 10% of German adults are over-indebted, meaning that they cannot meet their debt obligations over a longer period of time, even when reducing their living standards (Creditreform Wirtschaftsforschung, 2020). The issue is also prevalent elsewhere: in the United States, for example, every third household is under pressure by debt collectors (Urban Institute, 2019). Over-indebtedness can have serious effects on households, as it puts a strain on individual welfare, correlating negatively with physical and mental health, and psychological well-being (Drentea and Lavrakas, 2000; Brown et al., 2005; Sweet et al., 2013). At the same time, too much household debt can jeopardize economic stability and growth as those affected are highly sensitive to income and interest rate shocks (Debelle, 2004; Mian et al., 2017). Moreover, consumer debt dampens consumption growth (Ekici and Dunn, 2010).

A variety of factors, including job loss, divorce, and health problems, are typically given as reasons why people borrow too much. However, these factors neither account for the full extent of borrowing observed nor explain the quantity of non-optimal borrowing decisions (Zinman, 2015; Beshears et al., 2018).

At the same time, financial literacy explains borrowing decisions less well than asset decisions (Lusardi and Tufano, 2015) and financial education is less effective at improving borrowing decisions than savings decisions (Kaiser and Menkhoff, 2017).This raises the question of what determines over borrowing and how is this linked to financial literacy.

An intuitive, but so far not fully understood, cause of over-indebtedness is impulsive and excessive borrowing for consumption. This factor is responsible for a significant share of hardship cases: about 10% of German debt counseling cases are classified as mainly due

to consumption behavior (Institut für Finanzdienstleistungen, 2020). Impulsive borrowing is essentially a form of bringing gratification forward but paying for this in the future. A large number of such behaviors can be explained through limited self-control (Thaler and Shefrin, 1981; Laibson, 1997). In this paper, we thus investigate the role of self-control problems as a behavioral bias that affects impulsive borrowing for consumption.

Although prior research provides valuable insights into a potential link between self-control, financial literacy, consumption, and borrowing (Gathergood, 2012), these are, to the best of our knowledge, all based on surveys, hence, suffer from endogeneity. Unobserved variable bias, as well as reverse causality, are a concern. We aim to provide the first causal evidence for the effect of self-control on borrowing for consumption, thus aiming to contribute to the understanding of over-indebtedness. We also collect information on participants' financial literacy. We thereby aim to shed light on the interrelationship of self-control with financial literacy, specifically whether those with higher financial literacy are able to reduce the effect of lower self-control.

In this paper, we run a lab experiment during which we implement an exogenous variation to self-control. In order to achieve this in an experimental treatment and measure effects on borrowing decisions, we use a well-established ego depletion exercise commonly used in psychology, namely the crossing out letter task (Baumeister et al., 1998). It aims to reduce the ability for self-control by demanding constant suppression of a habituated behavior. This approach assumes that self-control is a finite resource (Baumeister et al., 1994; Baumeister and Heatherton, 1996).[1] Letter-crossing tasks are considered to be the most effective ego

[1]Within-person variation in self-control due to tasks such as these does not contradict the evidence from longitudinal studies that self-control is considered to be a relatively stable personality trait as they also find some variation over time (Turner and Piquero, 2002; Burt et al., 2006; Hay and Forrest, 2006). This is also

depletion exercises (Hagger et al., 2010). During these, treated individuals first complete a habituation exercise, immediately followed by a depletion task. In parallel, the control group continues with a second habituation exercise instead of the depletion task. In order to check the effectiveness of this intervention, we perform manipulation checks.

Following the letter-crossing tasks and manipulation check, participants enter a shopping stage. All participants are offered hot drinks that they can purchase with money that they will earn later during the experiment. This purchase is explicitly framed as a loan involving interest rates. To make hot drinks more appealing and the temptation more visceral, we artificially cooled down the lab to about 17 degrees Celsius (63 degrees Fahrenheit). Drinks are served during the experiment, while the participants still have other tasks to perform. Specifically, they continue with a second round, including depletion exercises, manipulation checks, and a shopping stage. Both shopping stages are completely anonymous to rule out social signaling concerns. After the main part of the experiment, we ask a number of questions to measure financial literacy, socio-economic characteristics, and financial behavior.

Results regarding manipulation checks are as follows: We find that the letter-crossing treatment reduces the participant's ability to concentrate significantly. Treated participants are also less likely to choose a hard puzzle to perform at the end of the experiment, although this difference is insignificant. When constructing an index from all manipulation checks, we find that the treated are, on average, significantly more depleted. Therefore, we consider our treatment to be successful.

true for self-control dubbed as time preferences, for which the observed stability holds under the condition of some instability (Meier and Sprenger, 2015).

Overall, 16 percent of the full sample borrow in the first round to purchase a hot drink, twice as much as in the second round. Looking at average effects of our treatment and the decision to borrow for consumption, we find no significant average effects. We do however find that in the first round, treated participants are six percentage points more likely to borrow than the control group. However, the average difference is statistically insignificant. This also applies to the second round and alternative outcome variables, such as amount borrowed and amount of interest paid.

We perform heterogeneity analysis with a special focus on financial literacy to determine if participants with higher financial literacy have a better understanding of the financial downsides of their impulsive consumption and so refrain from doing so. We find that the relationship between our treatment and borrowing is positive, significant, and large in magnitude for people with low financial literacy. This result is driven by borrowing choices in the first, more expensive round. Looking at the potential mechanism behind this, we see that people with lower financial literacy are more ego depleted and also have poorer understanding of the experiment and its consequences.

To assess the external validity of our results, we add survey evidence from a representative German household panel. In line with our experimental results, self-control is related to significantly fewer debt repayment problems and slightly less borrowing for consumption overall. When we interact financial literacy with self-control ability, we can show that the interaction term between the two variables is always positive, indicating a weaker relationship between self-control and debt problems for people with high financial literacy.

This paper is linked to three strands of literature: (1) studies on the effect of self-control on economic behaviors, (2) observational studies on self-control and levels of (expensive) consumer debt and (3) literature on financial literacy and financial behaviors.

First, self-control is linked to a large number of economic and health outcomes. The ability to regulate one's impulses is positively linked to better health and educational outcomes, success in the labor market, stronger relationships, interpersonal skills, and overall life satisfaction (Tangney et al., 2004; Cobb-Clark et al., 2019). Self-control is also positively correlated with well-being at within- and between-person levels (Buyukcan-Tetik et al., 2018). It further positively correlates with financial assets (Liu et al., 2019).

Few experimental studies focus explicitly on self-control problems and their economic consequences. In a public goods experiment, self-reported self-control correlates with more cooperation (Kocher et al., 2017). In addition, self-control is significantly associated with more altruistic behavior among children (Ugur, 2021). The experimental intervention that we use is similar to Gerhardt et al. (2017), who use an ego depletion task to reduce self-control and subsequently measure risk preferences, finding no causal effect of depletion on risk aversion. In an online experiment, Burger et al. (2011) find that a willpower-depleting task has a negative impact on completing another incentivized task on the same day, but does not negatively affect performance on the next day. Palma et al. (2018) use eye-trackers to control how much their experimental participants comply with a self-control depleting exercise. The more effort participants exerted, the more likely they purchased small items rather than keeping $5 in the lab.

Secondly, a number of studies provide evidence of a consistent relationship between self-control and financial behaviors related to over-indebtedness. Self-control problems are asso-

ciated with compulsive buying (Achtziger et al., 2015) and financial distress (Biljanovska and Palligkinis, 2018). Heidhues and Kőszegi (2010) provide a formal assessment that present-biased consumers are exploited by lenders and over-borrow. To the best of our knowledge, this is the first study that examines this relationship in an experimental setting.

Self-control ability is related to the notions of present bias and inconsistent time preferences, which is a more common concept in economic sciences. Related to the link between these concepts and debt taking, the assumption of hyperbolic consumers explains high observed borrowing rates in the expensive credit card market (Laibson et al., 2003). Time preferences explain both credit card borrowing (Meier and Sprenger, 2010) and credit card balance (Bradford et al., 2017). Moreover, Kuchler and Pagel (2021) show that present bias can explain debt repayment patterns.

Third, a large number of studies have linked financial literacy to beneficial financial behavior. It has been shown that people with higher financial literacy are more likely to plan for retirement (Lusardi and Mitchell, 2008), have higher wealth (Van Rooij et al., 2012), and hold stocks (Van Rooij et al., 2011). Financial education has been shown to be effective in improving savings and budgeting behaviors but is less effective at improving borrowing behavior (Kaiser and Menkhoff, 2017).

Few studies have examined the interrelation between self-control, financial literacy, and debt taking. Gathergood (2012) finds that the effect of financial literacy on impulsive borrowing is reduced when a variable measuring self-control is included in a regression. Financial literacy and present bias both predict problematic mortgage product decisions by consumers (Gathergood and Weber, 2017). Bu et al. (2021) find that an intervention focused on self-control skills is more effective than a more standard financial literacy training. This paper

adds to the literature outlined above using a novel experiment. At the same time, it examines the link between self-control and debt-taking rather than debt stock in detail and can identify effects in a causal way.

Following this introduction, this paper proceeds as follows. Section 2 presents our experimental design. We discuss our main experimental results in Section 3, provide survey evidence in Section 4, and conduct robustness checks in Section 5. Section 6 concludes.

2. Experimental Evidence

2.1. Experimental design

The main elements of the experiment consist of two rounds, each including an ego-depletion task and a shopping stage. It is the aim of our treatment to reduce the self-control ability in the short term among our treated participants and to let all participants choose to buy hot drinks on credit. We are interested in the causal difference in purchases between treated and non-treated individuals. A summary of the structure of the experiment is displayed in Figure 1. We here outline each stage of the experiment in detail.

2.1.1. Instructions and comprehension

When first entering the lab, participants read the instructions. These are given in written form (see English translation in Appendix I.1). Then, the participants answer comprehension questions regarding the procedure of the experiment and consumption costs on screen (see Appendix I.2 for detailed questions). In case a participant answers the comprehension questions incorrectly, one of the experimenters approaches the participant and asks to re-

think the answer. If the participant continues to misunderstand, the experimenter explains the right answer. The experiment starts once all participants understand the experimental procedure.

2.1.2. Letter-crossing task

For the purpose of reducing self-control in our experimental treatment, we make use of the letter-crossing task, one of the most commonly used and well-established methods for ego-depletion, first introduced by Baumeister et al. (1998).

In general, ego depletion methods are designed to induce lower self-control in a laboratory environment. The depletion exercises are both strenuous and unrewarding, thereby causing mental fatigue and leading the subjects to a state of "ego depletion." The evoked state of depletion is then assumed to reduce the ability to exert self-control in subsequent tasks (Muraven and Baumeister, 2000). In such a state, the energy available to the self is low and the capacity to control the mind over habituated responses is impaired.

In our experiment, we decided to use the well known crossing-out letters task, as this is shown to be most effective at reducing self-control according to the meta-analysis by Hagger et al. (2010). The task consists of two exercises. The first exercise asks both the treatment and control group to cross out all letters 'e' in a paper-based text for three minutes. This first exercise is designed to instill a habit among all participants. Following this, participants are given a new text and task description. The treated participants are requested to cross out the letter 'e' for ten minutes according to a new rule. This rule is as follows: always cross out the letter 'e' except for these cases: when a vowel follows the 'e' by one or two letters, or when a vowel precedes the 'e' by two letters. Thus, when no vowels follow or precede the 'e'

in such a way, the 'e' shall be crossed out. The control participants, on the other hand, are given the same new text but are asked to continue crossing out all letters 'e' for ten minutes. Hence, the rules for them are the same as during the first exercise. The selected text is an extract on the history of statistical recording in Germany (see a description and example in Appendix I.3). These were chosen as the authors believe the content to be very uninteresting to a mostly student population.

In sum, the treatment serves as an exogenous shock to the mental state of participants as it is designed to first instill a habit among all subjects for the first three minutes. As the instructions change for the treatment group, they are forced to suppress this habituated behavior. As a result, the treated participants use up mental resources linked to self-control.

The text exercises are not incentivized as they are designed to be unrewarding and effortful. Secondly, by not incentivizing these tasks, we prevent that financial performance in the letter-crossing tasks influences shopping behavior during the next stage of the experiment. This further means that participants are unlikely to buy a hot drink during their first round in order to improve their performance in the second round.

It is notable that manipulation failure is raised as a concern to ego depletion studies. Thus, performing manipulation checks following an ego-depletion task is important. Hagger et al. (2010) find significant evidence for the effectiveness of ego-depletion tasks across 198 studies. However, Carter et al. (2015) strongly challenge this view and indicate that a publication bias and small sample sizes overestimate the actual effects. These concerns produced a sudden surge in further meta analyses and responses (Alós-Ferrer et al., 2019; Cunningham and Baumeister, 2016; Baumeister and Vohs, 2016; Dang and Hagger, 2019; Dang et al., 2021). It seems relatively certain now that a habituation phase is necessary to obtain an ego

depletion effect. Moreover, paper-based letter crossing tasks seem a little less controversial than electronic tasks and the depletion task must not be too short. Further, researchers must ascertain that participants sufficiently engage in the tasks.

We believe that we follow all of these points in our chosen ego depletion task to deplete self-control in this experiment. Inzlicht and Friese (2019) further point to the importance of validating manipulations and ensuring transparent good scientific practices. Therefore, we put considerable effort into ensuring that our manipulations are successful.

2.1.3. Manipulation check

Manipulation checks follow the crossing-out letters task. This stage consists of questions about perceived participant exhaustion levels before the experiment and exhaustion after each depletion exercise. We also ask for perceived concentration difficulty during each text exercise. These items are measured on a Likert-scale from one to ten.

All participants are further tested using the cognitive reflection test (CRT) introduced by Frederick (2005). Ego depletion can be seen as a shift from "system two" to "system one" as resources are being depleted (Gerhardt et al., 2017). The CRT measures the ability to turn on "system two" (exert effort for conscious thinking), and thus, we expect that ego depleted individuals are less able to answer these questions correctly.

Lastly, participants are asked to choose either a difficult or an easy puzzle to complete at the end of the experiment. This further serves as an estimate for ego depletion. We believe that ego-depleted individuals are more likely to choose the easier puzzle rather than the hard puzzle. These measures of ego-depletion are shown to be effective by Gerhardt et al. (2017). Other ways to measure if a person is ego-depleted involve letting participants perform further

ego-depletion tasks. This is not possible in our setting as it would confound with the original treatment in the following rounds.

2.1.4. Debt-taking in the lab

As the main aim of the experiment is to test if there is a causal relationship between ego deletion and taking on debt, we strive to recreate debt-taking in the lab. The questions to check for manipulation are, hence, followed by a shopping stage during which all participants can anonymously purchase hot drinks. This is done by letting participants select from a choice of hot drinks in combination with milk and sugar (see Appendix I.4 for details of the setting). To make hot drinks more viscerally appealing, we cooled down the lab to about 17 degrees Celsius (62.6 degrees F.). Purchase options are advertised with prices on the computer screen to the participants. Importantly, the indicated prices are higher for hot drinks than in the retail outlet in the same building. Since the participants have not earned any money at this point of the experiment, they must take out a loan to purchase the drinks. The loan has an interest rate. These interest rates are relatively high and decrease between rounds. In the first round of shopping, the loan charges 20% interest, and 10% in the second round. Both the loan and the interest rate are taken off the participation fee at the end of the experiment. Credit costs are framed as being added on top of prices. The prices for goods remain the same throughout the experiment. Drinks are served very shortly after participants make their choices and participants are made aware of this at the beginning of the experiment. We so hope to be able to satisfy the visceral desire for a hot drink immediately.

Participants are made aware of the prices and both interest rates at the beginning of the experiment and again on the computer screen during the shopping stages. There is no real

debt-taking during the experiment, as this is regarded as unethical by the laboratory. We, however, create a setting that is similar to the process of taking debt to finance consumption through framing. Furthermore, we assume that students take part in lab experiments to earn money. Therefore, we believe that we recreate the emotional and cognitive process involved in borrowing to finance consumption.

Participants are further informed both before the experiment and during the shopping stages that they will receive free tap water if no purchase is made. Participants are unaware of who makes purchases and who does not within the laboratory environment as everybody receives a drink in identical paper cups as pre-announced. Thus, borrowing to buy a hot drink should not be linked to social status or signaling concerns. After each shopping stage, all drinks for all participants are prepared in a separate room and quietly delivered to the participants' workstations in the lab while they are continuing with the next experimental stage.

As mentioned above, the three experimental stages (text exercises, manipulation check, shopping round) are completed twice.

2.1.5. Control variables

The last shopping round is followed by a questionnaire during which we collect information regarding the participants' socio-demographics, financial characteristics, and experimental experience.

As we are mostly dealing with students, we asked about working for more than ten hours a week and whether participants earned more than 1000 € per month, thus roughly above the poverty line for single households in Germany. As part of this experiment is to examine

the interaction between self-control and financial literacy, we also included six questions to measure financial literacy. These questions, which are standard in the literature (see, for example, Van Rooij et al., 2011; and Lusardi and Mitchell, 2008), are shown in Appendix I.7.

We also ask a number of questions regarding the participant's previous financial behavior. These were included to establish if there is a certain financial type that displays certain financial behaviors that will translate to the experiment. Moreover, we included the self-control scale by Bertrams and Dickhäuser (2009) translated from Tangney et al. (2004) after the main experiment, see Appendix I.8.

2.2. Sample

Our experiment took place at the Technische Universität (TU) Berlin in December 2019. This was preceded by a pilot study in November 2019. Including the two pilot sessions, 12 experimental sessions were conducted, each lasting 60 minutes.[2]

All sessions had between 20 and 23 participants. In total, 283 people participated in the experiment. On average, participants earned 16.7 €, including a show-up fee of 7 € and a participation fee of up to 10 €.

Treatments were randomized at the individual level using a computerized process. All sessions included participants in the treatment and the control group. The experiment is programmed using z-Tree (Fischbacher, 2007), and participants are recruited from the subject pool of the TU Berlin laboratory via ORSEE (Greiner, 2015). This study was registered

[2]For the main sessions, the following changes to the experimental design were implemented in order to ensure that the experiment only took 60 minutes: (1) shorter instructions comprehension test; (2) a 2 minute timer in the CRT test and for the puzzle task; and (3) shortening the second text exercise from 12 to 10 minutes in in both rounds.

before the main sessions in the AEA RCT Registry, and the unique identifying number is $AEARCTR-0005185.5185-1.0$.

2.3. Summary statistics

In Table 1, we present descriptive statistics comparing treatment and control groups. Current university students make up 96% of all participants. They are mostly in the fields of engineering, natural sciences, mathematics, and economics. The groups are fairly gender balanced, and the average participant is around 22 years old, an undergraduate, and had a monthly income below 1000 €. About a third of participants have previous experience with consumer debt or currently have consumer debt. Every third participant reports being always or often stressed about money issues.

Regarding the experiment, on average, participants felt slightly cold. Female participants felt significantly colder than male participants, choosing 2.78 and 2.27 respectively on a 1-5 scale. Further, 18% know another subject from an earlier session and 20% have participated in five or more lab experiments.

The t-tests comparing group averages indicate that the computerized randomization succeeded in rendering balanced groups based on observable characteristics. To complement this evidence, the test result for joint orthogonality renders an *F statistic* of 0.77 ($p = 0.744$), which allows us to infer that average outcome differences across groups will be a causal consequence from our treatment (see Appendix Table II.I for more detailed summary statistics on the full sample).

3. Experimental Results

3.1. Manipulation check

In this section, we test whether the crossing-out letters exercise was effective in depleting participants' egos in the treatment group and thus, reduces their self-control.

Table 2 displays the results of t-tests of our manipulation check of the ego depletion tasks, comparing the treatment and control groups. Panel A shows the number of completed paragraphs for each round of text exercises. As expected in the short, 3 minutes exercises, during which treatment and control groups perform the same task, the number of paragraphs completed is the same. In the longer tasks, during which the treatment group performed the task designed to deplete the ego, the number of paragraphs completed is significantly lower. This is understandable as the task that is performed by the treatment group is considerably harder and more time consuming. This also shows that participants exerted effort even though none of the text exercises were incentivized.[3] In addition to this, Figure 2 displays the distribution of completed paragraphs across the sample by treatment status. It is evident that all participants complied with the exercises, albeit with varying output. As expected, the mean and standard deviation are smaller among the treated who also perform the harder exercises.

We measure whether our manipulation was effective in depleting self-control resources in three different ways. First, we asked participants how exhausted they felt at the beginning of the experiment and then after each text round. Here, we calculate the difference between the two reported values. Additionally, after each round, we asked how hard participants had

[3]There is no link between having purchased a hot drink in the first round and depletion in round 2.

to concentrate during the first and the second tasks. Lastly, after the first round of the ego depletion task, we asked participants if they would like to participate in a hard or an easy puzzle at the end of the experiment. This way of checking if manipulations are successful is in line with Gerhardt et al. (2017). In addition, we also included the three cognitive reflection questions by Frederick (2005) after the first round of the experiment. Panel B in Table 2 shows the respective results comparing treatment and control groups. There are no significant differences between the treatment and control groups when it comes to reported exhaustion. There are also no significant differences for the cognitive reflection questions. We do, however, find a significant difference in the concentration difficulty change between tasks in the expected direction. The treatment group is also borderline more likely to choose the easier puzzle, suggesting that they are more ego depleted at the end of the first round of crossing-out letters tasks.

We collect these indicators together to form a depletion index in line with Gerhardt et al. (2017) (See details below Table 2.). We turn each indicator into a z-score and generate an average out of these z-scores. The average is also turned into a z-score. This is done to reduce measurement error in each indicator. The depletion index is significantly higher for the treatment group than it is for the control group. This holds for the overall depletion index and both rounds separately. Hence, we argue that we successfully depleted participants using the crossing-out letters task. We use this index in the following regressions.

3.2. Shopping and borrowing

We show the average effect of our treatment in Table 3. The table shows mean values as well as p-values for t-tests and Wilcoxon rank-sum tests. It examines the total amount borrowed

for both rounds, the interest rate paid, as well as whether drinks were purchased in any of the rounds. Looking at the full sample, drink purchases were made by a minority, only 22% of our sample buy any drinks and the overall average borrowing amount is about 30 cents. Nevertheless, there is a positive albeit insignificant effect of our treatment on debt taken. On average, ego-depleted participants spend 53% more than control group participants in the more expensive round 1. Similarly, they are also 6 percentage points more likely to purchase a drink in this round. In round 2, the treated participants are no more likely to purchase any drink than the control participants. However, their average spending in round 2 is still 29% higher than the control groups. These results are not statistically significant according to t-tests and Wilcoxon rank-sum tests.

Power analysis confirms that our study is underpowered. The mean detectable effect size (MDES) is 0.19 for this sample size at the standard deviation of 0.57 and 80% power to detect such an effect for the total amount of money spent during the experiment. This is considerably higher than the effect of 0.09 observed by us.

In Table 4, we move on and present our findings using regression analysis with session fixed effects. In this table, we use a dummy that is 1 if a person has bought any drinks as the outcome variable. We show the results for other outcome variables (such as borrowing amount or interest paid) in Appendix II.

Columns (1) to (3) in Table 4 show results for round 1, while columns (4) to (6) show results for round 2. In columns (1) and (4), we look at simple correlations between our treatment indicator and whether a participant bought a drink. We see a positive, non-significant relationship. In the next columns, we include the depletion index and see that there is a slight drop in the coefficient between the treatment and buying a drink. This

indicates that some of this relationship is because people in the treatment group are more depleted. However, none of these relationships are significant.

In the last columns, we include a large set of control variables. Few coefficients are significantly different from zero. Students are less likely to buy drinks in round 1 but are just as likely to buy drinks in round 2.

There are also some significant relationships between variables that measure factors surrounding the experiment. People with more previous sessions in the lab are less likely to buy drinks, whereas people who know another participant are more likely to buy drinks in round 2. It is possible that people with more lab sessions are more money focused.

Participants with lower financial literacy are more likely to buy drinks in the more expensive round 1, which suggests a relationship between impulsive borrowing and financial literacy, which we here examine further.

3.3. Self-control, financial literacy and debt

Financial literacy has been shown to be linked to a number of positive financial behaviors (Lusardi and Mitchell, 2014). The question that arises from here is whether financial literacy can also protect from low self-control in situations where one is tempted by impulsive borrowing. Hence, we here examine the interaction between financial literacy and self-control and how this affects borrowing for consumption.

Table 5 is synonymous in its set up to the table above. By experimental round, it shows the regression results with the binary dependent variable for buying a drink on loan. In addition, we include an interaction term between below-median financial literacy and our treatment. Again, we include the full set of control variables in columns (3) and (6).

The interaction term between financial literacy and our treatment is always positive. In the first, more expensive round, the results are very consistent across specifications and statistically significant at the 5% level. Moreover, the coefficients in round 1 are large in magnitude: The treated below-median financially literate is about 20 percentage points more likely to borrow than the untreated. In sum, this shows that people with low financial literacy who were treated are more likely to buy hot drinks than treated individuals with high financial literacy.

These results indicate that the relationship between low self-control and borrowing for consumption is stronger for those with lower financial literacy. This subgroup seems more prone to buy drinks on credit in the more expensive first round, thus leading to expensive impulsive consumption on credit. From these results, it is not clear why exactly we find this relationship. We explore this further in the next section.

3.4. Mechanism

The question that arises is why those with lower financial literacy are more prone to give in to temptation and so are more likely to buy hot drinks during the experiment. We see three potential reasons that we examine here. First, they are more affected by the ego depletion task. Second, they have poorer understanding of the experiment and so the financial consequences. We here also explore if they are have generally poorer understanding of money that and act more impulsively, which would also translate into other financial decisions outside the lab. To explore these three possible explanations, we compare people with low

and high financial literacy on a number of other domains that might influence decisions in the lab or debt-taking. [4]

Table 6 shows the t-test results for a number of different variables for participants with high and with low financial literacy split at the median. We start by looking at the ego depletion during the experiment to examine whether people with lower financial literacy may be more affected by the ego depletion task and the experimental conditions in general. From the table we can see that participants with low financial literacy on average score worse on the ego depletion index than participants with high financial literacy. This indicates that participants with low financial literacy are more affected by the ego depletion task than other participants.

Interestingly, participants with higher financial literacy felt more exhausted prior to the experiment. At the same time, they did not feel more or less cold. Looking at self-control measured after the experiment, we can see that individuals with lower financial literacy self-assess their self-control on average higher. In terms of magnitude, they rate themselves on average at 3.16 on a 1-5 scale against 3.01 for higher financial literacy individuals.[5] This shows that participants with low financial literacy are not more affected by temperatures in the lab or pre-experimental exhaustion, but are more affected by ego depletion exercises and

[4]This section was not part of the pre-registrations. It should also be noted that we are not claming causality in this part of the paper.

[5]The self-control scale by Tangney et al. (2004) is constructed after asking participants to state to which extent they agree with a set of statements, such as "I am good at resisting temptations" on a scale from 1-5. We employed a shortened version with 13 items, and translated into German by Bertrams and Dickhäuser (2009), which proved to be nonetheless reliable and valid in measuring individual differences in perceived self-control. For the full list of items, see Appendix I.8. We re-arrange the items so that they are increasing in self-control, standardize the individual items, take the mean and standardize the score again to construct an estimate for individual self-control capacity.

but at the same are more confident about their general self-control, which could be due to perception.

Next, we examine variables that may indicate whether participants with lower financial literacy have generally lower cognitive ability and worse understanding of the experiment. We do find some evidence for this. They perform on average significantly worse on the CRT test and are less likely to get all comprehension questions correct right away. Poorer understanding of the experiment could be due to less experience with experiments, however the difference in lab experience is insignificant. Thus, this gives an indication that some of the results described in the previous section are due to a generally poorer understanding of the experiment, the financial consequence of the decisions made and possbly linked to lower cognitive ablities as indicated by the CRT.

In sum, the results so far seem to indicate that participants with lower financial literacy are more prone to the effects of the ego depletion task and also have poorer understanding of the experimental setting and the financial consequences. This would not matter if these results could not be translated to financial situations outside the lab. Therefore, we here examine if participants with lower financial literacy have different experiences with debt. Indeed, participants with lower financial literacy have on average more experience with overdraft and consumer debt, however, none of these differences are statistically significant. They are also more worried and stressed about money, this gap being statistically significant. This indicates that these lab results may also translate to real life situations.

The results in this section suggest interesting policy implications. Higher levels of financial literacy may protect people from going into debt as a result of impulsive borrowing caused by low self-control. However, as this is a lab experiment with students, external validity is a

concern. We hence would like to test if these results also hold in a more representative sample. We examine this in Section 4 by looking at representative survey data on the relationship between self-control, debt, and financial literacy.

4. Survey Evidence

In this section, we add to our experimental results by examining data from a representative survey of German households containing information on self-control, debt, and financial literacy. Thereby, we hope to add external validity to our experimental findings.

4.1. GSOEP-IS

We aim to establish the link between low self-control and consumer debt as well as repayment difficulties, which can be regarded as a measure of over-indebtedness. In addition, we want to test how financial literacy interacts with this relationship. In order to do this, we use the German Socio-Economic Panel (GSOEP), a representative sample of German households. The data that we examine in this study was collected as part of a smaller add-on survey for which a new sample was drawn in 2016, generally called the innovation sample (IS). Hence the survey that we use here is known as the GSOEP-IS. We combine data from waves collected in 2016, 2017, and 2018. For details of data and sampling see Appendix III and specifically Table III.I.

The GSOEP-IS collects a large number of standard socio-economic characteristics that are also collected as part of the main GSOEP. In addition, the 2018 wave of the GSOEP-IS includes 13 questions designed to measure individual self-control. These questions are widely

used in psychology (Tangney et al., 2004; Bertrams and Dickhäuser, 2009) and identical to those elicited in the questionnaire at the end of our experiment. All questions require participants to place themselves on a scale between 1 and 5, with 1 meaning completely disagreeing and 5 meaning completely agreeing. Out of these questions, we generate a score to measure self-control by aligning questions such that a higher number is associated with greater self-control and taking the mean of all questions. Descriptive statistics of this variable are shown in Table III.II in the Appendix and in Figures III.I and III.II.

We are particularly interested in the interaction between self-control and financial literacy. Therefore, we also include the six questions on financial literacy into the GSOEP-IS. These are the same question as those used during the experiment and are standard questions that have previously been used in the literature in similar forms (Van Rooij et al., 2011). We take the sum over the correct questions to measure individual financial literacy.

We perform t-tests to determine if the average self-control scale scores differ across socio-demographic variables. Results are shown in Table III.III in the Appendix. We find some common patterns that are known from the literature (Tangney et al., 2004); younger people tend to have less self-control. People with higher self-control also tend to be healthier and have higher life satisfaction in this sample. We find that women and men, on average, do not rate themselves differently with respect to self-control. In this survey, there is no difference in self-control between people with higher and lower financial literacy. As expected, the scale is also positively associated with higher household income and individual regular precautionary savings; the latter is seen in Appendix section III.

Further, we asked about objective as well as subjective measures regarding debt levels. As this paper is about borrowing for consumption and thus leading to over-indebtedness, we mostly focus on consumer debt when looking at objective measures of debt.

4.2. Survey results

First, we examine if self-control is linked to borrowing for consumption and, second, we are interested in how self-control interacts with financial literacy. Below, we examine two different types of measures for over-indebtedness, namely the existence of problematic debt and the existence of debt repayment problems.

Table 7 presents the results. In column (1), we construct a dummy indicating whether household consumer debt, personal consumer debt, or other personal debt excluding mortgages is reported. Within the column, we first only look at the relationship between self-control and debt. In a second step, we introduce financial literacy together with an interaction term between self-control and financial literacy. Lastly, we introduce further control variables.

A clear pattern emerges. The regressions show that higher self-control is linked to less consumer debt. When we introduce financial literacy and an interaction term between the two variables and add a full set of control variables, we see that people with higher financial literacy are less likely to hold debt. The interaction term between the two variables is smaller and partially positive, which suggests a tendency that the link between self-control and debt taking is weaker for people with higher financial literacy.

In columns (2) and (3) of Table 7, we look at two measures of repayment as outcome variables. Column (2) examines whether participants believe that they will be unable to

repay their consumer debt without problems. In column (3), the outcome variable measures if participants were unable to repay all their debt on time in the past year.

We find the same pattern as before and see in column (2) that the relationship between self-control and our measure of subjective over-indebtedness is negative, meaning that people with high self-control are less likely to believe that they will have problems repaying their consumer debt. When we add financial literacy and the interaction between the two variables, we again see that people with higher financial literacy are less likely to be over-indebted. Now the interaction term between the two variables is always positive, indicating a weaker relationship between self-control and over-indebtedness due to consumption for people with high financial literacy. In columns (3), we find the same patterns; however, these relationships are insignificant when we add further control variables.

From these columns, we most importantly derive that the relationship between a lack of self-control and problems with consumer debt is weaker for people with higher financial literacy, which confirms our experimental results for a representative sample. These results further suggest external validity of our experimental results.

5. Robustness

We perform a number of robustness checks to see if our results persist when excluding pilot sessions or using alternative continuous outcome variables. All results are presented in Appendix II. First, we do not find meaningful differences in our manipulation checks or main experimental results when excluding the participants from the two pilot sessions where the treatment was slightly more intense as the text exercises were longer. Second, instead of

looking at a simple dummy, we repeat our analysis using the borrowed amount with interest and only total interest paid as alternative outcome variables. We do this for our general results as well as for the heterogeneity analysis. The results remain the same.

Next, we exclude participants who borrow in the first round from the analysis of the second round. This does not meaningfully change the results for the second round as shown in Table II.VIII.

A variation in pre-experimental exhaustion could cause differences at the individual level in the degree of depletion in the initial task and in the borrowing decision. We ask participants during the first round about their exhaustion before the experiment on a ten point Likert scale. On average, they self-assess it at 4.89 (std. dev. 2.20). Tables II.IX and II.X display the results when we control for this initial mental state and additionally use dummy variables for the time of the day. Pre-experimental exhaustion appears to be negatively correlated with borrowing for consumption in round 1. However, controlling for the variable does not meaningfully change the treatment effects.

In addition, we perform further heterogeneity analysis, exploring the role of reported financial behavior outside the lab. Currently, having consumer debt makes it less likely for participants to purchase a hot drink. However, the interaction between current or previous consumer debt and our treatment is positive for our full specification but nonetheless small and statistically insignificant. Financial worries and stress appear to be negatively linked to impulsive borrowing in the lab, but interacting these variables with our treatment renders ambiguous and insignificant coefficients. In sum, neither current nor past consumer debt or feelings related to money among our experimental participants play a relevant role in the experiment.

Lastly, we explore the impact of using a different regression technique. As the depletion index by itself is not significantly linked to drink purchases in the lab, we explore the idea to use the variable as an instrument for our treatment. Table II.XV shows the results of an IV regression for reach round, where the treatment is instrumented by the respective depletion index. The results do not differ substantially from the OLS results.

6. Conclusion

High personal and household debt is a growing problem worldwide (IMF, 2017). To a large extent, these high levels cannot be explained by conventional economic theory (Zinman, 2015). At the same time, low levels of financial literacy often do not explain problematic consumption behavior (Kaiser and Menkhoff, 2017). Thus, in this paper, we try to gain insights into a determinant of excessive debt though impulsive borrowing. We here focus on one behavioral bias that can potentially explain observed over-indebtedness: self-control problems. Furthermore, we study how this interacts with financial literacy.

Using a laboratory experiment, we contribute causal evidence on the link between low self-control and impulsive borrowing for consumption, which may lead to excessive and expensive borrowing. We manipulate participant's self-control by letting them perform an ego depletion task. After this, participants can buy hot drinks on credit. While the prices of hot drinks stay constant, the separately published interest rate decreases over time. During the shopping stages, money spent is presented to participants as a loan against their future earnings. At the end of the experiment, this loan is deducted from their participation fee.

We perform manipulation checks, and the evidence suggests that our treatment is generally successful in depleting egos. Looking at the link between our treatment and the likelihood of buying drinks during the experiment, we find no significant average effects of the treatment on buying drinks, but borrowing rates are higher among treatment group members. However, we do find that the treatment leads to significantly more purchases for participants with lower financial literacy, especially in the more expensive first round with a higher interest rate. In order to examine the mechansim behind this link, we compare people with low and high financial literacy. The evidence suggests that people with low financial literacy are more ego depleted, but also that they have poorer understanding of the experiment in general.

We add to this by using evidence from a representative German household survey. We find that both people with higher self-control as well as those with higher financial literacy tend to have less debt. The relationship between self-control and debt repayment problems appears to be slightly weaker for people with higher financial literacy, which confirms our experimental results.

We hence conclude from these two studies that low self-control leads to impulsive consumption on credit. We further find evidence that higher financial literacy may protect from this effect.

This study offers clear policy lessons that can be drawn: The link between financial literacy, self-control, and borrowing for consumption suggests that improving financial literacy could reduce harmful behavior due to low levels of self-control. Further work should be done in trying to design and evaluating finance training that also addresses possible self-control

problems as these results suggest that good levels of financial literacy and higher self-control can substitute for each other.

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Table 1: Descriptives across Treatments

Variable	Full sample (Mean)	Treatment (Mean)	Control (Mean)	Diff.	t-test (p-value)	N
Socio-economic						
Female	0.49	0.53	0.46	-0.07	0.233	280
Age	22.56	22.43	22.70	0.26	0.637	282
Bachelor degree or higher	0.31	0.31	0.31	0.00	0.968	283
Student	0.96	0.96	0.96	0.01	0.769	283
Working at least 10h/week	0.29	0.30	0.28	-0.01	0.823	283
Mthl. net income above 1000 €	0.18	0.20	0.16	-0.04	0.365	275
Financial literacy (std.)	0.00	-0.01	0.01	0.02	0.892	283
Financial characteristics						
Spontaneous buyer (1-5 scale)	2.67	2.78	2.57	-0.21	0.146	283
Ever in debt on overdraft	0.28	0.25	0.30	0.06	0.273	283
Currently has consumer debt	0.10	0.10	0.10	0.00	0.984	283
Previously had consumer debt	0.14	0.12	0.17	0.05	0.229	283
Always/often worried about finances	0.23	0.26	0.21	-0.05	0.277	283
Always/often stressed about money	0.34	0.38	0.30	-0.08	0.183	283
Experiment						
Exhaustion prior to experiment (1-10 scale)	4.89	4.80	4.98	0.18	0.503	283
Felt cold (1-5 scale)	2.52	2.59	2.45	-0.14	0.342	239
Knows earlier subject	0.18	0.19	0.18	-0.01	0.781	283
Lab experience above 5x	0.20	0.21	0.20	-0.01	0.792	283
Truthful survey information (1-5 scale)	4.64	4.59	4.68	0.09	0.241	283

Table 2: Manipulation Check across Treatments

Variable	Full sample (Mean)	Treatment (Mean)	Control (Mean)	Diff.	t-test (p-value)
A Number of completed paragraphs					
Text exercise 1 (3min)	2.05	2.04	2.06	0.02	0.774
Text exercise 2 (10min)	4.13	2.14	6.12	3.97	0.000
Text exercise 3 (3min)	1.90	1.85	1.95	0.10	0.144
Text exercise 4 (10min)	3.73	1.91	5.56	3.65	0.000
Overall	11.80	7.93	15.68	7.75	0.000
Observations	232	116	116		
B Reported mental state					
Exhaustion Δ after R1 rel. start	0.80	0.73	0.86	0.13	0.548
Exhaustion Δ after R2 rel. start	1.24	1.30	1.18	-0.12	0.671
Concentr. difficulty Δ from task 1-2 in R1	1.70	2.63	0.76	-1.87	0.000
Concentr. difficulty Δ from task 1-2 in R2	2.02	2.82	1.21	-1.60	0.000
Number of wrong CRT questions	1.28	1.28	1.27	-0.01	0.929
C Motivation					
Easy puzzle chosen	0.47	0.51	0.42	-0.10	0.108
Observations	283	142	141		
Aggregate*					
Depletion Index after R1 (std.)	0.00	0.20	-0.20	-0.41	0.001
Depletion Index after R2 (std.)	0.00	0.24	-0.24	-0.48	0.000
Depletion Index overall (std.)	0.00	0.26	-0.26	-0.51	0.000
Observations	283	142	141		

Depletion Index

*The depletion index for round 1 consists in equal parts of the (1) standardized concentration difficulty change within round 1, (2) standardized exhaustion change within round 1 and (3) the standardized probability of the easy puzzle being chosen and (4) the standardized number of wrong questions in the CRT test. For round 2, it consists in equal parts of the (5) standardized concentration difficulty change within round 2, (6) standardized exhaustion change within round 2. The overall depletion index includes all six components.

Note: After taking the average of the standardized components, the resulting values are standardized again to form the depletion index values.

Table 3: Comparing Outcomes across Treatments

Variable	Full Sample (Mean)	Treatment (Mean)	Control (Mean)	t-test (p-value)	Wilcoxon test (p-value)
Debt taken (€)	0.30	0.34	0.25	0.216	0.181
Debt taken in R1 (€)	0.24	0.29	0.19	0.153	0.119
Debt taken in R2 (€)	0.16	0.18	0.14	0.451	0.430
Total interest paid (€)	0.04	0.05	0.04	0.190	0.185
Any drink (%)	0.22	0.25	0.18	0.205	0.205
Any drink in R1 (%)	0.16	0.19	0.13	0.152	0.151
Any drink in R2 (%)	0.08	0.08	0.07	0.671	0.670
Observations	283	142	141		

* Spending is in € including interest paid. Any drink refers to at least one drink purchased by participants and is set up as a dummy variable. **Only six participants purchase a drink in both rounds.**

Table 4: Treatment Effect on Impulsive Borrowing

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0621	0.0505	0.0683	0.0138	0.0196	0.0294
	(0.0439)	(0.0449)	(0.0495)	(0.0323)	(0.0333)	(0.0386)
Manipulation check						
Depletion Index after R1 (std.)		0.0283	0.0235			
		(0.0229)	(0.0261)			
Depletion Index after R2 (std.)					-0.0121	-0.0244
					(0.0169)	(0.0205)
Socio-economic						
Female			-0.0451			-0.0265
			(0.0532)			(0.0416)
Age			0.00765			0.00574
			(0.00654)			(0.00512)
Bachelor degree or higher			0.0246			-0.000371
			(0.0603)			(0.0471)
Student			-0.310**			0.0714
			(0.146)			(0.114)
Financial characteristics						
Working at least 10h/week			0.0300			0.0543
			(0.0581)			(0.0453)
Mthl. net income above 1000 €			0.0601			0.00435
			(0.0696)			(0.0545)
Financial literacy (std.)			-0.0541*			-0.00112
			(0.0283)			(0.0213)
Spontaneous buyer (1-5 scale)			-0.0148			0.00421
			(0.0209)			(0.0165)
Ever in debt on overdraft			-0.0670			0.00462
			(0.0573)			(0.0449)
Currently has consumer debt			-0.200*			0.00326
			(0.102)			(0.0797)
Previously had consumer debt			0.130			-0.0765
			(0.0870)			(0.0680)
Always/often worried about finances			-0.0417			-0.0364
			(0.0705)			(0.0557)
Always/often stressed about money			-0.0529			-0.0761
			(0.0652)			(0.0509)
Experiment						
Felt cold (1-5 scale)			0.0142			0.00367
			(0.0233)			(0.0183)
Knows earlier subject			0.0447			0.126**
			(0.0622)			(0.0489)
Lab experience above 5x			-0.120*			-0.0417
			(0.0637)			(0.0498)
Constant	0.177**	0.187**	0.200	0.0764	0.0732	0.526**
	(0.0785)	(0.0788)	(0.322)	(0.0577)	(0.0579)	(0.251)
Observations	283	283	236	283	283	236
R-squared	0.027	0.032	0.148	0.021	0.023	0.150

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Treatment Effect on Impulsive Borrowing by Financial Literacy

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0292	-0.0336	-0.0481	-0.0469	-0.0407	-0.0257
	(0.0614)	(0.0620)	(0.0681)	(0.0457)	(0.0465)	(0.0537)
Below-median FL	0.0136	0.00805	-0.0440	-0.0574	-0.0547	-0.0270
	(0.0623)	(0.0633)	(0.0707)	(0.0464)	(0.0466)	(0.0550)
Treatment*Below-median FL	0.195**	0.193**	0.231**	0.122*	0.122*	0.118
	(0.0873)	(0.0875)	(0.0977)	(0.0650)	(0.0651)	(0.0764)
Manipulation check						
Depletion Index after R1 (std.)		0.0121	0.0276			
		(0.0234)	(0.0256)			
Depletion Index after R2 (std.)					-0.0122	-0.0241
					(0.0170)	(0.0204)
Socio-economic						
Female			-0.0461			-0.0349
			(0.0530)			(0.0414)
Age			0.00775			0.00688
			(0.00648)			(0.00508)
Bachelor degree or higher			0.0154			-0.00868
			(0.0601)			(0.0470)
Student			-0.330**			0.0843
			(0.144)			(0.112)
Working at least 10h/week			0.0311			0.0511
			(0.0577)			(0.0450)
Financial characteristics						
Mthl. net income above 1000 €			0.0463			-0.00430
			(0.0695)			(0.0545)
Spontaneous buyer (1-5 scale)			-0.0161			0.00241
			(0.0209)			(0.0165)
Ever in debt on overdraft			-0.0641			0.00158
			(0.0570)			(0.0446)
Currently has consumer debt			-0.195*			-0.00778
			(0.101)			(0.0789)
Previously had consumer debt			0.117			-0.0802
			(0.0877)			(0.0686)
Always/often worried about finances			-0.0538			-0.0469
			(0.0704)			(0.0557)
Always/often stressed about money			-0.0260			-0.0705
			(0.0643)			(0.0504)
Experiment						
Felt cold (1-5 scale)			0.0160			0.00488
			(0.0233)			(0.0182)
Knows earlier subject			0.0420			0.121**
			(0.0619)			(0.0487)
Lab experience above 5x			-0.129**			-0.0481
			(0.0635)			(0.0497)
Constant	0.151*	0.158*	0.187	0.0972	0.0924	0.490*
	(0.0829)	(0.0842)	(0.320)	(0.0617)	(0.0621)	(0.250)
Observations	283	283	236	283	283	236
R-squared	0.066	0.067	0.161	0.034	0.035	0.162

* OLS Regression Results with Session Fixed Effects. Below-median financially literate participants are those with a standardized financial literacy (FL) score below the median (see Appendix I.7). These are 49.82% of the full sample or 141 participants. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Descriptive Statistics and T-Test by High and Low Financial Literacy

Variable	High financial literacy (Mean)	Low financial literacy (Mean)	t-test (p-value)	N
Depletion Index (std.)	-0.20	0.33	0.000	283
Exhaustion prior to experiment (1-10 scale)	5.23	4.33	0.001	283
Felt cold during experiment (1-5 scale)	2.48	2.59	0.480	239
Self-control scale (std.)	-0.09	0.15	0.054	283
Number of correct CRT questions	2.06	1.17	0.000	283
No false answers in comprehension questions	0.65	0.50	0.013	283
Knows earlier subject	0.15	0.25	0.039	283
Lab experience above 5x	0.18	0.25	0.195	283
Mthl. net income above 1000 €	0.18	0.18	0.953	275
Ever in debt on overdraft	0.26	0.30	0.446	283
Currently has consumer debt	0.09	0.12	0.303	283
Previously had consumer debt	0.12	0.19	0.106	283
Always/often worried about finances	0.20	0.29	0.069	283
Always/often stressed about money	0.30	0.42	0.047	283

* This table shows means and p-values for t-tests by financial literacy. High financial literacy refers to answering 5 questions (the median) or more correctly (out of 7), while low financial literacy refers to less than 5 (see Appendix I.7 for the list of questions).

Table 7: Borrowing for Consumption in the GSOEP-IS

Variable	(1) Household or personal consumer debt			(2) Unable to repay consumer debt without problems			(3) Unable to repay repay all debt on time		
	Dummy			*Dummy*			*Dummy*		
Average SCS (std.)	-0.06***	-0.09**	-0.00	-0.05***	-0.18***	-0.13*	-0.01***	-0.01	-0.01
	(0.015)	(0.042)	(0.046)	(0.020)	(0.068)	(0.076)	(0.005)	(0.013)	(0.014)
FL sum		-0.01	-0.01		-0.05***	-0.05***		-0.00	-0.00
		(0.009)	(0.011)		(0.013)	(0.015)		(0.003)	(0.004)
Average SCS (std.)		0.01	-0.00		0.03*	0.02		-0.00	0.00
*FL sum		(0.009)	(0.010)		(0.014)	(0.015)		(0.003)	(0.003)
Socio-economic									
Female			-0.01			0.02			-0.03**
			(0.031)			(0.038)			(0.011)
Age			0.02***			-0.00			-0.00
			(0.005)			(0.009)			(0.002)
Age squared			-0.00***			0.00			-0.00
			(0.000)			(0.000)			(0.000)
Education			-0.01			-0.04			0.00
			(0.023)			(0.033)			(0.009)
Income			-0.00			0.00			-0.00**
			(0.000)			(0.000)			(0.000)
Constant	0.24***	0.28***	0.02	0.10***	0.35***	0.52**	0.01***	0.02	0.09*
	(0.015)	(0.043)	(0.143)	(0.019)	(0.063)	(0.234)	(0.005)	(0.014)	(0.052)
Interaction	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	851	851	771	249	249	240	594	594	542
R-squared	0.016	0.018	0.067	0.030	0.115	0.116	0.013	0.013	0.039

* OLS regression results based on the GSOEP-IS wave data from 2016, 2017, and 2018. FL sum refers to the number of correctly answered financial literacy questions. Income refers to the monthly net income of the household. Column 2 is conditional on the presence of consumer debt, column 3 on any debt. Both include repayment rates and interest rates. In column 3, the ability to pay all debt on time is measured as able to repay all obligations in the past year without any delay. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

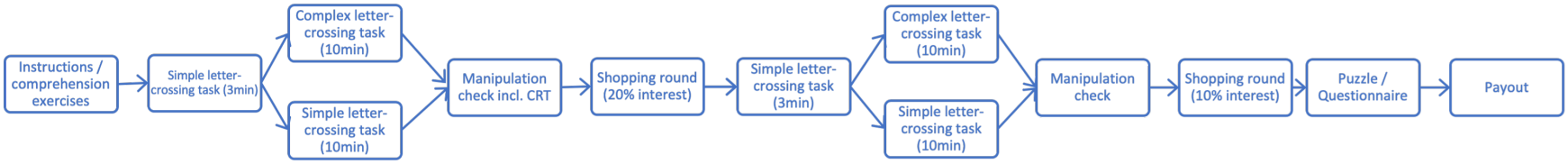
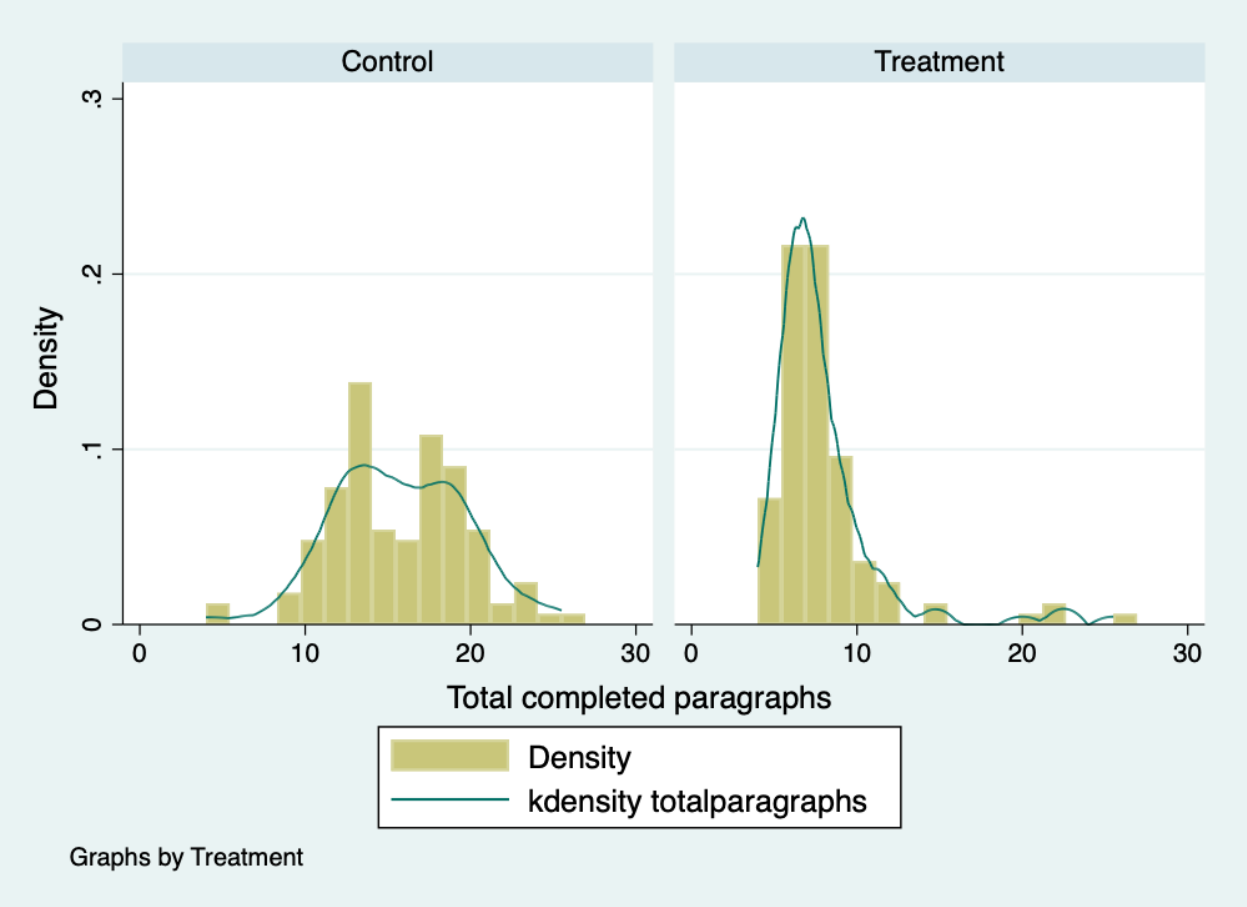


Figure 1: Experimental flow

Figure 2: Distribution of completed paragraphs in letter-crossing task



Note: This includes completed paragraphs from both rounds for 232 experimental participants as these were only recorded during the main sessions.

Appendix for "The Effect of Self-Control and Financial Literacy on Impulsive Borrowing: Experimental Evidence"

Contents:

I: Experimental Material

II: Additional Results from Experiment

III: The German Socio-Economic Panel

I. Experimental Material

I.1. Instructions

Instructions

The experiment in which you will now participate is designed to analyze decision-making behavior. The room temperature is part of the experiment. We ask you not to wear your coats in the laboratory.

For your participation in this experiment, you will receive an amount of **7 euros**. You will receive this amount regardless of your decisions and other events in the experiment. Furthermore, you can earn a sum of money in this experiment, which depends on your decisions. It is therefore very important that you read these instructions thoroughly and carefully.

During the experiment, you are not allowed to use electronic devices or communicate with other participants. Please use only the programs and functions intended for the experiment. Please do not talk to the other participants.

If you have a question, please raise your hand. We will then come to you and answer your question in silence. Please do not ask your questions out loud. If the question is relevant for all participants, we will repeat it out loud and answer it. If you violate these rules, we must exclude you from the experiment and the payout.

At the beginning of the experiment, you will find short comprehension questions on the screen, which we kindly ask you to answer. If you answer one or more of these questions incorrectly, one of the experimenters will come to you to clarify any open questions.

Structure of the experiment

1. Working round 1
2. Questions about working round 1
3. Drinks round 1
4. Working round 2
5. Questions about working round 2
6. Drinks round 2
7. Puzzle
8. Questionnaire

What happens in a working round?

During a working round, you have to process two tasks. For each of these tasks, you have to cross out letters from a text. For detailed instructions, please refer to the screen in front of you. The first task is three minutes long; the second is 10 minutes long. It is better to work thoroughly on fewer paragraphs than to work inaccurately on many paragraphs. The remaining time is shown on the screen in front of you in the upper right corner. For both working rounds, you will receive a total **of 5 euros**.

After each working round, there are a few questions about your perception during the working round.

What happens during the drinks round?

In these rounds, you can buy hot drinks. These are coffee, tea and hot chocolate. These drinks cost 1€: Milk and sugar are an extra 30 cents each. Since you have not earned any money at this point, you will have to pay back the purchase from the money you earned at the end of the experiment. So you take out a loan in the meantime. Interest is charged on this loan. In the first round of drinks the interest rate is 20% of the loan. In the second round of drinks, the interest rate is 10% of the loan.

If you do not buy a drink, you will get a free cup of tap water. The other participants cannot see what you have bought.

Questionnaire and puzzle:

After the second round of drinks, there will be a short puzzle and a questionnaire. For answering both, you will get **5 euros**.

Payout:

This experiment will take about 60 minutes. You will receive a flat rate of 7 euros and will earn another 10 euros during the experiment. The borrowed credit will be deducted from these earnings.

I.2. Comprehension questions

Comprehension questions

Here are six questions to test your understanding of the instructions. The answers to the questions will not affect your payout.

1. In this experiment, I will work on texts independently and not interact with other participants.
    a. Correct
    b. False

2. **(Note: this question is only included in the pilot session due to time constraints)** After each working round, I will have the opportunity to buy a hot drink. The price of the hot drink (without credit costs) will be lower after the first working round than after the second working round.
    a. Correct
    b. False

3. How many tasks are there in a working round?
    a. 1
    b. 2
    c. 4

4. How is a working round remunerated?
    a. I get 2 cents for every letter crossed out correctly
    b. I get 5 euro for both work rounds together
    c. I get 5 euro if I finish two paragraphs

5. What does a hot drink with milk and sugar cost?
    a. 1 euro
    b. 1.30 euro
    c. 1.60 euro

6. How can I repay a loan?
    a. Not at all
    b. The loan will be deducted from my earnings in the experiment
    c. I have to pay off the loan with cash

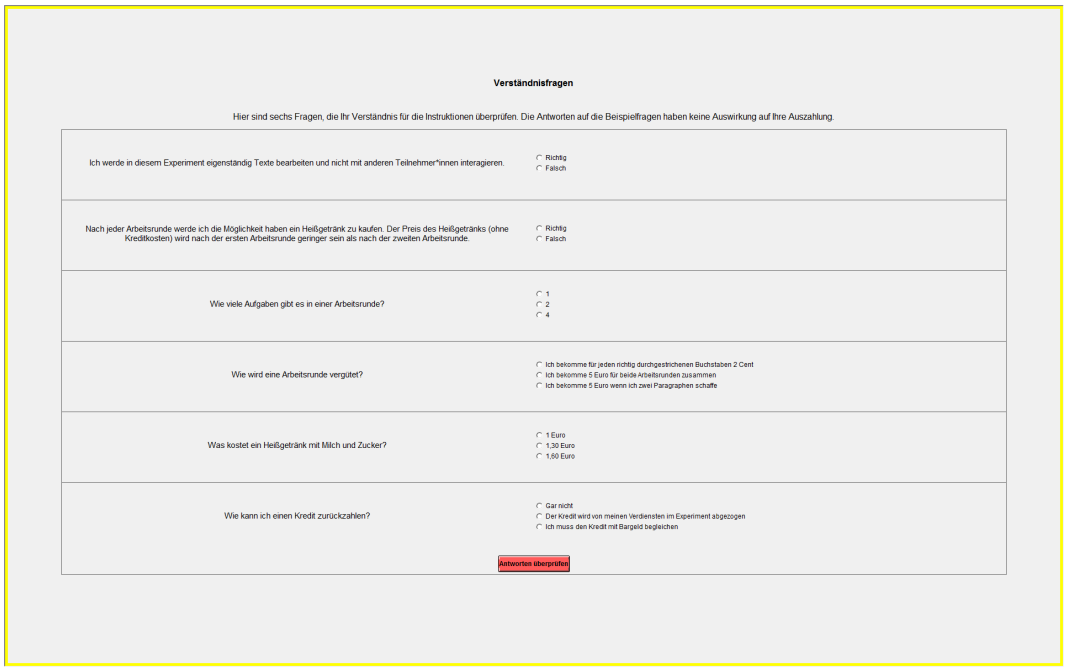


Figure I.I: Six comprehension questions as displayed to participants during pilot

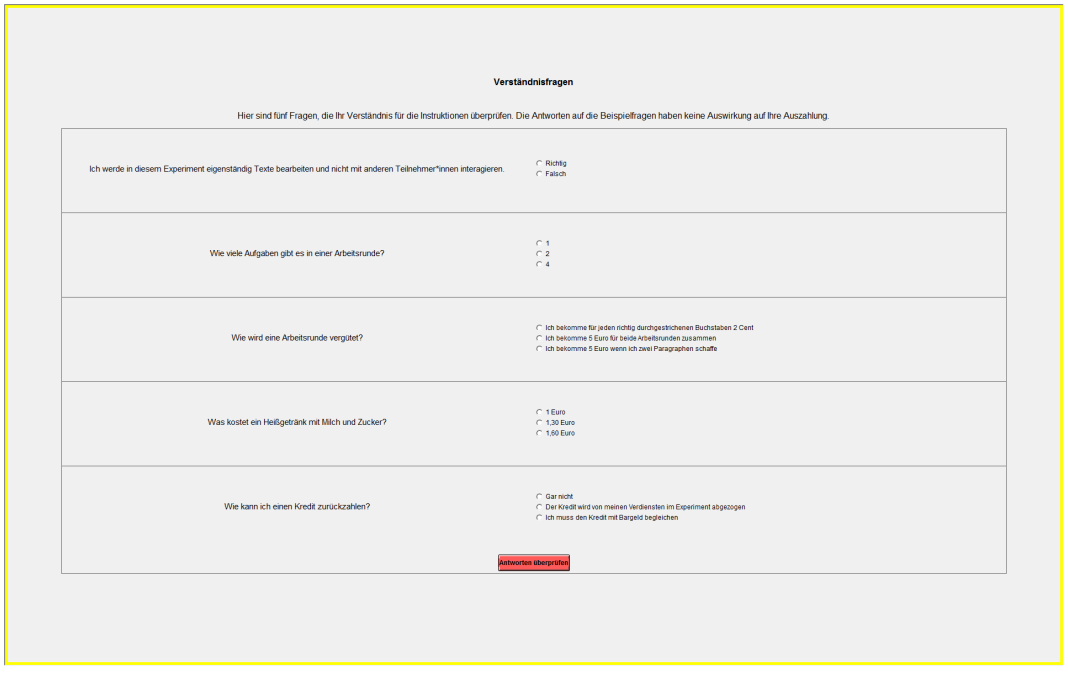


Figure I.II: Five comprehension questions as displayed to participants during main sessions

I.3. Ego depletion material: Example

The selected materials for the ego depletion exercises are extracted pages from the 1987 book "Praktische Wirtschaftsstatistik" by Dietrich Kunz. The selected parts describe and discuss methods for statistical recording from 1950 until 1987 in Germany. Below one example, namely, the first text in working round 1 handed out to both the treatment and control group.

II Bereichsübergreifende Erhebungen

1 Arbeitsstättenzählungen

Arbeitsstättenzählungen sind totale Bestandsaufnahmen sämtlicher Arbeitsstätten außerhalb der Landwirtschaft[157]. Sie umfassen auch die Arbeitsstätten des öffentlichen Dienstes und der Organisationen ohne Erwerbszweck. In der Bundesrepublik Deutschland gab es derartige Erhebungen bisher in den Jahren 1950, 1961 und 1970. Die nächste Arbeitsstättenzählung ist für 1987 geplant.

Mit dem Auf- und Ausbau bereichsgebundener Berichtssysteme in der Zeit seit dem Zweiten Weltkrieg haben die Arbeitsstättenzählungen ihre einstige Bedeutung größtenteils verloren. Während sie früher für fast alle Wirtschaftszweige die wichtigste Informationsquelle waren, sind sie inzwischen zu einer Art Rahmenerhebung geworden. Ihr Erkenntniswert liegt nach wie vor darin, daß sie für einen bestimmten Zeitpunkt einen Gesamtüberblick über alle Arbeitsstätten und Unternehmen außerhalb der Landwirtschaft vermitteln. Auch sind sie weiterhin von spezieller Bedeutung für diejenigen Wirtschaftszweige, in denen es keine besonderen Berichtssysteme gibt. Das gilt vor allem für bestimmte Zweige des Dienstleistungsbereichs.

Arbeitsstättenzählungen erfordern einen großen Erhebungsapparat. Sie werden daher in Verbindung mit Volkszählungen durchgeführt. Bei diesen Großzählungen werden die Gemeinden in Zählbezirke eingeteilt. Ein Zähler muß alle Grundstücke und Gebäude seines Zählbezirks aufsuchen, um festzustellen, welche Haushalte und Arbeitsstätten sich dort befinden. Dabei hat er jeder Arbeitsstätte einen Fragebogen, den Arbeitsstättenbogen, auszuhändigen und ihn nach Ausfüllung wieder abzuholen. Das Erhebungsprogramm beschränkt sich auf verhältnismäßig wenige, leicht zu beantwortende Fragen. Das ist notwendig, da der Kreis der Befragten sehr groß und mannigfaltig ist (vom Zeitungskiosk bis zum Automobilwerk) und das Zählgeschäft von ehrenamtlichen Zählern innerhalb weniger Tage abgewickelt werden muß.

Bei der Aufbereitung werden die Arbeitsstätten nach Wirtschaftszweigen und in einer sehr tiefen regionalen Gliederung dargestellt. Das wichtigste quantitative Merkmal ist die Anzahl der in den Arbeitsstätten tätigen Personen, gruppiert nach Männern und Frauen – mit »Darunterzahlen« für Teilzeitbeschäftigte und für Ausländer – sowie nach der Stellung im Betrieb. Die Ergebnisse vermitteln ein Gesamtbild aller Beschäftigten außerhalb der Landwirtschaft nach dem Arbeitsortkonzept[158]. Vor allem regionalstatistischen Zwecken dient auch die Erfragung der Bruttolohn- und -gehaltsumme.

Im Rahmen der Arbeitsstättenzählungen lassen sich mit verhältnismäßig geringem Aufwand auch Ergebnisse für Unternehmen gewinnen. Dazu wird bei jeder Arbeitsstätte die Niederlassungsart festgestellt, d. h. es wird gefragt, ob es sich um die einzige Arbeitsstätte, die Hauptniederlassung oder die Zweigniederlassung eines Unternehmens handelt. Die Anzahl der Unternehmen ergibt sich dann als Summe der einzigen Niederlassungen (weitaus häufigster Fall) und der Hauptniederlassungen. Für die Zwecke der Unternehmensaufbereitung machen die Hauptniederlassungen einige zusätzliche Angaben für das Unternehmen als Ganzes (Wirtschaftszweig, tätige Personen in vereinfachter Gruppierung, Bruttolohn- und -gehaltsumme, Rechtsform[159]).

I.4. Shopping information

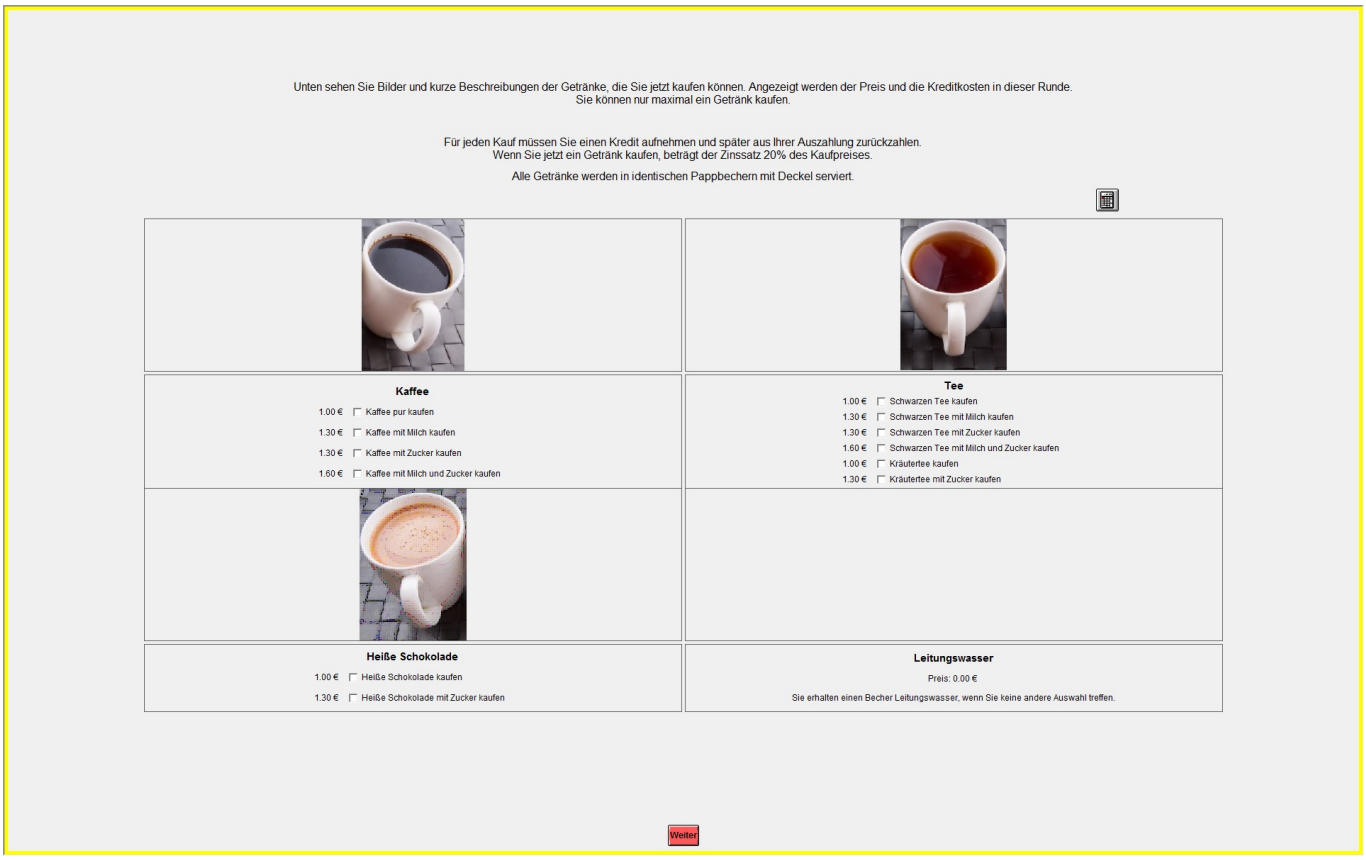


Figure I.III: Shopping information in round 1 as displayed to participants

I.5. Cognitive reflection test

Below, the questions by Frederick (2005) as displayed in the experiment and translated from German.

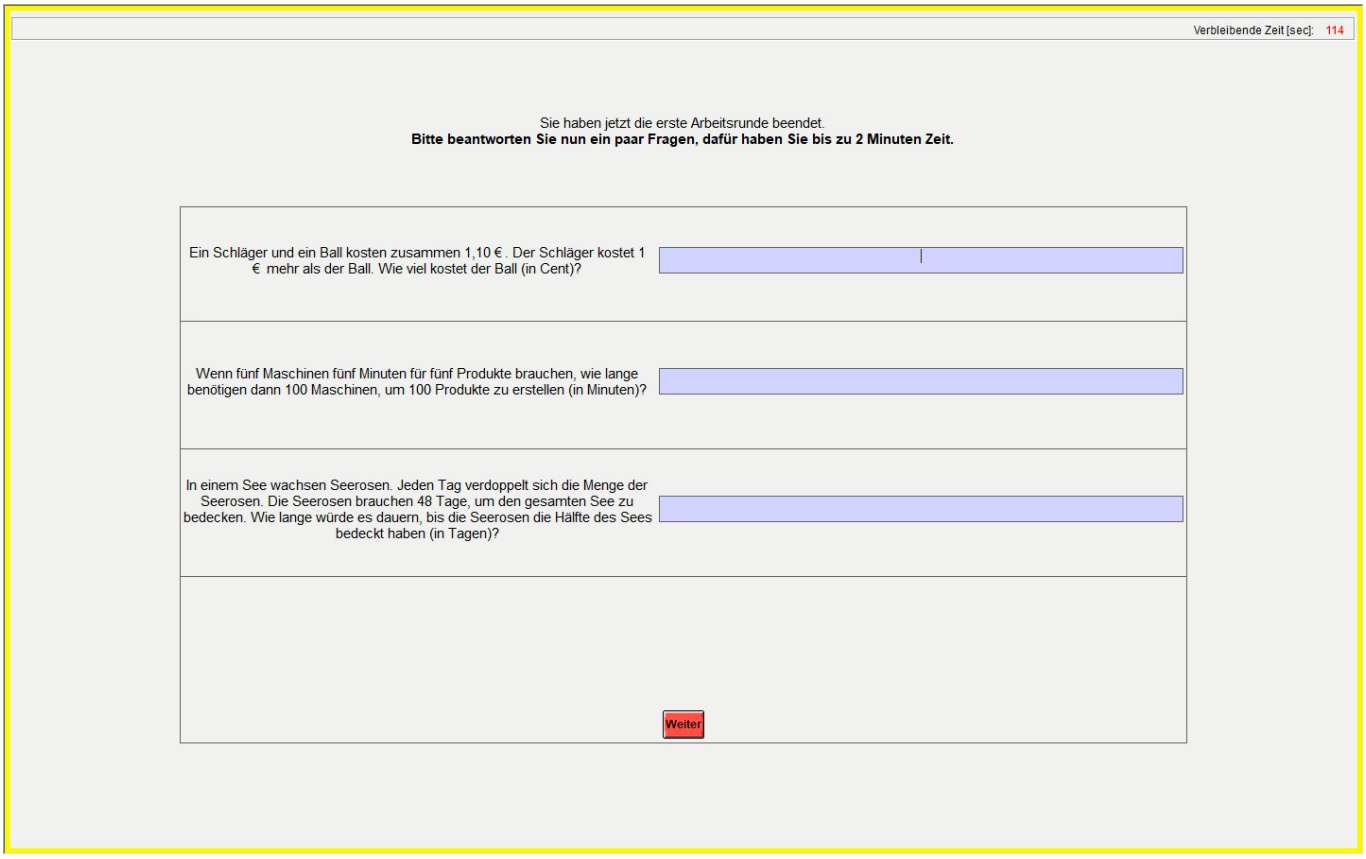


Figure I.IV: CRT questions

You have now completed the first working round. **Please answer a few questions now, you have up to 2 minutes to do so.**

1. A bat and a ball cost 1.10 € in total. The bat costs 1 € more than the ball. How much does the ball cost (in cents)?

2. If it takes 5 machines 5 minutes to make 5 products, how long would it take 100 machines to make 100 products (in minutes)?

3. In a lake, water lilies are growing. Every day, the number of water lilies doubles. The water lilies need 48 days to cover the entire lake. How long would it take for the water lilies to cover half of the lake (in days)?

[Next page in experiment:] Did you already know one or more of the questions just asked here? Please answer truthfully. Yes/No

I.6. Puzzle

As part of our manipulation check, participants must decide after the first working round whether they want to do a rather easy or rather harder puzzle at the end of the experiment. These ultimate puzzles are displayed and translated below.

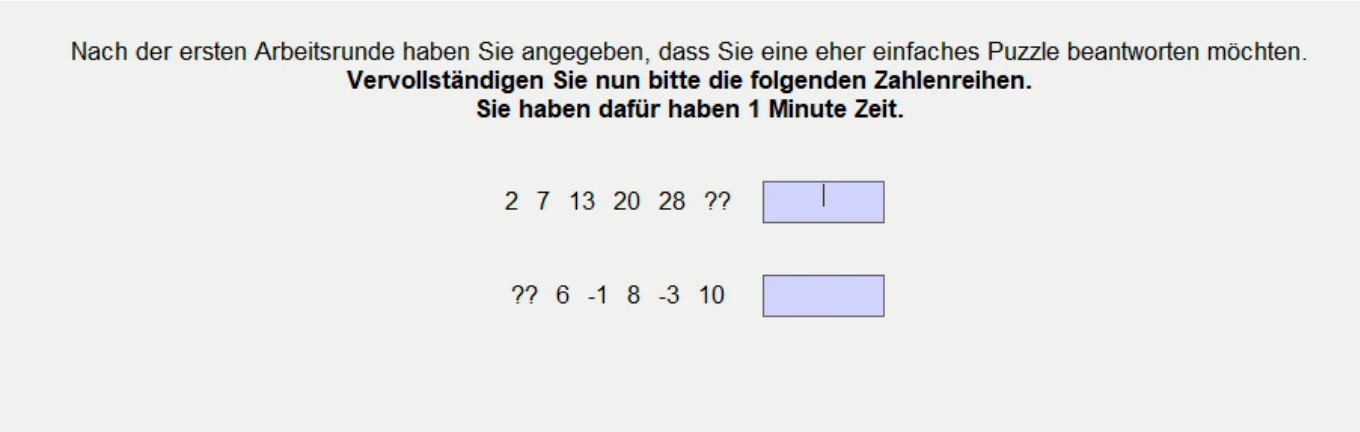


Figure I.V: Easy number series

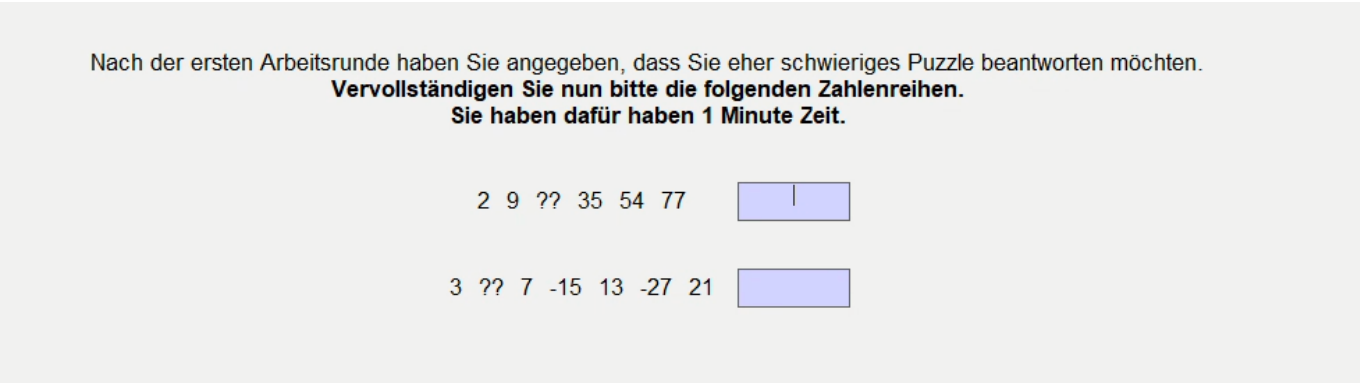


Figure I.VI: Hard number series

After the first working round, you indicated that you would like to answer a rather [easy/hard] puzzle. **Now please complete the following series of numbers. You have 1 minute for this.**

I.7. Financial literacy

To measure financial literacy, we use the following seven questions, measuring a basic understanding of interest rates, inflation, the function of the stock market, risk diversification, and volatility. On average, the experimental participants answer 4.82 questions correctly.

To construct a single standardized score of financial literacy, we standardize the accuracy of each response, take the mean of the seven values, and standardize this number again.

The questions are translated from German.

1. Assume you have 100 € in your savings account. This balance will earn interest at 2% per year and you will leave it in your account for 5 years. How much money will be in your savings account after 5 years?

    - More than 102 €
    - Exactly 102 €
    - Less than 102 €
    - Don't know

2. Suppose the interest rate on your savings account is 1% per year, and the inflation rate is 2% per year. What do you think: After one year, will you be able to buy as much, more or less, than today with the balance of your savings account?

    - More
    - Just as much
    - Less
    - Don't know

3. What is the main function of the stock market?

    - The stock market helps to predict stock profits
    - The stock market leads to an increase in stock prices
    - The stock market brings together buyers and sellers of shares
    - None of the above
    - Don't know

4. Is the following statement correct or false: investing in shares of a single company is less risky than investing in a share fund.

    - Correct
    - False
    - Don't know

5. Which of the following investment forms shows the highest fluctuations in return over time?

    - Savings accounts
    - Time deposits
    - Fixed-interest securities
    - Shares
    - Don't know

6. Assume you have 100 € in your savings account. This balance will earn interest at 20% per year and you will leave it in this account for five years. How much money will be in your savings account after 5 years?

- More than 200 €
- Exactly 200 €
- Less than 200 €
- Don't know

7. Let's assume you have 2,000 € on your savings account, and you receive 10% interest every year. How much money do you have on your savings account after two years?

   Answer: _____

I.8. Self-control scale

The 13 item scale to elicit self-perceived self-control capacity is the SCS-K-D taken from Bertrams and Dickhäuser (2009), translated to German but directly based on Tangney et al. (2004). Participants are asked to judge themselves on a scale from 1 (completely disagree) to 5 (completely agree) for each statement.

1. I am good at resisting temptation.
2. I have a hard time breaking bad habits.
3. I am lazy.
4. I say inappropriate things.
5. I do certain things that are bad for me, if they are fun.
6. I wish I had more self-discipline.
7. Pleasure and fun sometimes keep me from getting work done.
8. I have trouble concentrating.
9. I am able to work effectively toward long-term goals.
10. Sometimes I can't stop myself from doing something, even if I know it is wrong.
11. I often act without thinking through all the alternatives.
12. I refuse things that are bad for me.
13. People would say that I have iron self-discipline.

II. Additional Results from Experiment

Table II.I: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Socio-economic					
Female	0.49	0.501	0	1	280
Age	22.56	4.657	16	54	282
Bachelor degree or higher	0.31	0.464	0	1	283
Student	0.96	0.194	0	1	283
Working at least 10h/week	0.29	0.454	0	1	283
Financial characteristics					
Mthl. net income above 1000 €	0.18	0.386	0	1	275
Financial literacy (std.)	0.00	1.000	-2.76	1.14	283
Spontaneous buyer	2.67	1.238	1	5	283
Ever in debt on overdraft	0.28	0.448	0	1	283
Currently has consumer debt	0.10	0.299	0	1	283
Previously had consumer debt	0.14	0.353	0	1	283
Always/often worried about finances	0.23	0.424	0	1	283
Always/often stressed about money	0.34	0.475	0	1	283
Experiment					
Exhaustion prior to experiment	4.89	2.202	1	10	283
Felt cold during experiment	2.52	1.118	1	5	239
Knows earlier subject	0.18	0.388	0	1	283
Lab experience above 5x	0.20	0.404	0	1	283
Truthful survey information	4.64	0.640	1	5	283

Table II.II: Manipulation Check across Treatments excluding Pilot Sessions

Variable	Full Sample (Mean)	Treatment (Mean)	Control (Mean)	Diff.	t-test (p-value)
Reported mental state and motivation					
Exhaustion Δ after R1 rel. start	0.82	0.79	0.85	0.07	0.765
Exhaustion Δ after R2 rel. start	1.29	1.26	1.31	0.04	0.881
Concentr. difficulty Δ from task 1-2 in R1	1.78	2.78	0.78	-2.00	0.000
Concentr. difficulty Δ from task 1-2 in R2	2.09	2.96	1.22	-1.74	0.000
Number of wrong CRT questions	1.32	1.31	1.34	0.04	0.806
Easy puzzle chosen	0.47	0.50	0.44	-0.06	0.327
Aggregate					
Depletion Index after R1 (std.)	0.00	0.19	-0.19	-0.38	0.003
Depletion Index after R2 (std.)	0.00	0.23	-0.23	-0.45	0.000
Depletion Index (std.)	0.00	0.24	-0.24	-0.49	0.000
Observations	235	118	117		

Table II.III: Treatment Effect on Impulsive Borrowing excluding Pilot Sessions

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0577	0.0466	0.0696	0.00814	0.0161	0.0222
	(0.0480)	(0.0489)	(0.0498)	(0.0360)	(0.0371)	(0.0383)
Manipulation check						
Depletion Index after R1 (std.)		0.0290	0.0253			
		(0.0249)	(0.0268)			
Depletion Index after R2 (std.)					-0.0175	-0.0202
					(0.0188)	(0.0204)
Socio-economic						
Female			-0.0454			-0.0256
			(0.0535)			(0.0411)
Age			0.00760			0.00497
			(0.00659)			(0.00506)
Bachelor degree or higher			0.0229			-0.00536
			(0.0608)			(0.0466)
Student			-0.310**			0.0552
			(0.147)			(0.113)
Working at least 10h/week			0.0291			0.0549
			(0.0584)			(0.0447)
Financial characteristics						
Mthl. net income above 1000 €			0.0633			-0.00505
			(0.0706)			(0.0543)
Financial literacy (std.)			-0.0540*			0.000557
			(0.0285)			(0.0211)
Spontaneous buyer (1-5 scale)			-0.0143			0.000738
			(0.0211)			(0.0164)
Ever in debt on overdraft			-0.0674			0.00707
			(0.0576)			(0.0443)
Currently has consumer debt			-0.201*			0.00114
			(0.103)			(0.0787)
Previously had consumer debt			0.131			-0.0739
			(0.0875)			(0.0672)
Always/often worried about finances			-0.0414			-0.0495
			(0.0710)			(0.0551)
Always/often stressed about money			-0.0538			-0.0504
			(0.0665)			(0.0510)
Experiment						
Felt cold (1-5 scale)			0.0147			0.00251
			(0.0235)			(0.0180)
Knows earlier subject			0.0446			0.123**
			(0.0625)			(0.0483)
Lab experience above 5x			-0.120*			-0.0598
			(0.0646)			(0.0496)
Constant	0.171**	0.189**	0.355	0.0959	0.0887	-0.0689
	(0.0857)	(0.0870)	(0.255)	(0.0643)	(0.0648)	(0.192)
Observations	235	235	232	235	235	232
R-squared	0.027	0.033	0.146	0.022	0.025	0.102

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.IV: Treatment Effect on Impulsive Borrowing by Financial Literacy excluding Pilot Sessions

Dependent variable	In Round 1			In Round 2		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0448	-0.0489	-0.0463	-0.0430	-0.0351	-0.0362
	(0.0675)	(0.0679)	(0.0686)	(0.0512)	(0.0519)	(0.0532)
Below-median FL	-0.0435	-0.0492	-0.0423	-0.0552	-0.0524	-0.0375
	(0.0688)	(0.0694)	(0.0713)	(0.0522)	(0.0523)	(0.0545)
Treatment*Below-median FL	0.216**	0.210**	0.230**	0.102	0.103	0.124
	(0.0959)	(0.0965)	(0.0982)	(0.0728)	(0.0728)	(0.0754)
Manipulation check						
Depletion Index after R1 (std.)		0.0166	0.0296			
		(0.0257)	(0.0262)			
Depletion Index after R2 (std.)					-0.0179	-0.0199
					(0.0189)	(0.0203)
Socio-economic						
Female			-0.0465			-0.0335
			(0.0532)			(0.0408)
Age			0.00770			0.00606
			(0.00653)			(0.00503)
Bachelor degree or higher			0.0134			-0.0138
			(0.0607)			(0.0466)
Student			-0.330**			0.0687
			(0.145)			(0.111)
Working at least 10h/week			0.0301			0.0513
			(0.0580)			(0.0444)
Financial characteristics						
Mthl. net income above 1000 €			0.0499			-0.0138
			(0.0705)			(0.0543)
Spontaneous buyer (1-5 scale)			-0.0156			-0.000802
			(0.0210)			(0.0163)
Ever in debt on overdraft			-0.0645			0.00449
			(0.0573)			(0.0440)
Currently has consumer debt			-0.197*			-0.0101
			(0.101)			(0.0779)
Previously had consumer debt			0.118			-0.0753
			(0.0881)			(0.0677)
Always/often worried about finances			-0.0537			-0.0603
			(0.0709)			(0.0551)
Always/often stressed about money			-0.0266			-0.0448
			(0.0656)			(0.0505)
Experiment						
Felt cold (1-5 scale)			0.0165			0.00404
			(0.0234)			(0.0180)
Knows earlier subject			0.0418			0.117**
			(0.0622)			(0.0481)
Lab experience above 5x			-0.129**			-0.0666
			(0.0644)			(0.0495)
Constant	0.194**	0.208**	0.396	0.129*	0.120	-0.0745
	(0.0949)	(0.0974)	(0.255)	(0.0720)	(0.0727)	(0.193)
Observations	235	235	232	235	235	232
R-squared	0.056	0.058	0.160	0.030	0.034	0.115

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.V: Treatment Effect on Borrowed Amount and Interest

Dependent variable	**In Round 1**			**In Round 2**		
Sum of loan and interest (€)	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0975	0.0828	0.118	0.0464	0.0597	0.0687
	(0.0689)	(0.0705)	(0.0799)	(0.0603)	(0.0622)	(0.0684)
Manipulation check						
Depletion Index after R1 (std.)		0.0360	0.0160			
		(0.0359)	(0.0422)			
Depletion Index after R2 (std.)					-0.0278	-0.0619*
					(0.0316)	(0.0363)
Socio-economic						
Female			-0.0899			-0.0548
			(0.0860)			(0.0736)
Age			0.0160			0.0126
			(0.0106)			(0.00906)
Bachelor degree or higher			0.0134			-0.0298
			(0.0973)			(0.0833)
Student			-0.324			0.102
			(0.237)			(0.202)
Working at least 10h/week			0.0801			0.112
			(0.0937)			(0.0801)
Financial characteristics						
Mthl. net income above 1000 €			0.0564			-0.0144
			(0.112)			(0.0965)
Financial literacy (std.)			-0.107**			-0.0340
			(0.0457)			(0.0377)
Spontaneous buyer (1-5 scale)			-0.00508			0.0168
			(0.0338)			(0.0292)
Ever in debt on overdraft			-0.127			-0.0501
			(0.0925)			(0.0794)
Currently has consumer debt			-0.274*			-0.0456
			(0.165)			(0.141)
Previously had consumer debt			0.115			-0.134
			(0.140)			(0.120)
Always/often worried about finances			-0.0637			-0.0502
			(0.114)			(0.0985)
Always/often stressed about money			-0.113			-0.109
			(0.105)			(0.0900)
Experiment						
Felt cold (1-5 scale)			0.0282			0.0133
			(0.0377)			(0.0323)
Knows earlier subject			0.162			0.267***
			(0.100)			(0.0866)
Lab experience above 5x			-0.177*			-0.102
			(0.103)			(0.0881)
Constant	0.323***	0.335***	0.789	0.348***	0.341***	0.451
	(0.123)	(0.124)	(0.519)	(0.108)	(0.108)	(0.445)
Observations	283	283	236	283	283	236
R-squared	0.026	0.030	0.137	0.043	0.046	0.139

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.VI: Treatment Effect on Borrowed Amount and Interest by Financial Literacy

Dependent variable	**In Round 1**			**In Round 2**		
Sum of loan and interest (€)	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0662	-0.0686	-0.0787	-0.0693	-0.0520	-0.0616
	(0.0957)	(0.0968)	(0.110)	(0.0847)	(0.0861)	(0.0945)
Below-median FL	0.0210	0.0181	-0.0191	0.00219	0.00963	-0.0236
	(0.0971)	(0.0988)	(0.114)	(0.0859)	(0.0861)	(0.0967)
Treatment*Below-median FL	0.349**	0.348**	0.397**	0.245**	0.244**	0.275**
	(0.136)	(0.137)	(0.157)	(0.120)	(0.120)	(0.134)
Manipulation check						
Depletion Index after R1 (std.)		0.00634	0.0208			
		(0.0365)	(0.0412)			
Depletion Index after R2 (std.)					-0.0341	-0.0600*
					(0.0314)	(0.0359)
Socio-economic						
Female			-0.0954			-0.0696
			(0.0853)			(0.0727)
Age			0.0166			0.0146
			(0.0104)			(0.00894)
Bachelor degree or higher			-0.00447			-0.0473
			(0.0968)			(0.0827)
Student			-0.361			0.111
			(0.231)			(0.198)
Working at least 10h/week			0.0839			0.109
			(0.0929)			(0.0791)
Financial characteristics						
Mthl. net income above 1000 €			0.0330			-0.0334
			(0.112)			(0.0958)
Spontaneous buyer (1-5 scale)			-0.00876			0.0124
			(0.0336)			(0.0290)
Ever in debt on overdraft			-0.125			-0.0546
			(0.0917)			(0.0785)
Currently has consumer debt			-0.267			-0.0604
			(0.162)			(0.139)
Previously had consumer debt			0.0781			-0.155
			(0.141)			(0.121)
Always/often worried about finances			-0.0855			-0.0722
			(0.113)			(0.0979)
Always/often stressed about money			-0.0634			-0.0872
			(0.103)			(0.0886)
Experiment						
Felt cold (1-5 scale)			0.0298			0.0149
			(0.0375)			(0.0321)
Knows earlier subject			0.157			0.257***
			(0.0996)			(0.0857)
Lab experience above 5x			-0.194*			-0.115
			(0.102)			(0.0874)
Constant	0.277**	0.281**	0.751	0.323***	0.310***	0.382
	(0.129)	(0.131)	(0.515)	(0.114)	(0.115)	(0.440)
Observations	283	283	236	283	283	236
R-squared	0.076	0.076	0.156	0.072	0.076	0.162

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.VII: Treatment Effect on Paid Interest and by Financial Literacy

Dependent variable **Interest paid overall in both rounds (€)**	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0136	0.0119	0.0184	-0.0115	-0.0115	-0.0135
	(0.0105)	(0.0109)	(0.0122)	(0.0146)	(0.0149)	(0.0166)
Below-median FL				-0.00116	-0.00112	-0.00934
				(0.0149)	(0.0151)	(0.0171)
Treatment*Below-median FL				0.0530**	0.0530**	0.0643***
				(0.0208)	(0.0209)	(0.0237)
Manipulation check						
Depletion Index (std.)		0.00330	0.000494		-0.000109	0.00136
		(0.00555)	(0.00645)		(0.00561)	(0.00630)
Socio-economic						
Female			-0.0138			-0.0147
			(0.0129)			(0.0128)
Age			0.00197			0.00210
			(0.00159)			(0.00157)
Bachelor degree or higher			0.00799			0.00511
			(0.0147)			(0.0146)
Student			-0.0496			-0.0535
			(0.0355)			(0.0347)
Working at least 10h/week			0.0107			0.0109
			(0.0141)			(0.0140)
Financial characteristics						
Mthl. net income above 1000 €			0.0150			0.0110
			(0.0170)			(0.0169)
Financial literacy (std.)			-0.0140**			
			(0.00682)			
Spontaneous buyer (1-5 scale)			-0.00357			-0.00412
			(0.00515)			(0.00510)
Ever in debt on overdraft			-0.0113			-0.0109
			(0.0139)			(0.0138)
Currently has consumer debt			-0.0392			-0.0388
			(0.0249)			(0.0244)
Previously had consumer debt			0.0168			0.0126
			(0.0212)			(0.0213)
Always/often worried about finances			-0.0128			-0.0166
			(0.0173)			(0.0171)
Always/often stressed about money			-0.0217			-0.0145
			(0.0159)			(0.0156)
Experiment						
Felt cold (1-5 scale)			0.00438			0.00482
			(0.00569)			(0.00565)
Knows earlier subject			0.0218			0.0206
			(0.0152)			(0.0150)
Lab experience above 5x			-0.0311**			-0.0338**
			(0.0155)			(0.0154)
Constant	0.0482**	0.0494***	0.0902	0.0437**	0.0437**	0.0831
	(0.0188)	(0.0189)	(0.0782)	(0.0198)	(0.0201)	(0.0773)
Observations	283	283	236	283	283	236
R-squared	0.019	0.021	0.132	0.062	0.062	0.156

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.VIII: Treatment Effect on Impulsive Borrowing excluding Round 1 Purchasers

Dependent variable	Round 2			Round 2 by Financial Literacy		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.00604	0.00646	0.0129	-0.0363	-0.0366	-0.00458
	(0.0332)	(0.0345)	(0.0400)	(0.0460)	(0.0471)	(0.0549)
Below-median FL				-0.0615	-0.0616	-0.0411
				(0.0475)	(0.0479)	(0.0568)
Treatment*Below-median FL				0.0864	0.0864	0.0439
				(0.0681)	(0.0683)	(0.0805)
Manipulation check						
Depletion Index after R2 (std.)		-0.000819	-0.00266		0.000535	-0.00345
		(0.0177)	(0.0215)		(0.0179)	(0.0216)
Socio-economic						
Female			-0.0276			-0.0318
			(0.0424)			(0.0424)
Age			0.000124			0.000893
			(0.00612)			(0.00617)
Bachelor degree or higher			0.0351			0.0333
			(0.0501)			(0.0506)
Student			0.0503			0.0721
			(0.147)			(0.147)
Working at least 10h/week			0.0216			0.0175
			(0.0479)			(0.0480)
Financial characteristics						
Mthl. net income above 1000 €			0.0361			0.0345
			(0.0597)			(0.0601)
Financial literacy (std.)			0.0200			
			(0.0223)			
Spontaneous buyer (1-5 scale)			-0.0118			-0.0114
			(0.0173)			(0.0174)
Ever in debt on overdraft			0.0521			0.0496
			(0.0468)			(0.0470)
Currently has consumer debt			0.0366			0.0254
			(0.0807)			(0.0805)
Previously had consumer debt			-0.0549			-0.0463
			(0.0745)			(0.0758)
Always/often worried about finances			-0.0301			-0.0351
			(0.0574)			(0.0582)
Always/often stressed about money			-0.0871*			-0.0910*
			(0.0517)			(0.0518)
Experiment						
Felt cold (1-5 scale)			0.00564			0.00725
			(0.0192)			(0.0193)
Knows earlier subject			0.0407			0.0394
			(0.0516)			(0.0518)
Lab experience above 5x			-0.0234			-0.0291
			(0.0505)			(0.0510)
Constant	0.102*	0.102*	0.652**	0.126*	0.126*	0.624**
	(0.0607)	(0.0611)	(0.262)	(0.0638)	(0.0644)	(0.265)
Observations	238	238	199	238	238	199
R-squared	0.014	0.014	0.163	0.023	0.023	0.162

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.IX: Treatment Effect on Impulsive Borrowing by Prior Exhaustion and Session Time

Dependent variable	In Round 1			In Round 2		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0578	0.0521	0.0740	0.0152	0.0167	0.0171
	(0.0431)	(0.0441)	(0.0486)	(0.0320)	(0.0330)	(0.0393)
Exhaustion prior to experiment (1-10 scale)	-0.0260***	-0.0246**	-0.0158	0.00867	0.00830	0.0103
	(0.00982)	(0.0101)	(0.0115)	(0.00730)	(0.00756)	(0.00944)
Morning session	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Noon session	-0.0459	-0.0468	-0.0499	0.0158	0.0161	0.00785
	(0.0545)	(0.0546)	(0.0646)	(0.0405)	(0.0406)	(0.0527)
Afternoon session	0.00552	0.00232	0.0145	0.0160	0.0164	-0.00134
	(0.0502)	(0.0505)	(0.0537)	(0.0373)	(0.0374)	(0.0435)
Manipulation check						
Depletion Index after R1 (std.)		0.0146	0.0121			
		(0.0228)	(0.0263)			
Depletion Index after R2 (std.)					-0.00332	-0.00742
					(0.0171)	(0.0215)
Socio-economic						
Female			-0.0372			7.63e-05
			(0.0518)			(0.0418)
Age			0.00693			0.00428
			(0.00636)			(0.00517)
Bachelor degree or higher			0.0240			0.00299
			(0.0589)			(0.0478)
Student			-0.256*			0.122
			(0.139)			(0.112)
Working at least 10h/week			0.0394			0.0353
			(0.0563)			(0.0455)
Financial characteristics						
Mthl. net income above 1000 €			0.0329			0.0214
			(0.0677)			(0.0551)
Financial literacy (std.)			-0.0550**			-0.00127
			(0.0277)			(0.0218)
Spontaneous buyer (1-5 scale)			-0.00849			-0.00661
			(0.0200)			(0.0163)
Ever in debt on overdraft			-0.0541			0.00572
			(0.0561)			(0.0457)
Currently has consumer debt			-0.187*			-0.0239
			(0.1000)			(0.0811)
Previously had consumer debt			0.126			-0.0564
			(0.0859)			(0.0698)
Always/often worried about finances			-0.0372			-0.0502
			(0.0688)			(0.0566)
Always/often stressed about money			-0.0795			-0.0647
			(0.0630)			(0.0511)
Experiment						
Felt cold (1-5 scale)			0.0214			0.00287
			(0.0224)			(0.0182)
Knows earlier subject			0.0398			0.105**
			(0.0603)			(0.0493)
Lab experience above 5x			-0.113*			-0.0277
			(0.0618)			(0.0501)
Constant	0.267***	0.264***	0.322	0.0182	0.0191	-0.163
	(0.0644)	(0.0646)	(0.230)	(0.0479)	(0.0481)	(0.186)
Observations	283	283	236	283	283	236
R-squared	0.035	0.036	0.135	0.006	0.006	0.071

* OLS Regression Results. In the first round of the experiment, we ask participants to rate their exhaustion before the experiment on a scale from one to ten. On average, treated participants report 4.98, and control participants choose 4.80. The difference is not statistically significant. 41% of sessions took place in the morning (starting between 9:00am and 10:30am), 25% took place at noon (11:30am, 12:00pm), and the remaining 34% were run in the afternoon (2:00pm, 3:30pm). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.X: Treatment Effect on Impulsive Borrowing by Financial Literacy and by Prior Exhaustion and Session Time

Dependent variable	In Round 1			In Round 2		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.0275	-0.0283	-0.0286	-0.0509	-0.0494	-0.0664
	(0.0602)	(0.0608)	(0.0663)	(0.0451)	(0.0460)	(0.0542)
Below-median FL	0.00374	0.00298	-0.143	-0.0596	-0.0592	-0.0318
	(0.0606)	(0.0613)	(0.0907)	(0.0454)	(0.0455)	(0.0735)
Treatment*Below-median FL	0.183**	0.183**	0.212**	0.134**	0.133**	0.175**
	(0.0853)	(0.0855)	(0.0953)	(0.0640)	(0.0641)	(0.0773)
Exhaustion prior to experiment (1-10 scale)	-0.0215**	-0.0214**	-0.0142	0.00968	0.00935	0.0118
	(0.00983)	(0.0100)	(0.0115)	(0.00737)	(0.00761)	(0.00940)
Morning session	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Noon session	-0.0514	-0.0514	-0.0601	0.0132	0.0135	0.00394
	(0.0538)	(0.0539)	(0.0643)	(0.0404)	(0.0404)	(0.0525)
Afternoon session	8.72e-05	-0.000319	0.0147	0.0153	0.0156	-0.00473
	(0.0496)	(0.0499)	(0.0533)	(0.0372)	(0.0373)	(0.0432)
Manipulation check						
Depletion Index after R1 (std.)		0.00206	0.00923			
		(0.0231)	(0.0261)			
Depletion Index after R2 (std.)					-0.00296	-0.00526
					(0.0171)	(0.0214)
Socio-economic						
Female			-0.0456			-0.00791
			(0.0515)			(0.0416)
Age			0.00833			0.00535
			(0.00634)			(0.00515)
Bachelor degree or higher			0.0158			-0.00685
			(0.0587)			(0.0476)
Student			-0.241*			0.118
			(0.139)			(0.112)
Working at least 10h/week			0.0341			0.0351
			(0.0560)			(0.0453)
Financial characteristics						
Mthl. net income above 1000 €			0.0193			0.00810
			(0.0675)			(0.0549)
Financial literacy (std.)			-0.0721*			0.0208
			(0.0432)			(0.0346)
Spontaneous buyer (1-5 scale)			-0.00765			-0.00805
			(0.0200)			(0.0162)
Ever in debt on overdraft			-0.0539			0.00502
			(0.0557)			(0.0453)
Currently has consumer debt			-0.201**			-0.0288
			(0.0995)			(0.0807)
Previously had consumer debt			0.143			-0.0627
			(0.0875)			(0.0711)
Always/often worried about finances			-0.0528			-0.0622
			(0.0686)			(0.0565)
Always/often stressed about money			-0.0734			-0.0515
			(0.0631)			(0.0511)
Experiment						
Felt cold (1-5 scale)			0.0247			0.00308
			(0.0223)			(0.0181)
Knows earlier subject			0.0362			0.101**
			(0.0599)			(0.0489)
Lab experience above 5x			-0.127**			-0.0385
			(0.0616)			(0.0500)
Constant	0.246***	0.246***	0.348	0.0454	0.0459	-0.156
	(0.0730)	(0.0731)	(0.229)	(0.0547)	(0.0549)	(0.185)
Observations	283	283	236	283	283	236
R-squared	0.067	0.067	0.156	0.022	0.022	0.094

* OLS Regression Results. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.XI: Treatment Effect on Impulsive Borrowing by Current Consumer Debt

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0676	0.0554	0.0636	0.00529	0.0110	0.0240
	(0.0464)	(0.0473)	(0.0521)	(0.0341)	(0.0354)	(0.0410)
Currently has consumer debt (dummy)	-0.0451	-0.0514	-0.226*	-0.0769	-0.0722	-0.0251
	(0.105)	(0.105)	(0.136)	(0.0775)	(0.0779)	(0.106)
Treatment*Currently has consumer debt	-0.0575	-0.0567	0.0520	0.0865	0.0799	0.0561
	(0.151)	(0.151)	(0.176)	(0.111)	(0.112)	(0.139)
Manipulation check						
Depletion Index after R1 (std.)		0.0297	0.0237			
		(0.0229)	(0.0262)			
Depletion Index after R2 (std.)					-0.0106	-0.0233
					(0.0170)	(0.0207)
Socio-economic						
Female			-0.0435			-0.0245
			(0.0536)			(0.0420)
Age			0.00746			0.00555
			(0.00658)			(0.00515)
Bachelor degree or higher			0.0263			0.00157
			(0.0607)			(0.0474)
Student			-0.311**			0.0711
			(0.147)			(0.114)
Working at least 10h/week			0.0295			0.0538
			(0.0582)			(0.0454)
Financial characteristics						
Mthl. net income above 1000 €			0.0568			0.000662
			(0.0706)			(0.0554)
Financial literacy (std.)			-0.0540*			-0.00102
			(0.0284)			(0.0214)
Spontaneous buyer (1-5 scale)			-0.0146			0.00433
			(0.0210)			(0.0165)
Ever in debt on overdraft			-0.0684			0.00336
			(0.0576)			(0.0451)
Previously had consumer debt			0.130			-0.0762
			(0.0872)			(0.0682)
Always/often worried about finances			-0.0425			-0.0376
			(0.0707)			(0.0559)
Always/often stressed about money			-0.0531			-0.0762
			(0.0653)			(0.0510)
Experiment						
Felt cold (1-5 scale)			0.0147			0.00425
			(0.0235)			(0.0183)
Knows earlier subject			0.0424			0.124**
			(0.0628)			(0.0495)
Lab experience above 5x			-0.123*			-0.0446
			(0.0645)			(0.0504)
Constant	0.187**	0.198**	0.204	0.0863	0.0829	0.529**
	(0.0800)	(0.0803)	(0.323)	(0.0587)	(0.0591)	(0.252)
Observations	283	283	236	283	283	236
R-squared	0.031	0.037	0.148	0.024	0.026	0.151

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.XII: Treatment Effect on Impulsive Borrowing by Previous Consumer Debt

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0694	0.0577	0.0606	-0.000696	0.00547	0.0125
	(0.0477)	(0.0487)	(0.0531)	(0.0350)	(0.0363)	(0.0418)
Previously had consumer debt (dummy)	0.107	0.100	0.107	-0.0933	-0.0908	-0.125
	(0.0839)	(0.0840)	(0.105)	(0.0616)	(0.0618)	(0.0819)
Treatment*Previously had consumer debt	-0.0161	-0.0104	0.0610	0.0823	0.0755	0.128
	(0.131)	(0.131)	(0.152)	(0.0961)	(0.0968)	(0.120)
Manipulation check						
Depletion Index after R1 (std.)		0.0261	0.0239			
		(0.0229)	(0.0262)			
Depletion Index after R2 (std.)					-0.0109	-0.0213
					(0.0170)	(0.0207)
Socio-economic						
Female			-0.0458			-0.0271
			(0.0534)			(0.0416)
Age			0.00790			0.00631
			(0.00658)			(0.00515)
Bachelor degree or higher			0.0237			-0.00196
			(0.0604)			(0.0471)
Student			-0.305**			0.0835
			(0.147)			(0.115)
Working at least 10h/week			0.0286			0.0514
			(0.0583)			(0.0453)
Financial characteristics						
Mthl. net income above 1000 €			0.0587			0.000814
			(0.0698)			(0.0546)
Financial literacy (std.)			-0.0542*			-0.00143
			(0.0284)			(0.0213)
Spontaneous buyer (1-5 scale)			-0.0144			0.00469
			(0.0210)			(0.0165)
Ever in debt on overdraft			-0.0667			0.00588
			(0.0574)			(0.0449)
Currently has consumer debt			-0.205**			-0.00666
			(0.103)			(0.0802)
Always/often worried about finances			-0.0413			-0.0366
			(0.0706)			(0.0556)
Always/often stressed about money			-0.0549			-0.0799
			(0.0655)			(0.0510)
Experiment						
Felt cold (1-5 scale)			0.0151			0.00555
			(0.0235)			(0.0183)
Knows earlier subject			0.0452			0.127**
			(0.0624)			(0.0489)
Lab experience above 5x			-0.120*			-0.0417
			(0.0638)			(0.0498)
Constant	0.153*	0.163**	0.189	0.0963	0.0929	0.500**
	(0.0804)	(0.0809)	(0.323)	(0.0591)	(0.0594)	(0.252)
Observations	283	283	236	283	283	236
R-squared	0.035	0.040	0.148	0.029	0.031	0.155

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.XIII: Treatment Effect on Impulsive Borrowing by Financial Worries

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0658	0.0531	0.0617	0.0192	0.0248	0.0344
	(0.0504)	(0.0512)	(0.0571)	(0.0367)	(0.0377)	(0.0446)
Always/often worried about finances	-0.0616	-0.0696	-0.0581	-0.0920	-0.0908	-0.0240
	(0.0785)	(0.0786)	(0.0995)	(0.0572)	(0.0573)	(0.0783)
Treatment*Always/often worried	-0.00109	0.000497	0.0277	-0.000821	-0.00197	-0.0209
about finances	(0.106)	(0.106)	(0.119)	(0.0773)	(0.0774)	(0.0927)
Manipulation check						
Depletion Index after R1 (std.)		0.0312	0.0237			
		(0.0230)	(0.0262)			
Depletion Index after R2 (std.)					-0.0113	-0.0246
					(0.0168)	(0.0206)
Socio-economic						
Female			-0.0450			-0.0267
			(0.0534)			(0.0417)
Age			0.00771			0.00569
			(0.00656)			(0.00514)
Bachelor degree or higher			0.0228			0.000941
			(0.0609)			(0.0475)
Student			-0.316**			0.0754
			(0.149)			(0.116)
Working at least 10h/week			0.0289			0.0551
			(0.0584)			(0.0455)
Financial characteristics						
Mthl. net income above 1000 €			0.0610			0.00367
			(0.0698)			(0.0547)
Financial literacy (std.)			-0.0535*			-0.00148
			(0.0285)			(0.0214)
Spontaneous buyer (1-5 scale)			-0.0145			0.00397
			(0.0210)			(0.0166)
Ever in debt on overdraft			-0.0669			0.00445
			(0.0574)			(0.0450)
Currently has consumer debt			-0.201*			0.00398
			(0.102)			(0.0800)
Previously had consumer debt			0.132			-0.0778
			(0.0875)			(0.0685)
Always/often stressed about money			-0.0509			-0.0776
			(0.0659)			(0.0514)
Experiment						
Felt cold (1-5 scale)			0.0148			0.00326
			(0.0235)			(0.0184)
Knows earlier subject			0.0445			0.126**
			(0.0624)			(0.0490)
Lab experience above 5x			-0.122*			-0.0403
			(0.0643)			(0.0503)
Constant	0.186**	0.197**	0.204	0.0892	0.0860	0.523**
	(0.0794)	(0.0797)	(0.323)	(0.0579)	(0.0581)	(0.252)
Observations	283	283	236	283	283	236
R-squared	0.031	0.038	0.148	0.041	0.043	0.150

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.XIV: Treatment Effect on Impulsive Borrowing by Financial Stress

Dependent variable	**In Round 1**			**In Round 2**		
At least one drink purchased	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.0549	0.0383	0.0421	0.00171	0.00886	0.00414
	(0.0543)	(0.0554)	(0.0619)	(0.0397)	(0.0410)	(0.0482)
Always/often stressed about money	-0.100	-0.112	-0.0913	-0.101**	-0.0998**	-0.114*
	(0.0690)	(0.0694)	(0.0851)	(0.0505)	(0.0506)	(0.0665)
Treatment*Always/often stressed	0.0389	0.0494	0.0733	0.0520	0.0482	0.0713
about money	(0.0936)	(0.0937)	(0.104)	(0.0685)	(0.0687)	(0.0811)
Manipulation check						
Depletion Index after R1 (std.)		0.0328	0.0256			
		(0.0229)	(0.0264)			
Depletion Index after R2 (std.)					-0.0121	-0.0227
					(0.0169)	(0.0206)
Socio-economic						
Female			-0.0470			-0.0275
			(0.0534)			(0.0416)
Age			0.00751			0.00563
			(0.00655)			(0.00512)
Bachelor degree or higher			0.0207			-0.00385
			(0.0606)			(0.0472)
Student			-0.327**			0.0574
			(0.148)			(0.115)
Working at least 10h/week			0.0246			0.0494
			(0.0586)			(0.0456)
Financial characteristics						
Mthl. net income above 1000 €			0.0606			0.00489
			(0.0697)			(0.0545)
Financial literacy (std.)			-0.0535*			-0.00109
			(0.0284)			(0.0213)
Spontaneous buyer (1-5 scale)			-0.0147			0.00424
			(0.0210)			(0.0165)
Ever in debt on overdraft			-0.0675			0.00465
			(0.0574)			(0.0449)
Currently has consumer debt			-0.199*			0.00440
			(0.102)			(0.0798)
Previously had consumer debt			0.131			-0.0756
			(0.0871)			(0.0681)
Always/often worried about finances			-0.0383			-0.0334
			(0.0708)			(0.0558)
Experiment						
Felt cold (1-5 scale)			0.0154			0.00483
			(0.0234)			(0.0183)
Knows earlier subject			0.0447			0.126**
			(0.0623)			(0.0489)
Lab experience above 5x			-0.126*			-0.0476
			(0.0644)			(0.0503)
Constant	0.199**	0.213***	0.242	0.0991*	0.0955	0.563**
	(0.0801)	(0.0805)	(0.327)	(0.0586)	(0.0589)	(0.255)
Observations	283	283	236	283	283	236
R-squared	0.037	0.045	0.150	0.039	0.041	0.153

* OLS Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table II.XV: 2SLS Estimates of the Effect of the Treatment on Impulsive Borrowing

Dependent variable	**In Round 1**		**In Round 2**	
At least one drink purchased	(1)	(2)	(3)	(4)
Treatment	0.317	0.264	-0.0784	-0.178
	(0.219)	(0.206)	(0.131)	(0.170)
Socio-economic				
Female		-0.0509		-0.0105
		(0.0526)		(0.0424)
Age		0.00783		0.00592
		(0.00634)		(0.00510)
Bachelor degree or higher		0.0214		0.00633
		(0.0587)		(0.0472)
Student		-0.292**		0.0770
		(0.141)		(0.114)
Working at least 10h/week		0.0420		0.0451
		(0.0567)		(0.0457)
Financial characteristics				
Mthl. net income above 1000 €		0.0399		0.0247
		(0.0724)		(0.0585)
Financial literacy (std.)		-0.0701**		0.0102
		(0.0280)		(0.0226)
Spontaneous buyer (1-5 scale)		-0.0162		0.00481
		(0.0206)		(0.0166)
Ever in debt on overdraft		-0.0523		-0.00436
		(0.0569)		(0.0459)
Currently has consumer debt		-0.227**		0.0316
		(0.103)		(0.0828)
Previously had consumer debt		0.164*		-0.113
		(0.0929)		(0.0752)
Always/often worried about finances		-0.0516		-0.0317
		(0.0698)		(0.0563)
Always/often stressed about money		-0.0737		-0.0555
		(0.0648)		(0.0522)
Experiment				
Felt cold (1-5 scale)		0.0103		0.00734
		(0.0230)		(0.0185)
Knows earlier subject		0.0283		0.140***
		(0.0637)		(0.0514)
Lab experience above 5x		-0.129**		-0.0314
		(0.0626)		(0.0504)
Constant	0.0497	0.167	0.123	0.519**
	(0.134)	(0.311)	(0.0856)	(0.250)
Observations	283	236	283	236
R-squared		0.083		0.031

* IV Regression Results with Session Fixed Effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

III. The German Socio-Economic Panel

III.1. Sample Description and Summary Statistics

Table III.I provides information about the main socio-demographic characteristics of selected waves from the German Socio-Economic Panel (SOEP) Innovation Sample (IS). The GSOEP is one of the largest and longest-running multidisciplinary household surveys worldwide and an independent research-driven infrastructure. Data from the GSOEP surveys are made available to researchers worldwide. More information about the GSOEP can be found here.

In Table III.I, we present data from the GSOEP-IS waves 2016, 2017 and 2018. The sample consists of 51% female and 49% male respondents. Their age ranges from 17 to 96 years. 57% of respondents are married. In terms of education, the average respondent has upper secondary education and completed a vocational degree. The sample has a moderate financial literacy and an average monthly net household income of 2,946 €. The respondents differ with respect to their work situation (32% work full-time, 20% work part-time and 46% are economically inactive).

Table III.I: GSOEP-IS Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	N
Socio-demographics					
Female	0.51	0.50	0	1	901
Age	53.80	18.13	17	96	901
Married (share)	0.57	0.50	0	1	898
Education	1.99	0.71	0	3	864
Financial literacy	4.34	1.59	0	6	901
General health status (1-5 scale)	2.52	0.98	1	5	901
Overall life satisfaction (0-10 scale)	7.71	1.74	0	10	901
Income and Employment					
Monthly net household income (in €)	2,945.83	1,660.74	300	10,000	853
Full-time worker (share)	0.32	0.47	0	1	901
Part-time worker (share)	0.20	0.40	0	1	901
Not working (share)	0.46	0.50	0	1	901
Saving Behavior and Assets					
No ability to save regularly (share)	0.35	0.48	0	1	893
Regular saving for wealth accumulation (share)	0.31	0.46	0	1	901
Regular precautionary saving (share)	0.55	0.50	0	1	901
Monthly saving for wealth accumulation (in €)	140.43	385.59	0	4,000	895
Monthly precautionary saving (in €)	228.76	421.07	0	4,000	892
Assets (share)	0.59	0.49	0	1	892
Borrowing Behavior					
Current household consumer debt (share)	0.17	0.38	0	1	898
Current personal consumer debt (share)	0.13	0.34	0	1	832
Other personal loans excl. mortgages (share)	0.03	0.17	0	1	833
Able to repay consumer debt without problems	0.89	0.31	0	1	257
Unable to repay debt on time (1-3 scale)	1.03	0.21	1	3	624

Note: The table provides summary statistics for the SOEP-IS waves 2016, 2017, and 2018. Variables refer to individual characteristics unless specified otherwise. Education is an ordinal variable containing the highest achieved educational degree from 0 (no or basic educational degree), 1 (middle or upper secondary education), 2 (vocational degree), to 3 (university degree). Financial literacy is measured by the number of correctly answered questions out of 6. Both general health status and life satisfaction are self-assessed. 'Assets' refers to the presence of personal saving accounts and/or life insurance, stocks, bonds, or mutual funds. Being unable to meet debt obligations on time includes the repayment for all loans, mortgages, and leasing in the past year. It is measured with three responses: 1 being all debt obligations were met on time, 2 being one obligation was late or was not met, 3 being more than one obligation being late or not met. The last two variables are conditional on debt obligations.

Table III.II: Self-control Scale (SCS)

Variable	Mean	Std. Dev.	Min	Q25	Q50	Q75	Max	N
Average SCS score	3.60	0.585	1.77	3.23	3.62	4	5	893

Note: The table provides summary statistics for the self-control scale (SCS) module deployed in the SOEP-IS 2018 survey. Respondents rated their self-perceived trait, measured via the 13-item-scale identical to the experimental version presented in I.8. The responses are measured on a Likert scale from 1 to 5, where 1 indicates 'Completely disagree' and 5 indicates 'Completely agree.' The 13 responses are first recoded to be increasing in the ability for self-control and secondly are equally weighed to calculate the average score.

Figure III.I: Histogram of Average SCS Score

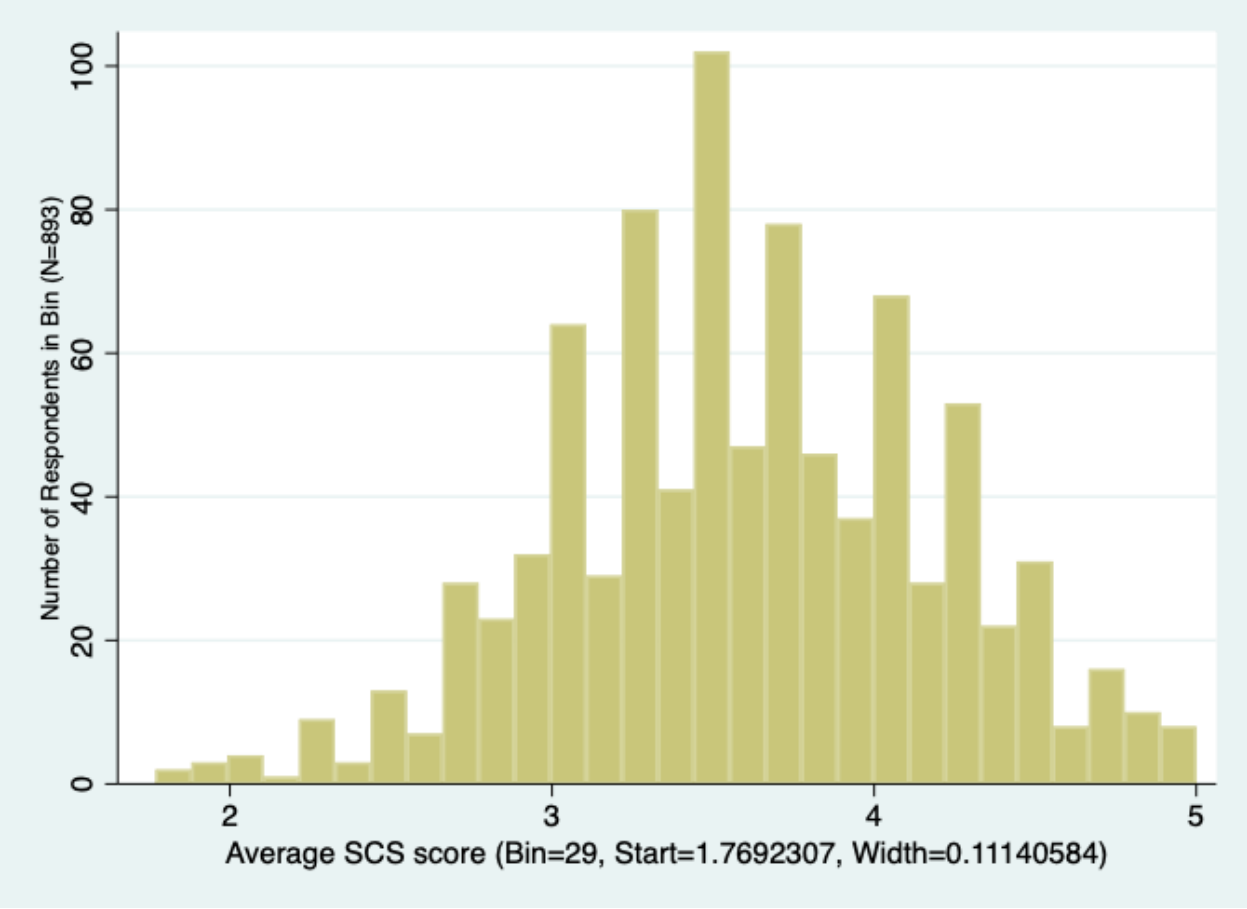


Figure III.II: Distribution of responses to first item in SCS

Note: The responses are measured on a Likert scale from 1 to 5, where 1 indicates 'Completely disagree' and 5 indicates 'Completely agree.' See the full list of items in Appendix I.8.

Table III.III: Average SCS Score by Attribute

Attribute	Mean SCS Score	t-test (p-value)	N
Gender			
Female	3.61	0.661	457
Male	3.59	0.661	436
Age			
≤ 35	3.35	0.000	172
36 - 45	3.53	0.124	132
> 45	3.69	0.000	589
Education			
None, basic, middle or upper secondary degree	3.43	0.001	109
Tertiary degree	3.64	0.001	747
Financial Literacy			
< 6 correct answers	3.61	0.536	625
$= 6$	3.58	0.536	268
Household net income			
< 2950€	3.46	0.002	325
≥ 2950€	3.59	0.002	358
Health			
Bad health rating	3.55	0.015	402
High health rating	3.64	0.015	491
Overall life satisfaction			
Life satisfaction < 8	3.44	0.000	306
Life satisfaction ≥ 8	3.68	0.000	587

Note: The table depicts descriptive results based on the 901 respondents in the SOEP-IS survey, both 2017 and 2018 responses. For each attribute, the mean score in the self-control scale (SCS) is displayed. This scale is measured on a Likert scale from 1 to 5, where 1 indicates 'Does not apply at all' and 5 indicates 'Fully applies'. The p-value of the t-test indicates the statistical significance of the difference in average SCS score compared to the other dummy variable outcome(s) in its group (e.g., male vs. female). Tertiary education refers to any vocational or university degree. The household income attribute is only compared for the sub-sample of those aged ≤ 68. It is compared along with this group's median monthly household income equal to 2950€. High health rating refers to health self-perceived as good or very good, respectively bad health rating refers to self-perceived health rated as only sufficient, less than sufficient, or bad. Overall life satisfaction is rated on a Likert scale from 0 to 10.

III.2. Self-Control Scale and Saving Behavior

Table III.IV: OLS for Saving Behavior by SCS (std.) with Controls

Variable	(1) No ability to save *Dummy*	(2) Regular wealth saving *Dummy*	(3) Regular precautionary saving *Dummy*	(4) Monthly wealth saving *In €*	(5) Monthly precautionary saving *In €*
Average SCS (std.)	-0.13***	-0.00	0.10**	-24.99	-3.33
	(0.046)	(0.047)	(0.050)	(40.127)	(40.782)
FL sum	-0.04***	0.03***	0.02*	-1.89	3.40
	(0.011)	(0.011)	(0.011)	(9.287)	(9.426)
Average SCS (std.)*FL sum	0.02**	0.00	-0.02*	6.48	-0.03
	(0.010)	(0.010)	(0.011)	(8.604)	(8.746)
Female	-0.02	0.01	0.06*	-21.97	8.26
	(0.032)	(0.032)	(0.034)	(27.238)	(27.701)
Age	0.01**	0.00	-0.02***	-2.32	-2.08
	(0.005)	(0.006)	(0.006)	(4.764)	(4.844)
Age squared	-0.00**	-0.00	0.00***	0.01	0.05
	(0.000)	(0.000)	(0.000)	(0.044)	(0.045)
Education	-0.06***	0.03	0.09***	24.39	40.37**
	(0.023)	(0.023)	(0.025)	(19.949)	(20.304)
Net monthly HH income	-0.00***	0.00***	0.00***	0.10***	0.13***
	(0.000)	(0.000)	(0.000)	(0.009)	(0.009)
Constant	0.60***	-0.09	0.48***	-86.21	-298.11**
	(0.145)	(0.147)	(0.154)	(125.884)	(128.004)
Observations	767	772	772	766	767
R-squared	0.189	0.153	0.161	0.190	0.267

OLS regression results. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.