Are you able to control your irresistible urges to buy?
An Empirical Study on Compulsive Buying Behavior and Self-Control

Master Thesis

M.Sc. in Advanced Economics and Finance

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Abstract

Compulsive buying behavior is often identified with uncontrollable and excessive urges to buy. This thesis builds on previous studies to conduct experimental research to analyze to what extent participants are able to control their buying behaviors when influenced by external instruments. The exogenous shock is here represented by email reminders assigned to a group of students according to an incentive-compatible mechanism. Reminders serve as a tool to make students aware of their financial status and induce them to carefully think before shopping. The data is collected from two different surveys directed to university students in Denmark. The results are fourfold. First, this study provides new and numerical ways to quantify compulsive buying behavior. Second, it investigates the effect of reminders on self-control abilities related to purchasing. Third, it elicits students' willingness to pay to receive or avoid reminders and relates it to both self-reported compulsive buying Likert scale and our new measures of compulsive buying behavior to examine people's awareness of their biases. Finally, this research inspects how psychological, sociological, and economic factors can predict compulsive buying behavior.

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Compulsive buying behavior *or*
oniomania,
*from Greek ὤνιος ónios "**for sale**" and μανία manía "**insanity**"*

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1. Introduction

Consumer behavior has become an important study area, especially in behavioral economics over the years. Specifically, the interest in the negative aspects of consumer behavior has increased exponentially, since it could provide "modified or new perspective for the study of positive consumption behaviors" (Shoham and Brenčič, 2003). Compulsive buying behavior (CBB) is the ultimate example of negative and problematic consumer behavior. It has been defined as "a response to an uncontrollable drive or desire to obtain, use or experience a feeling, substance or activity that leads an individual to repetitively engage in a behavior that will ultimately cause harm to the individual and/or others" (Faber and O'Guinn, 1989). This definition has been extended a few years later highlighting the difficulty of compulsive buyers to control themselves and cease to buy, which of course leads to extremely painful consequences for the affected individuals (Faber and O'Guinn, 1992). Furthermore, compulsive buying behavior is also described as "impulsive and/or compulsive buying of unneeded objects" (Ninan et al., 2000); and "excessive or poorly controlled preoccupations, urges or behaviors regarding…spending" (Black, 2001). Compulsive buying can harm not only individuals, but also their family, friends, and even society (Faber and O'Guinn, 1992), as it often results in severe sociological and financial consequences. Importantly, studies on negative aspects of consumer behavior can provide potential guidelines on how to handle it and reduce its impact on the society.

Numerous research papers on compulsive buying have been conducted among college students, often focusing on the psychological, sociological, and demographic antecedents of the problem (Roberts, 1998). Recently, compulsive buying has been analyzed also from an economic point of view, to provide a more complete study of this behavior and the factors that accompany this addictive nature (Norum, 2008).

Empirical studies have provided reliable and valid measures of compulsive buying behavior that can be used to screen consumers' compulsive buying tendencies and identify them as compulsive buyers (Shoham and Brencic, 2003). The Diagnostic Screener of Compulsive Buying (DSCB), a five-point Likert scale by Faber and O'Guinn, has been widely used in the

previous literature. In general, compulsive buying behavior has been measured through a psychometric self-reported scale, where subjects are asked to answer diverse questions related to their spending behavior. Unfortunately, previous literature did not investigate clear measures to actively quantify compulsive spending. Developing alternative measures of compulsive buying behavior can therefore be fundamental to expand the research on such a present-day topic.

In this thesis, we first explore and create new measures to quantify compulsive spending. Then, we utilize these new measures to answer our central question: "Are compulsive buyer students in Denmark able to control their buying behavior when they are aware of the amount of money left on their bank account?". Compulsive buying behavior is often described as an irresistible and uncontrollable urge to purchase as a way to cope with anxiety and stress. However, are we sure that individuals cannot engage in some type of self-control and consciously decide to reduce their frivolous spending? Is there a way to help individuals to carefully think before any purchases and make them aware of their actions?

We address this issue by conducting an incentivized experimental study via two surveys. Both surveys are web-based questionnaires spread via social media across different Danish universities. The two surveys were sent out in an interval of two weeks' time. The purpose of the experiment is to test if students' spending behaviors change when subjected to an exogenous shock aimed at making individuals conscious of their not-indispensable consumption.

The first survey focuses on various topics related to compulsive buying behavior. The first part is centered upon measures of compulsive buying behavior. On one hand, Faber and O'Guinn's self-reported compulsive buying scale is used to measure CBB and its value is utilized as a reference point. On the other hand, we ask questions targeted at quantifying compulsive spending. In the following parts, participants are asked questions related to their emotions before and after shopping, their attitude towards risk, and a few demographics questions. The final block of the first survey represents the crucial aspect of our analysis. In this final section, we design an instrument to verify if people's purchasing behavior can be affected by external tools. We employ reminders, an example of attention-increasing

interventions (Bronchetti et al., 2020), to test this potential change in participants' behavior. Reminders are constructed as the exogenous shock to make students aware of their spending habits. Our idea is to encourage students to think carefully before shopping and verify if they are able to control themselves and their urges to spend. To test the effect of reminders on students' buying behavior, a "Reminders Program" has been conceived. Students have to express whether or not they prefer to receive two email reminders in the two weeks' time between the two surveys and how much they are willing to pay to ensure their favorite choice to be implemented. We elicit students' willingness to pay, utilizing an incentive-compatible mechanism. Willingness to pay to receive (or not) reminders is also exploited to understand to what extent people are aware of their biases.

The second survey largely replicates the spending behavior questions asked in the first survey. Only people who answered both surveys are considered eligible for our study. Students who received reminders represent our treatment group. Students who did not receive reminders represent the control group.

Our results are fourfold. First, we analyze our new measures of CBB and compare them with the self-reported CBB score. We infer our measures of compulsive buying from our two surveys. The first measure is the ratio of total unanticipated spending ratio across five different shopping categories over the total spending on all categories[1]. This measure has been created for both the first and second surveys. The second measure utilizes non-strictly-necessary spending instead of unanticipated spending. The strength of the correlations between the self-reported CBB and each of our measures is found to be weak[2]. However, the direction of the linear relationship between our measures and the self-reported CBB is as expected. This means that when the value of one variable increases, the value of the other variable tends to increase accordingly.

[1] The five categories are: clothes, make-up, tech items/video games, bag/accessories, and shoes. For more details, please refer to section 4.3.1

[2] In the body of the thesis, we will report only results related to our first measure of CBB, the unanticipated spending ratio. Results for the second measure, the not-strictly-necessary spending ratio, can be found in the Appendix.

As the next step, we analyze the effect of the "Reminders Program" on students' buying behaviors. We test the effect of the reminders with the different aforementioned measurements of CBB. We find that although the total unanticipated spending ratio increases in both groups from the first to the second survey, it increases relatively less in the treatment group ($t(63) = 1.089$, $p = 0.280$). This supports our hypothesis that the "Reminders Program" has a positive effect on students' self-control abilities on their buying behavior.

In the third part, we analyze the relationship between the willingness to pay (WTP) and the various CBB measures. We investigate the relationship between WTP and both our new CBB measures and the self-reported CBB scale. Our WTP data allows us to examine how WTP varies within our measures of CBB and the self-reported CBB scale. Results seem to go in the opposite direction. We find suggestive, but no significant evidence that when the total unanticipated spending ratio increases, students become more inclined to willing to receive reminders ($p = 0.297$), which means that the more they spend unanticipatedly, the more they would be willing to pay to receive reminders. For self-reported CBB score we find suggestive, but no significant evidence that when CBB score increases, students become more inclined to willing to avoid reminders ($p = 0.255$), which means that the more compulsive buyer they are, the more they would be willing to pay to avoid getting the reminders.

In the last part, we investigate the relationship between CBB and other explanatory variables such as time preferences, parental and personal income, gender, age, and emotions. Time preferences are defined in relation to participation in risky behaviors. Generally, consumers who engage in risk-taking behaviors, are more likely to have a present-orientation rather than a future-orientation (Becker and Murphy, 1988; Finke and Huston, 2003). Eating junk food, not doing work out, and spending a lot of money are used to proxy a future time orientation. We find a positive and significant relationship between time preferences and the self-reported CBB score. On the other hand, the suggestive but not significant results show that both parental and personal income have a negative impact on the self-reported CBB score. This means that students whose parents have lower levels of income tend to score higher on the CBB scale, and students with higher personal incomes tend to score lower on the CBB scale. Faber and O'Guinn (1992) defined compulsive buying as "chronic, repetitive

purchasing that becomes a primary response to negative events or feeling", hence negative emotions have been investigated as potential explanatory factors. Unexpectedly, the results show that students who experience negative emotions such as sadness, anger, or regret before shopping are more likely to have lower self-reported CBB scores ($p = 0.026$). Nevertheless, respondents who experience negative emotions once they have time to reflect upon their purchases are more likely to have higher self-reported CBB scores ($p = 0.072$).

The remainder of the thesis is organized as follows. Section 2 reviews the related literature. Section 3 describes the theoretical framework, the research question, and the hypotheses we want to test. Section 4 outlines our methodology with data collection and experimental design. Section 5 first presents our results and then the related discussion. Section 6 concludes by summarizing our key takeaways. Section 7 presents the limitations of our study and future research.

2. Literature Review

Studying the negative aspect of consumer behavior gives many insights on the analysis of consumer behavior in general. Researchers have argued that studying negative aspects of consumer behavior is essential to create a more complete and developed field (Faber and O'Guinn 1988; O'Guinn and Faber 1989a). In particular, what is fundamental in this analysis is precisely the ability to measure the negative aspect of consumer behavior. This is why we have decided to focus on compulsive buying behavior, the most problematic aspect of consumer behavior, and its measurements.

2.1 Compulsive Buying Behavior

2.1.1 Definition

Compulsive consumption is defined as "a response to an uncontrollable drive or desire to obtain, use or experience a feeling, substance or activity that leads an individual to repetitively engage in a behavior that will ultimately cause harm to the individual and/or others" (Faber and O'Guinn, 1989). This definition has been subsequently further extended adding that compulsive buying can be seen as "chronic, repetitive purchasing that becomes a primary response to negative events or feelings" (O'Guinn and Faber, 1992). Christenson et al., (1994) and Lejoyeux et al., (1996) added that compulsive spending is characterized by irresistible and overpowering urges to purchase (useless) goods and by uncontrollable needs and tension that can be relieved only by buying. Solomon (2002) specified that compulsive buying refers also to "consumers' repetitive shopping, at time excessive, because of boredom, tension, or anxiety".

A few years later Faber (2004) stressed again that compulsive buying can be outlined as a repeated extensive buying, which is uncontrollable, occurs frequently, and brings negative consequences. These consequences include negative effects in personal life, i.e., personal relationship and partnership, distress, the feeling of guiltiness, and potentially negative financial consequences such as high personal debt (Black, 2007; Mueller et al., 2010).

To sum up, compulsive buying is defined by the following characteristics. An irresistible urge to buy, which occurs repetitively since individuals have this tendency to continue incurring this behavior. Furthermore, compulsive buying does not cease to exist in the addictive subjects, even though the adverse consequences it generates, such as debts, personal or social losses. Indeed, it can be seen as a dependency on shopping, which at the extreme leads to the loss of self-control (Scherhorn, 1990). In particular, unnecessary products are bought to cope with adverse events and negative emotional states, such as stress and anxiety (McElroy et al, 1994). Finally, some research explicitly depicted compulsive buying as a mechanism with a compensatory component. It is suggested that the act of buying is a way to counterbalance other unmet needs and desires (Dittmar, 2004, 2005; Neuner et al., 2005; Scherhorn et al., 1990; Thornhill et al., 2012).

2.1.2 Compulsive Buying Behavior Scale

Due to the various but similar and complementary definitions of compulsive buying behavior, there are also a number of different instruments that measure this behavior.

The most frequently used self-reported scale is Faber and O'Guinn compulsive buying scale. Faber and O'Guinn (1992) developed the first unidimensional and reliable (alpha = 0.78) screening scale for CBB[3]. Their measure, the so-called Diagnostic Screener of Compulsive Buying (DSCB), helps indicate whether or not an individual is affected by compulsive buying behavior. Their main contribution was to create a method able to properly identify those at risk of compulsive buying and verify how frequently this spending behavior happened. Their final scale is a seven-item, five-point Likert scale focused on personality variables, motivations for buying, and consequences of compulsive buying. Questions focus on a variety of elements. Some examples are as follows. The extent to which individuals feel the urge to spend leftover money at the end of the month and the extent to which they feel anxious and nervous on days without shopping. The embarrassment and shame of compulsive buyers when they recognize their behavior. The uncontrollable urge to buy stuff despite the (rational)

[3] Figure 7 in the Appendix

knowledge of no money availability. According to Faber and O'Guinn scale, an individual can be classified as a compulsive buyer if her score on this scale, a weighted sum between all the answers, is lower than the cutoff point of -1.34[4].

Edward (1993) identified five different levels into which consumers can be classified. The two most problematic types of individuals are the so-called "compulsive buyers", who according to his definition frequently purchase items to relieve stress and anxiety and often feel guilty after the purchase of an unneeded item, and the "addicted buyers". Addictive buyers always experience a continuous urge to buy which is so strong that prevents them from continuing any other activities. To evaluate subjects, he created a five-point Likert scale with 13 different items. The final compulsive spending score is the average of all items. On this scale, there is no cut-off point.

Ridgway et al. (2008) create a measure of CBB with both impulsive and compulsive elements[5]. This measure considers compulsive buying behavior partly as an obsessive-compulsive - an anxiety disorder - and partly as an impulse-control disorder. This scale specifically addresses buying rather than shopping. As opposed to Faber and O'Guinn scale, the Richmond scale focuses more on actual characteristics of compulsive buying instead of its consequences. According to Richmond scale, if respondents score more than 25 then they are classified as compulsive buyers. To establish the cut-off point, Ridgway et al. (2008) examined the relationship between compulsive buying index and aspects such as negative feelings and self-reporting about buying. Since the value of these variables dramatically increased after the compulsive-buying index reaches 25, this number was chosen as a switch point.

[4] The scoring equation is built as follows: $scoring\ equation = -9.69 + (Q1a * 0.33) + (Q2a * 0.34) + (Q2b * 0.50) + (Q2c * 0.47) + (Q2d * 0.33) + (Q2e * 0.38) + (Q2f * 0.31)$. If the score is below -1.34 you are classified as a compulsive buyer.
[5] Figure 8 in the Appendix.

2.1.3 Previous Literature

Various studies have analyzed compulsive buying behavior among university students. The majority of them explored compulsive buying behavior from psychological, sociological, and demographic perspectives (Roberts, 1998). Roberts (1998) utilized the widely used Faber and O' Guinn scale to measure compulsive buying behavior among young adults. His main objectives were to investigate this compulsive behavior among college students, explore the psychological, familial, sociological, and demographical causes of CBB, and discuss the implication of this phenomenon in society. His research revealed that six percent of students (on a sample of 300 individuals) showed compulsive buying behavior. He found the most significant variables that affected compulsive buying behavior were credit card usage, gender, self-esteem, and shopping frequency.

Robert and Jones (2001) expanded the previous research, utilizing again Faber and O' Guinn screener as a measure for compulsive buying behavior. They decided to focus on the role of money attitudes and credit card use within the world of compulsive buying behavior.
The research identified 9% of students (on a sample of 406) as compulsive buyers. Importantly, they discovered how anxiety regarding money is crucial in determining compulsive buyers, and how it increases compulsive buying. Their study on anxiety supports previous research papers which identified compulsive buying as an immediate mechanism to deal with anxiety. Valence et al. (1988) indeed conceptualized a model where anxiety is the focus of the whole study "because it provokes a spontaneous action and pushes the consumer to reduce the tension". As a consequence, they found a positive and significant relationship between anxiety and compulsive buying.

Shoham and Brenčič (2003) computed a study on the compulsive buying behavior and its antecedents. They built their analysis studying how the purchase of "non-pre-planned items" and the tendency to buy "complementary and unplanned items" have an effect on compulsive buying behavior. Their first hypothesis displayed a positive relationship between unplanned purchases and compulsive purchase tendency. The second one was an immediate

consequence of the first one: there exists a positive link between the tendency to buy items off the product list and compulsive buying behavior. To implement their study, Faber and O' Guinn scale was used as a measure of CBB. Both hypotheses were sustained by data, underlining how unanticipated purchases are one crucial aspect in the study of CBB.

Norum (2008) extended the analysis of compulsive buying behavior introducing also an economic perspective. Indeed, her study specifically focused on the examination of compulsive buying behavior within the economic framework of time preferences. Her approach introduced a new aspect of compulsive buying behavior, the economic viewpoint, which was never previously explored. Her results contributed to the analysis of this behavior, shading light on the relationship between compulsive buying behavior and risky behaviors in relation to time preference. Faber and O' Guinn scale was used once again as a measure for compulsive buying behavior. In a final sample size of 4429 students, 8% of them were identified as compulsive buyers. Results showed that students who came from a family with high income were less likely to be compulsive buyers. Moreover, present-oriented students were more exposed to compulsive buying behavior, where present orientation was measured through risky behaviors. Finally, female students and irrational credit card users were found to be more exposed to compulsive buying.

A more recent study by Reisch et al. (2011), studied compulsive buying in association with socio-demographics, internet shopping, availability of credit and customer cards, and household financial management. According to the results, 5.81% of the subjects were considered compulsive buyers. The results also showed that age and sex have a decisive role on CBB, and a typical compulsive buyer could be a woman between the age of 25-44. Moreover, compulsive buyers seem to be more likely to be attracted to online shopping opportunities. Even though having credit cards makes no difference in consumer behavior, compulsive buyers are found to own more customer cards than regular customers. Lastly, according to the study, when a household manages money together, the prevalence of CBB declines.

Following the aforementioned research papers, we decided to frame compulsive buying behavior within a psychological, sociological, and economic framework. Emotions experienced before and after shopping will be the heart of the psychological analysis of CBB. Time preference and income represent the two aspects through which CBB will be explored within the economic framework. Age and gender, together with education, insert compulsive buying in a sociological domain.

2.2 Self-Control

Self-control refers to one's capacity to effortfully change its own responses to align them with standards such as ideals, morals, and social expectations, and support long-term goals and benefits (Baumeister et al., 2007). By definition, self-control can be identified for example as resisting impulses to engage in infidelity, eat unhealthy foods, smoke, spend too much money. Evidence shows that when people engage in self-control, this act uses up the limited resource of self-control available (strength, willpower), hence the following acts of self-control become even more challenging (Baumeister et al., 2007).

Self-control in consumer behavior is an interesting subject to analyze since failure in self-control can result in impulsive and/or compulsive purchasing. Resisting an impulse depends on one's capacity for self-control (Baumeister, 2002). Failure of any of the major ingredients of self-control may undermine self-control itself. The standards, a monitoring process, and the operational capacity to change one's behavior can be listed as those ingredients (Baumeister, 2002).

Standards refer to ideals, norms, goals. When these goals are uncertain or conflicting, they undermine self-control (Baumeister, 2002). Many shoppers want to own something that is going to make them happy. Even the simple act of purchasing might itself make them happy, however, they would also like to save money, so they will face a challenging situation when led to choose from two conflicting goals. Faber and O'Guinn's (1989) research on compulsive buying behavior shows that compulsive shoppers derive more pleasure from the act of

purchasing than from actually owning the item. Emotions play also an important factor in deciding between the two aforementioned goals. Particularly, emotional distress contributed to failures in self-control (Baumeister et al., 1998). When people are upset, immediate gratification becomes more important than other self-control goals that might result in desirable outcomes in the long-term. In consumer behavior, this is reflected in the case where people who are emotionally upset purchase goods or services to feel better instead of saving money (Baumeister, 2002).

Another important ingredient of self-control is the process of monitoring, which refers to keeping track of the relevant behavior. Many research suggests that when people lose track of their behavior, self-control fails (Baumeister, 2002). Monitoring is likely to be related to consumer behavior. As people keep track of their money and spending carefully, they will be less likely to purchase impulsively (Baumeister, 2002).

The third vital ingredient of self-control is the capacity to change the self. One may know what she wants and track her own actions. However, if she fails to make the self-perform the required actions, then self-control fails again (Baumeister, 2002). When it comes to consumer behavior, one needs to resist the temptation to buy unnecessary items. According to one theory, this change in self depends on willpower or strength, while according to another theory, self-control is defined as a skill. A third theory explains it as cognitive processes, including knowing the self and contingencies (Baumeister, 2002).

The previously mentioned three theories differ in predictions to the consequences of consecutive acts of self-control. With respect to the first model, willpower or strength is limited, thus after the first act of self-control, the second one will be more difficult than it would normally be. On the other hand, the cognitive theory suggests that the first act of self-control would prime the relevant self-control schemas, thus the following acts of self-control will be improved. The theory based on skill predicts little effect of acts of self-control on the following self-control acts. This is because skill does not diminish and remains the same over consecutive acts of self-control (Baumeister, 2002). Multiple experiments have supported the

first model about willpower or strength, rather than the cognitive or skill models (Baumeister et al. 1998; Muraven et al., 1998). The state of reduced capacity for self-control is called "ego depletion" since the self's necessary resources have been depleted (Baumeister, 2002). In consumer behavior, it means that people in a state of ego depletion are more likely to fail to resist the temptations to buy, and consequently, they buy impulsively. Those consumers will be less likely to regulate their behavior of saving money.

Further research has stated that decision-making and self-control reduce the same self's necessary resource (Twenge et al. 2001). This is related to consumer behavior because most of the time consumers have to make several decisions, such as the purchase of a house or a car, which requires a series of decisions. If each decision reduces the resource more and more, then people become less self-controlled and more vulnerable to impulsive purchasing (Baumeister, 2002).

2.2.1 Self-control and Compulsive Buying Behavior

There exist conflicting studies on self-control and compulsive buying. Some research suggests that compulsive buyers do perform self-control, while others underline how a key factor of compulsive buying is the lack of self-control.

First of all, Konkolý Thege et al., (2015) identified that although the problematic aftermaths of long-lasting compulsive buying, such as feelings of regret and remorse over purchases, shame, guilt, legal and financial problems, and interpersonal difficulties, people with CBB fail in their attempts to stop compulsive buying.

Achtzigeret et al., (2015) explored the links between self-control, compulsive buying, and debts on a sample of the German population (n = 946). Results revealed that self-control turned out to be a significant negative predictor of compulsive buying. People with high levels of self-control reported fewer problems with compulsive buying than people with low levels. Authors concluded that the tendency to run into debts and to compulsively buy seems to be

more of a problem of low self-control (of psychological factors) and less a matter of financial problems (of economic factors). They found that individuals with fewer self-control abilities are less able to resist buying temptations for unnecessary items and less able to control negative emotions, "that might trigger a compensatory response such as buying".

On the other hand, among all the research on compulsive buying, Horváth et al. (2015) analyzed to which extent self-control has an influence on compulsive buying. In a two-study analysis, first with qualitative in-depth interviews and then with one quantitative survey, they found that compulsive buyers do engage in self-control, but in a different way with respect to non-compulsive buying individuals, i.e. prudent buyers. What compulsive consumers tried to do is to control spending in order to prolong the time they could enjoy purchasing, and not to avoid buying. They regulate their buying to be able to continue buying as long as possible (Horvath et al., 2015).

2.3 Exogenous shock: reminders tools

In our research, we use priming in an incentivized experiment to study to what extent students are able to engage in self-control abilities when exogenously affected by external instruments. We want to measure the causal effect of external instruments, email reminders in this specific case, on students' spending preferences and behaviors. Cohn and Maréchal (2016) state that one typical technique of priming is to prompt individuals to actually think about a specific concept, which in our case is the irrational spending behavior[6].

The idea to use reminders as an exogenous shock comes from Bronchetti et al. (2020). They investigated whether people value tools that help them increase their attention in a rational way. They developed a two-experiments study to test their hypotheses. The first part is an in-field experiment where they randomize incentives to complete specific course models (coding lectures) and incentives to make plans to complete the models.

[6] In Section 3 we report a deep analysis of the concept of priming experiment.

The second experiment deploys and explains the importance of reminders. In this second part, they computed an online survey in which they elicited the willingness to pay (WTP) of participants to receive three email reminders that remind them to complete a second survey in three weeks' time. They wanted to measure how much participants were willing to pay for reminder emails when the potential reward/prize for the survey's completion increased.

From a rational point of view, whoever optimally invests in the attention-increasing measure would be willing to increase her WTP by $1 times the probability's change of the task completion due to the technology, if the incentive to complete the task has increased by $1.

Particularly, participants were informed that they could have won either $2, $3, $4, or $5 for the survey's completion and that this amount was equally likely. For each of these four different amounts, students face an incentive multiple price list. The multiple price lists are composed of 11 choices, in which participants choose to get reminders plus a bonus or to not receive reminders plus a bonus. In the first five choices, participants need to choose between getting reminders and a bonus (in descending order starting from 150 cents) and getting neither reminders and nor bonus. The sixth choice is simply between getting reminders or not. The last five choices between getting reminders with zero bonus and not getting reminders plus a bonus (in ascending orders starting from 25 cents)

Furthermore, participants were told that the possible bonus for the survey's completion would have been randomly selected and sent to them a few days later after the completion. Participants faced a 10% chance that one of their WTP choices was selected and implemented. To test the effect of the reminders emails on completing the survey, Bronchetti et al. (2020) randomized 45% of participants to receive reminders and 45% of participants not to receive reminders, regardless of the WTP choices.

These results show that while individuals are willing to pay more for attention improvements when the stakes are higher, they do so in a smaller size than what the full rationality benchmark predicts. In other words, individuals appear to undervalue attention-improving

technologies. This finding suggests that “external attention-increasing interventions can increase efficiency by aligning individuals’ attention levels with their private optima”.

3. Theoretical Framework and Research Question

In this section we explain and analyze the main theoretical concepts behind our research: consumer behavior theory and addiction, and priming experiment. We also report a brief analysis of time preference since this theory is fundamental in the analysis of irrational consumer behavior.

We then state our research question with the corresponding hypotheses we want to test in our analysis.

3.1 Theoretical Framework

3.1.1 Consumer Behavior Theory

Our research is primarily based on consumer behavior, in particular students' purchasing behavior. First of all, it is important to define the word "consumer". According to Walters (1974) a consumer is "an individual who purchases, has the capacity to purchase goods and services offered for sale by marketing institutions in order to satisfy personal or household needs, wants, or desires." Furthermore, he defined consumer behavior as "... the process whereby individuals decide whether, what, when, where, how, and from whom to purchase goods and services." Finally, consumer behavior is also defined as "the study of the processes involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences to satisfy needs and desires" (Solomon et al, 2013).

Broadly speaking consumer behavior theory studies how individuals make consumption decisions, i.e., how people make decisions when they purchase. In particular, it studies how people decide to spend their money based on their individual preferences and budget constraints. Preferences represent consumers' attitudes towards their choices and the way in which consumers decide to satisfy their desires. Budget constraint represents the limit on what a consumer can purchase due to the limited resources she has.

In general, it is possible to enlist different factors that influence the buyer behavior. First of all, we can recognize psychological factors which include a person's attitude, his or her perception towards the situation, the ability to collect and understand all the information, their beliefs, and their personality. Secondly, we have personal factors, which are represented by age, gender, personal income, job status, culture, and tradition. Thirdly, we have the social factors which include a person's friends, family, work's place and can in large extent influence the buying behavior of individuals[7].

It is important to notice that everyone makes different buying decisions and whoever make these decisions is a different consumer from the rest, however, we can divide buying behavior into four types. First, routine response buying represents the "automatic" purchase people make, without interacting with our hidden reasons. Second, there exists limited decision buying. Here, buyers are in a new never-experienced situation, and when deciding to buy they most likely go for an item that costs less and seems the most "practical". Third, extensive decision-making is the most complete process in buying behavior. People deeply analyze their financial situation, actively decide how to and how they would need to prepare. Fourth, we can find impulsive buying. Consumers in this case make unplanned decisions on the spot, without any pre-planning[8]. As already mentioned, when this latter behavior becomes repetitive over time, derives from the negative surrounding environment, and results in negative and severe consequences, we enter the world of compulsive buying.

Besides different buying behaviors, it is possible to identify also different types of buyers.
In particular, there exists a major difference between addictive buyers and non-addictive buyers. Whereas ordinary non-addicted consumers state "value and usefulness as their primary motives for shopping", compulsive buyers make purchases in order to improve their mood, cope with stress, gain social approval and recognition, and improve their self-image (Granero et al., 2016).

[7] https://fastpayltd.co.uk/blog/consumer-behaviour-theory-how-has-it-changed/
[8] https://fastpayltd.co.uk/blog/consumer-behaviour-theory-how-has-it-changed/

3.1.2 Addiction

One of the interesting topics investigated in behavioral economics is addictive behaviors such as gambling, drinking, and smoking. There are two models regarding addictive behaviors: rational addiction and bounded rational addiction (Ida and Goto, 2009). The rational addiction model states that consumers maximize utility considering the consequences of their past and current consumption of addictive goods, while the bounded rational addiction model argues that many addicts regret their reliance on these addictive goods and that addiction results from mistaken beliefs about the likelihood of being addicted (Ida and Goto, 2009). The most known economic model of addictive consumption is the rational addiction model by Becker and Murphy (Zhang, 2015).

In many studies, addiction is analyzed in relation to time and risk preferences. In Ida and Goto's paper (2009), the findings state that there is a positive relationship between addictive behaviors and time preference and an inverse relationship between addictive behavior and risk aversion coefficient.

Compulsive buying can precisely be seen as a form of addiction. What truly defines CBB is that people affected by this disorder cannot resist the temptation to buy and spending money. Compulsive buyers continue to spend money even when the act of purchasing and its consequences causes emotional and personal distress, even when they cannot afford those purchases spend, and even when the things they buy give them no joy or excitement[9]. Like other addictions, compulsive spending tends to escalate over time, with buyers needing to spend more and more money to get the same "feeling good" emotion they once achieved with a single purchase[10].

[9] https://www.psychologytoday.com/us/blog/when-your-adult-child-breaks-your-heart/201612/compulsive-spending-what-you-need-know
[10] https://www.psychologytoday.com/us/blog/when-your-adult-child-breaks-your-heart/201612/compulsive-spending-what-you-need-know

3.1.3 Priming Experiment

The priming technique refers to the experimental concept in which a target stimulus is processed in the context of a previous stimulus (Franek and Režný, 2017). According to Logan (1980), priming refers to the incidental effect of environmental context on behavior and cognition. Priming effects result from the activation of mental representations that facilitate related subsequent behavior (Molden, 2014). Anderson (2001) defines priming as "the improvement of the processing of a stimulus as a function of a previous presentation." Stroebe et al. (2008) defined priming as "the finding that a pattern will be activated with higher probability if it was presented recently or if it was used in the past." Major (2008) also said that "priming is the benefit that an event receives when its processing has been preceded by the processing of a related or identical event."

Priming has been used in studies on complex forms of social behavior (Bargh, 2006), memory (Tulving and Schacter, 1990), visual perception (Kristjánsson and Campana, 2010), and other areas. Research has indicated that priming can affect conformity (Epley and Gilovich, 1999), helping behavior (Garcia et al., 2002), social self-confidence (Steele and Aronson, 1995), and many more.

Across research traditions, priming involves exposing subjects to different environmental contexts–or 'primes'–that are incidental to, and yet still influence, subsequent behavior. For example, work from the Lexical Decision Task (Schvaneveldt and Meyer, 1973) demonstrates that people are faster to correctly identify words (e.g., 'doctor') following the presentation of a related prime word (e.g., 'nurse') compared to an unrelated prime word (e.g., 'paper'). In other words, the target behavior – correctly indicating that 'doctor' is a word – occurs more quickly in contexts in which related, incidental stimuli are observed than in contexts in which unrelated stimuli are observed.

Recent evidence in cognitive neuroscience (Dehaene et al., 2006) has shown that there are two necessary factors for semantic priming to occur, first the attention to the prime and second the stimulus saliency to the participants (Franek and Režný, 2017).

Many studies have shown that a subliminal masked stimulus can be processed at the perceptual level (Dehaene, 2009). The main support comes from the repetition priming experiment, in which a subliminal prime is shown to facilitate the subsequent processing of an identical stimulus presented as a target. Priming is evidenced behaviorally as a reduction of response time on repeated trials compared to not-repeated trials and neurally as a reduction in the amount of evoked brain activity (repetition suppression).

Experimental design and statistical power have high importance to have a full accounting of priming effects' replicability. Priming effects reliably emerged when the research design and analyses used a within-subjects approach in which the experiment was highly-powered to detect priming effects. In contrast, priming effects did not emerge, with one exception, when the research design adopted a between-subjects approach in which the experiment lacked statistical power to reliably detect priming effects.

3.1.4 Time Preferences

Time preference is a concept belonging to intertemporal decision-making. Intertemporal choices are everyday-life decisions, where individuals have to select between different outcomes available at different times in the future (Larkin, 2015). When intertemporal decisions are made, these imply a trade-off between the additional greater reward you could earn in the future and the immediate smaller reward. People need to decide whether or not it is worth waiting.

Frederik (2002) distinguished the concept of time discounting and time preferences. Time discounting refers to every situation where individuals care less about future consequences, while time preferences refer to "the preference for immediate utility over delayed utility".

Time preferences explain how individuals evaluate actions, assets, feelings at a given particular time compare to the perception of the same actions, assets, feelings at a later time. A person who tends to prefer the present will focus on the short-term benefit. On the other hand, a person who tends to prefer the future will appreciate the future benefit more. Economic theory states that individuals tend to favor current consumption, therefore they require some sort of compensation in order to delay that consumption (Bayer et al., 2019). The economic concept to measure the trade-off between present and future is the discount rate, which indeed represents the rate at which individuals are willing to trade off present benefits for future benefits. This rate varies from person to person, and it depends on the individual's willingness to wait and their other personality traits. In general, a person who prefers current consumption over future consumption will have a higher discount rate than a person who prefers future consumption over the present.

According to economics, all human beings tend to prefer immediate gratification, even in situations where the potential future reward is much greater than the instant reward. Ericson and Laibson (2018) further explain this concept introducing the idea of present-focused preferences. Present-focused preferences exist "if agents are more likely in the present to choose an action that generates immediately experienced utility, then they would be if all the consequences of the actions in their choice set were delayed by the same amount of time." More informally, this leads to people choosing more impatiently for the present than they do for the future. In general, models that produce present-focused preferences include hyperbolic and quasi-hyperbolic discounting (i.e., models with present bias)[11]; a temptation that is experienced when choosing for the present but not when choosing for the future; an interaction between myopic and planner selves[12]; and distortions in the perception of time or in forecasting the future.

[11] Present bias is the tendency to rather settle for a smaller present reward than to wait for a larger future reward. Hyperbolic discounting refers to the tendency for people to increasingly choose a smaller-sooner reward over a larger-later reward as the delay occurs sooner rather than later in time. This implies that people are inconsistent both in the short-term and in the long-term. However, with quasi-hyperbolic discounting people are inconsistent only in the short-term.

[12] Myopic behavior is further explained in section 3.1.4.1.

3.1.4.1 Time Preferences and Addictive Behavior

A central topic in the analysis of addictive behavior is precisely time preference. As previously mentioned, from a psychological perspective, when human beings make decisions, they tend to seek immediate gratification and instant results. Indeed, consumers who engage in more risk-loving behaviors tend to have present-orientation rather than future-orientation (Becker and Murphy, 1988). Consumers who present a high preference towards the present are the ones who are more short-sighted. In economic terms, these individuals have a high discount rate for future utility. When people tend to overvalue whatever is received today and undervalue the future consequences, they show what is called "myopic behavior". This behavior satisfies an individual's short-term emotions and desires, but it will bring huge future long-term costs. This is consistent with compulsive buyers, who experience short-term gratification and mood improvements once they compute the repetitive act of purchases, but eventually, their behavior leads to negative future consequences such as major debts, guilt feeling, psychological stress, which have negative impacts on self-esteem and life happiness (Mrad and Cui, 2020).

3.2 Research Question and Hypotheses

The core of our research is to analyze to what extent students in Denmark are able to control their spending behavior once they are exogenously made aware of their financial status.

Compulsive buying behavior is often described as an irresistible and difficult-to-control urge to purchase as a way to cope with external negative feelings such as anxiety and stress. However, what is really intriguing behind this behavior is to understand whether individuals can engage in some type of self-control and consciously decide to reduce their not-indispensable spending. We intend to verify if there exists a way to help individuals carefully think before any purchases and make them aware of their actions.

The research question we aim to answer in our analysis is formulated as follows:

"Are compulsive buyer students in Denmark able to control their buying behavior when they are aware of the amount of money left on their bank account?"

To make students aware of their financial situation, i.e., the amount of money left on their bank account, we utilize the method of attention-increasing instruments, here represented by email reminders. The email reminders have the purpose to encourage students to actively and carefully think before jumping to any possible future superfluous purchase.

Before testing the effect of reminders on students' self-control abilities, we design new quantifiable measures of CBB to create an alternative way to support the widely used psychometric self-reported scale. These measures are extracted from the two surveys we conducted among university students in Copenhagen. Our first measure of CBB is the ratio of total unanticipated spending across five different shopping categories over the total spending on all categories[13]. This measure has been created for both the first and second surveys. The second measure utilizes non-strictly-necessary spending instead of unanticipated spending[14].

We want to verify if our measures are correlated to the well-known self-reported CBB scale. Hence, our first hypothesis is:

H1: There is a positive relationship between the unanticipated spending ratio and self-reported CBB score.

After examining our new quantifiable measures of CBB, we continue our research to test our main research question:

[13] A more detailed analysis of the five categories can be found in Section 4.3.1.
[14] In the body of our analysis, we only analyze the measure with the unanticipated spending ratio. In the Appendix, we briefly report the analysis with the not-strictly-necessary spending ratio.

H2: Students who took part in the Reminders Program (vs control group) are more likely to control their buying behavior, decreasing their frivolous spending.

The "Reminder Program" consists of two email reminders sent to students in two weeks' time, with the purpose to help them think carefully before shopping. Reminders should presumably help students in reducing their spending behavior and they represent the exogenous shock through which we make participants more conscious about their spending habits. We test the effect of reminders on participants by comparing the difference in their unanticipated spending ratio between the two surveys with respect to a control group who did not receive reminders.

The "Reminder Program" provides us also with useful information to establish whether individuals are aware of their biases. During the first survey, students are asked their preference regarding receiving or not the two email reminders in the two weeks' time between the two surveys. Afterward, we invite them to choose how much they are willing to pay to ensure their favorite option is implemented.

Exploring the relationship between WTP and both the self-reported scale and our quantifiable measures of CBB can shed light on individuals' biases related to purchases.

H3: Students with higher unanticipated spending ratios in the first survey are more inclined to willing to receive reminders.

H4: Students with higher self-reported CBB scores in the first survey are more inclined to willing to receive reminders.

In the final part of our research, we investigate psychological, sociological, and economic factors that can predict compulsive spending. First, we explore the relationship between time preferences and CBB.

H5: There is a positive relationship between time preferences - in relation to participation in risky behaviors - and CBB.

Time preferences are expressed through participation in risky behaviors. Generally, consumers who engage in risk-taking behaviors, are more likely to have a present-orientation rather than a future-orientation (Becker and Murphy, 1988; Finke and Huston, 2003). This is consistent with compulsive buyers who experience short-term gratification once they engage in their purchasing acts, but eventually, their behavior leads to negative future consequences as financial and emotional distress. In this analysis eating junk food, not doing work out, and spending a lot of money are used to proxy a future time orientation.

Next, we inspect how personal and parental income affect compulsive buying. There exists little research between income and compulsive buying, nonetheless, parental income has been found to be a predictor for compulsive buying. Norum (2008) reports a significant negative relationship between parental income and compulsive spending. Hence, we decide to test ourselves if this result can be supported.

H6: There is a negative relationship between parental income and CBB.

There exists no previous literature on personal income and CBB, hence no hypothesis is stated[15].

Lastly, we analyze the role of emotions in predicting compulsive buying. Compulsive buying is a coping mechanism that often emerges to deal with negative and conflicting situations and feelings. Compulsive buyers tend to feel lousy and miserable before the proper act of purchasing, hence we have this additional hypothesis:

[15] We found no evidence regarding previous analysis between CBB and personal income, however, we believe this can be interesting to analyze due to the high number of students in Denmark who have a job and consequently a personal income.

H7.1: There is a positive relationship between negative emotions experienced before shopping and CBB.

Additionally, we also test the relationship between CBB and the negative emotions people are expected to experience a few hours after shopping when they have time to reflect upon their purchases (Benson, 2009). The hypothesis is framed as follows:

H7.2: There is a positive relationship between negative emotions experienced few hours after shopping and CBB.

Finally, we decide to examine the relationship between CBB and how students feel when they successfully refrain from purchasing not-indispensable goods. There exists no previous literature on CBB and how people feel when refraining from shopping, hence no hypothesis is stated[16].

[16] We found no evidence/research regarding how compulsive buyers behave once they refrain from shopping, however, we believe this can be an additional aspect to investigate.

4. Methodology

4.1 New Measures of Compulsive Buying Behavior

The first innovative aspect of our research is the creation of new measures of CBB. Empirical studies have provided reliable and valid measures of compulsive buying behavior that can be used to screen consumers' compulsive buying tendencies and identify them as compulsive buyers (Shoham and Brencic, 2003). The Diagnostic Screener of Compulsive Buying (DSCB), what we call the self-reported CBB scale, has been widely used in the previous literature to identify subjects as compulsive buyers. In general, compulsive buying behavior has been measured through a psychometric self-reported scale, where subjects were asked to answer various questions related to their spending behavior. Previous literature did not investigate clear measures to actively quantify compulsive spending. Hence, we plan to fill this gap, building new measures of CBB based on its primary definition.

Compulsive buying, as mentioned beforehand, is identified and described as "chronic, repetitive purchasing that becomes a primary response to negative events or feelings" (O'Guinn and Faber, 1989). Moreover, it is also considered as "impulsive and/or compulsive buying of unneeded objects" (Ninan et al., 2000); and "excessive or poorly controlled preoccupations, urges or behaviors regarding…spending" (Black 2007). Following these definitions, we construct two new measurable ways to study this phenomenon.

First of all, it is essential to collect information regarding students' spending behavior and the amount of money spent on average on selected items. In our two surveys, we asked students to express how much they spent on average on five different spending categories in the two weeks anticipating both surveys[17]. For each category, we also asked the percentage of that purchase that participant believed to be unanticipated and not strictly necessary[18]. This choice has been made due to the fact that CBB is often characterized by unplanned and unnecessary

[17] The five categories are: clothes, make-up, tech items/video games, bag/accessories, and shoes. For more details, please refer to the "First Survey" section (section 4.3.1).
[18] For more details, please refer to the "First Survey" section (4.3.1).

purchases, and the purpose of these new measures is to elicit the amount of not planned and not strictly necessary spending with respect to the total spending for each category.

Looking at the single piece of information regarding the percentage of unplanned and unnecessary spending for each separate category is not truly interesting per se, because it cannot provide an appropriate estimate of compulsive buying.

Hence, to combine all these elements and generate a new measure of CBB, we decided to aggregate together the answers for each category of unplanned and unnecessary spending respectively and create two unique quantifiable measures of compulsive spending. The first measure takes the form of a ratio of total unanticipated spending across five different shopping categories over the total spending on all categories. The second is the ratio of total not strictly necessary spending across the five categories over the total spending on all categories.

For example, this is how we computed the unanticipated spending ratio. For each category, we calculated the amount of unanticipated spending multiplying the percentage of unanticipated spending by the amount spent on that category. We then sum up these five amounts to obtain the total unanticipated spending. Finally, we divided this total unanticipated spending by the total spending among all categories to obtain the unanticipated spending ratio[19].

Our two measures of CBB have been calculated as follows[20]:

$$\text{Unanticipated spending ratio (USR)} = \frac{total\ unanticipated\ spending}{total\ spending}$$

$$= \frac{\sum(\%\ of\ unanticipated\ spending * spending)}{\sum spending} = \frac{\sum_{i=1}^{5} w_i * s_i}{\sum_{i=1}^{5} s_i}$$

[19] The same has been done also for not strictly necessary spending ratio, where we used not strictly necessary spending instead of unanticipated spending.

[20] In our surveys it happened that a rather high fraction of participants did not spend money on some specified categories. Hence, our new measures are conducing to lose a lot of observations because of students' lack of actually spending money on few categories, and this results in missing values in the new CBB measure. In the Appendix, we report a robustness check where we have converted these missing values in zeros.

Where w_i is the percentage of unanticipated spending for category *i* and s_i the amount spent on category *i*, expressed in Danish kroner (DKK).

$$\text{Not strictly necessary spending ratio (NSNSR)} = \frac{total\ not\ strictly\ necessary\ spending}{total\ spending}$$

$$= \frac{\sum(\%\ of\ not\ stricly\ necessary\ spending * spending)}{\sum spending} = \frac{\sum_{i=1}^{5} u_i * s_i}{\sum_{i=1}^{5} s_i}$$

Where u_i is the percentage of not strictly necessary spending for category *i* and s_i the amount spent on category *i*, expressed in Danish kroner (DKK).

4.2 Data Collection

A between-group survey experiment has been conducted in order to verify whether individuals can engage in self-control and limit their inevitable buying addiction when influenced by an external factor. The purpose of the experiment is to measure the changes in buying behavior caused by the external intervention, our email reminders. The data is collected from students enrolled at major universities in Denmark[21], from both graduate and undergraduate courses. To collect data, two different online surveys were developed[22]. Both surveys were posted online on social media, where an invitation briefly explained the content of the survey and the instruction. The first survey was sent out at the end of March 2021, the second in two weeks' time[23]. As an incentive to participate in this study, students are offered a chance to take part in a raffle to win a 1000 DKK Amazon e-gift card[24]. Since the first survey is posted online, there is no direct possibility to track and monitor participants' change in behavior in the whole research, without breaking the anonymity and ensure anonymous responses. Hence, in the first survey students are given the opportunity to write their email

[21] Our respondents are enrolled in various danish universities, such as Copenhagen Business School, Copenhagen University, The Technical University of Denmark, Aarhus University.
[22] The software utilized to create both surveys is Qualtrics.
[23] The first survey was sent out on March 27th, 2021. The second survey April 10th, 2021.
[24] The probability to win the raffle was unknown to participants.

address and participate in the second survey (and in the raffle). A necessary condition to enter the raffle was to participate in both surveys.

A total of 205 students replied to the first survey. Among these respondents, 29 chose not to share their email addresses, hence they are disregarded from the research since their replies are not useful for the purpose of the research[25]. This leads to a final sample size of 176 students for the first survey. After collecting all the responses from the first survey, we applied the randomization and divided individuals into treatment and control groups[26]. After 15 days from the first survey, students were contacted again via email and invited to answer the second survey. From the second survey, 161 responses have been collected. 15 students did not share their email addresses, and consequently, they were eliminated from the study since it was not possible to relate their responses between the two surveys. Moreover, 6 students shared a different email address with respect to the first survey, making it impossible to recognize and compare their answers among the two surveys. Likewise, in the second survey students were asked to share their email addresses to be eligible to enter the final raffle for the prize. Thus, the final sample size of the research, taking into consideration all students who responded and shared the same identical email address in both surveys, counts a total of 140 students.

4.3 Experiment Design

4.3.1 First Survey

The first survey begins with a brief introduction about the content of the research and the instruction to follow[27]. Participants are told about the existence of the two surveys (separated by two weeks' time) and about the possibility to enter a raffle to win a 1000 DKK Amazon e-gift card. Students are eligible to win the prize only if they participate in both surveys. Participation in the research is completely voluntary and students have the chance to drop off at any time.

[25] In order to conduct our experiment, we need to track individuals' changes in spending behavior. Without the email address, we have no other means to contact that specific individual and invite her to participate in the second survey without breaking GDPR rules.
[26] For more details regarding how we conducted randomization please refer to the "Randomization and Reminders Program" section.
[27] The Appendix contains the link and the screenshots for both surveys in our research.

Students have the immediate possibility to decide whether to participate in the raffle by writing their email address in the appropriate text box. Only students who shared the email address are considered as subjects for the study[28].

The first survey consists of six blocks of questions, which all have different focus areas. Each block starts with a description of the questions that will be asked, to prepare and guide students step-by-step during the whole survey process[29].

The first part includes the most frequently used self-report CBB scale (DSCB scale) by Faber and O'Guinn (1992). Participants have to indicate how much they agree or disagree with the first statement, and how often they have done the described action for the next six statements[30]. Faber and O'Guinn scale has been chosen because of the reasonable reliability ($\alpha = 0.78$[31]) and because researchers in this field have widely acknowledged its capability to provide a trustworthy measure of compulsive behavior.

Subsequently, we ask students to answer questions about their shopping behavior during the weeks prior to the first survey[32]. Firstly, students are asked in which days they went shopping the week before the survey and then on average how many hours and minutes in total they spent on shopping on those days[33]. These questions have the purpose to proxy the

[28] This information is not revealed to students because we cannot enforce people to share sensitive information (the email address in this case).
[29] A bar on top of the page is added to help students keep track of their progress and show how far they are in the survey.
[30] For the sake of the accuracy of the research, we have made some changes in the statements of the second part. In the original DSCB scale by Faber and O'Guinn, there are two statements that are not relevant to our research, conducted on students in Denmark. We converted the statement "I write a check when I knew I did not have enough money in the bank to cover it" into "I use my credit card when I knew I did not have enough money in the bank to cover it", since writing a check is a very unpopular option among students. We also converted the statement "I made only the minimum payments on my credit cards" into "I made a purchase even though I knew it would make it difficult to get to the end of the month" because in Denmark only debit cards are available and paying the minimum is not possible. Hence, we used another statement that addresses the financial consequences of spending.
[31] Information is taken from Norum (2008).
[32] Students are informed that the word shopping means the actual act of purchasing either online or in stores, and that shopping does not include grocery shopping.
[33] When asked about which days they went shopping the week before the survey, students had also the chance to choose "*I didn't go shopping".* If the latter is chosen, the question regarding the total average number of hours and minutes spent on shopping on those days is not displayed.

repetitiveness element which characterized CBB[34]. Then, in order to quantify the amount of spending made by participants in the weeks prior to the survey we adopt the following strategy. First, students are asked to express how many DKK they spent on average on five different shopping categories the two weeks prior to the survey. The five categories include clothes, shoes, make-up, tech items/video games, and bags/accessories. We selected the majority of these categories because they represent the appearance-related products (ARP) which are found to be the most attractive products to compulsive buyers (Martinez-Novoa, 2016). For each category, students are asked to reveal what percentage of the total spending is unanticipated, and what percentage of the total spending is not strictly necessary. These questions are the basis for the creation of our new measures of CBB. Each of the five questions has the following structure: "*Please select how many DKK you spent on average on [category] in the last two weeks*". Students have to select a number between 0 and 700 DKK using a slide bar[35]. If they select a number greater than 0 DKK, the following two questions appear: "*You said you spent [amount]DKK on [category] in the last two weeks. What percentage of this amount was* ***unanticipated****?*" and "*We all have purchasing needs. However, sometimes we purchase things that are not strictly necessary. You said you spent [amount]DKK on [category] in the last two weeks. What percentage of this amount was* ***not strictly necessary****?*".

In the third block of questions, we acknowledge that each person's feelings vary in time and place, thus we ask the respondents to choose the emotions that best represent how they usually feel when they shop. Questions regarding how respondents feel when they shop are introduced because of the definitions of compulsive buying used in this analysis, where this behavior is seen as a coping mechanism towards external feelings and situations (Mrad and Cui, 2020). Specifically, we divide the shopping process into three moments, and we ask the same

[34] As already mentioned, one of the definitions of CBB is 'chronic, repetitive purchasing that becomes a primary response to negative events or feelings'' (Faber and O'Guinn, 1989).
[35] Respondents can only select discrete numbers, hence students can only choose 0, 100, 200, 300, 400, 500, 600, or 700 DKK.

question for "just before" shopping, "just after" shopping, and "a few hours after" shopping[36]. Usually, there is a substantial difference in the pattern of emotions during shopping between ordinary buyers and compulsive buyers. On one hand, ordinary buyers tend to be characterized by a positive mood before shopping, a more positive mood after shopping, and even more positive once they get home. On the other hand, compulsive buyers experience less positive emotions before shopping compared to ordinary buyers, however, their mood significantly spikes after shopping (Benson, 2009). Notwithstanding this extreme joy after shopping, compulsive buyers' mood becomes extremely negative a few hours after their purchases (Benson, 2009). Following this difference in patterns, we want to test how participants' moods vary in the different instants of the shopping process.

In addition, we ask a final question regarding how people feel after they successfully refrain from shopping. It is important to analyze also how students behave when they decide not to shop, since sometimes they may find themselves resisting the temptation to purchase something. This information sheds light on the emotions students feel when they succeed in avoiding buying unnecessary and superfluous goods. This gives us additional clues on the emotional pattern followed by individuals in the act of shopping. For this question, we use again the same relevant primary emotions we implemented in the three questions before.

The fourth block includes questions regarding the respondents' attitude towards risk. Risk preferences questions have been formulated according to Falk et al. (2016). Their hypothetical survey questions are a convenient tool for obtaining standardized measures for risk preferences. These questions are constructed in a way through which people self-report their perceived level of risk through the Likert scale. Risky behaviors are used as a proxy to identify time preference rates.

In the fifth block, the respondents were asked a few demographics questions.

[36] Each of the three questions has the following structure: "*Please select the options that best describe your feelings [moment] shopping (you can choose more than one)*". Students can choose among six emotions and have also the possibility to write down a different emotion if not listed as one of the choices. We selected which emotions to insert in the survey options following psychologist Robert Plutchik's wheel of emotions, and in particular, we opted for those relevant in the context of compulsive buying.

Finally, in the last block, we introduce the "Reminders Program", where we elicited students' willingness to pay to receive two e-mail reminders between the two weeks separating two surveys, designed to encourage them to carefully think before shopping[37].

We ask them whether they would like to receive these two e-mail reminders and how much they would be willing to pay between 0 and 1000 DKK to make sure their favorite choice is implemented. We also ask them to choose a message they would like to see in case they receive the reminders. Participants can choose between two pre-written messages or write their own message in the designated text box.

4.3.2 Second Survey

Two weeks after the first survey, we invite all the respondents who provided us with their e-mail addresses to participate in the second survey through a link via email. As mentioned above, we eventually reach and collect 140 answers.
The second survey is substantially shorter with respect to the first one and composed of only two blocks. The first block focuses on the influence of reminders and the second is a replica of the "spending behavior" block of the first survey.

Firstly, the respondents are asked whether they were assigned to receive the two e-mail reminders the past two weeks, and immediately after whether they actually received them. These two questions helped us to check possible human errors and ensure who is part of the treatment and control group in the experiment. Additionally, some questions about the effect and usefulness of reminders are asked. The purpose is to collect information on how students perceived reminders and how they value their effectiveness.

Secondly, students are asked again about their shopping behavior. Questions are structured in the same way as the ones from the first survey. Initially, students are asked about the days in which they went shopping in the past week, and the total average of hours and minutes they

[37] For details on the "Reminders Program", please refer to the "Randomization and Reminders Program" section.

spent on shopping on those days. After that, they are asked again all the questions to quantify their amount of spending among the aforementioned five categories, and the percentage of unplanned and unnecessary spending.

4.3.3 Randomization and Reminders Program

As mentioned above, at the end of the first survey participants are told that they might also take part in a "Reminders Program". We explain that if a student is selected to participate in this program, she will receive two email reminders in the two weeks following the first survey. These reminders are specifically designed to encourage students to carefully think before shopping.

Students are asked whether or not they want to receive these two email reminders and how much they are willing to pay to guarantee that their favorite option about reminders is implemented. Their willingness to pay needs to be selected in a specified range between 0 and 1000 DKK, where 1000 DKK is the potential final prize.

The "Reminder Program" questions have the following structure: "*If it was up to you, would you like to receive two email reminders to help you think before deciding to purchase something until the next survey (i.e. in two weeks' time)?*". Respondents are then asked to write how much they are willing to pay between 0 and 1000 DKK to ensure that their favorite choice is realized. The question is formulated as follows, "*You told us [favorite choice]*[38]*. How much are you willing to pay between 0 and 1000 DKK to make sure your favorite option is implemented?*". Students are then given a chance to choose the message they would like to read on their reminders, or even to write their own message[39].

To generate random assignment students are told that with a 5% chance, their decisions determine whether they will receive reminders or not, and with 95% chance, their participation in the "Reminders Program" is randomly determined by a computer. We elicited

[38] The *[favorite choice]* is "Yes, I would like to receive reminders" or "No, I would not like to receive reminders".
[39] Please refer to the survey screenshot in the Appendix to see the pre-defined messages choices available for the "Reminders Program".

students' willingness to pay to participate in the "Reminder Program", and their preferences were implemented with 5% possibility. For students in the 5% group, those whose decisions actually determine the participation in the "Reminders Program", we applied the Becker – De Groot – Marschak (BDM) method, which is an incentive-compatible procedure used in experimental economics to measure willingness to pay (WTP). Generally, in a BDM each subject simultaneously submits a bid. Then, this bid is compared to a price that is randomly drawn from a number generator. Any bidder who submits a bid greater than the price receives the auctioned price and pays an amount equal to the price. Any bidder who submits a bid smaller than the price receives nothing and pays nothing (Noussair et al, 2004). In our research, students expressed their WTP to receive or not reminders. A random number between 0 and 1000 has been drawn in a computer program[40]. If the random number is bigger than students' WTP, they will be assigned to the "Reminders Program" with 50% probability. If the random number is smaller than their WTP, students' willingness to receive reminders or not (the so-called "favorite option") is implemented. With a 95% chance respondents' participation in the "Reminders Program" was randomly assigned by a computer. It is valuable to remember that randomization is the most reliable way of creating homogeneous treatment and control groups without any potential biases.

If a student from the 5% group has been selected as the winner of the raffle, the amount of the randomly extracted number will be deducted from the 1000 DKK prize before sending out the Amazon e-gift card. If instead someone from the 95% group wins the raffle, her willingness to pay for the favorite option (receive or avoid reminders) will be deducted from the 1000 DKK before sending her the Amazon e-gift card.

Once we implemented the whole randomization process to decide which students receive the reminders and which not, participants were informed via email about their result and the allocation to the "Reminders Program". Students who were assigned to the Reminders Program represent the treatment group. Students who were not assigned to the Reminders Program represent the control group. It is relevant to underline that our treatment and control

[40] We used RAND() function in Excel.

group are formed only by those students who took part in both surveys, allowing us to track their potential change in spending behavior and the effect of reminders[41].

Figure 1 below shows the message students received when they were informed about their allocation to the Reminders Program.

Figure 1: "Reminder Program" emails

Control Group email	Treatment Group email
You have been randomly assigned to **NOT receive two reminders** that will help you think carefully before shopping. You will not receive any reminders in the following days.	You have been randomly assigned to receive **two reminders** that will help you think carefully before shopping. **You will soon receive your first reminder.**

Notes: the table shows an extract of the emails students received when informed about their allocation to the "Reminders Program". In particular, the table reports the messages for those students whose participation in the "Reminder Program" has been randomly selected by a computer. Students who belong to the 5% group received a slightly difference message. For example, an extract of their emails is as follows: "Your choices in the first survey have determined whether you will receive or not two reminders that will help you think carefully before shopping.
Here is your outcome: **[favourite choice]**".
Entire screenshots of the three different emails can be found in the Appendix.

4.4 Statistical models used in our analysis

4.4.1 Ordinary Least Square Regression

An Ordinary Least Square (OLS) regression is a statistical model that estimates the linear relationship between one or more independent variables, the explanatory variables, and a dependent variable, the explained variable.

The generic formula for the linear relationship, the OLS line is:

$$y = \mathrm{X}\beta + \varepsilon$$

$$= [1 \;\; x_1 \; x_2 \; \dots x_k] \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{bmatrix} + \varepsilon$$

[41] For instance, if a student has been assigned to the "Reminder Program", but she did not complete the second survey, she is not part of our treatment group even though she received the two email reminders.

$$= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_k x_k + \varepsilon$$

where $\beta_j \in \mathbb{R}$ and $j = 1, \ldots, K$ are the coefficients to estimate, K the number of independent variables, and ε is the error term which contains all other factors apart from β_j that affect the dependant variable, y. This method estimates the coefficients of the regression by minimizing the sum of the squared residuals.

The estimated OLS equation is

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{\beta}_3 x_3 + \cdots + \hat{\beta}_k x_k$$

where $\hat{\beta}_j$ with $j = 1, \ldots, K$ are the estimates of β_j. These estimates are chosen in such a way to minimize the sum of squared residuals. $\hat{u}_i = y_i - \hat{y}_i$ represent the residuals, the difference between the actual value y_i and the fitted value $\hat{y}_i$. Broadly speaking, the OLS regression line is the line that best fits the relationship between independent variables and dependent variables, such that to minimize the vertical distance between the data points and the line. Coefficients $\hat{\beta}_j$ have the following interpretation: $\hat{\beta}_1$ measures the change in $\hat{y}$ due to a one unit change in x_1, holding all the other explanatory variables constant (Wooldridge, 2012).

4.4.2 Two-Sample t Test

The Two-Sample *t* test is a parametric test that compares the means of two independent groups to determine whether the population means are significantly different. In order to perform the following tests, various requirements need to be satisfied:

- Dependent variable must be continuous
- Independent variable must be categorical
- The two samples must be independents, i.e., no relationship between the subjects in each sample
- Random sample of data from the population
- Dependent variable should follow a Normal distribution

- Variances should be approximately equal across the two samples

The null hypothesis of this test is $H_0: \mu_1 - \mu_2 = 0$, the difference between the two population's mean is zero. The alternative hypothesis is $H_1: \mu_1 - \mu_2 \neq 0$. Note that μ_1, μ_2 represents respectively the mean for group 1 and group 2.
The test statistic t is

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

With

$$s_p = \sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-1}}$$

Where $\bar{x}_1, \bar{x}_2$ are the mean of group 1 and 2; n_1, n_2 the sample size of group 1 and 2; s_1^2, s_2^2 the standard deviation of group 1 and 2 respectively. This t value is then compared to the critical value, and if the t-statistic is greater than the critical value H_0 is rejected[42].

4.4.3 Wilcoxon-Mann-Whitney Test

The Wilcoxon-Mann-Whitney (WMW) test is a non-parametric test that can be used instead of the Two-Sample *t*-test when there are doubts regarding the normality assumption of the variables in the population[43]. This test consists of taking all observations from the two groups under inspection and ranking them according to the size. The test statistic is

$$U_1 = R_1 - \frac{n_1(n_1+1)}{2}$$

Where n_1 is the sample size for sample 1 and R_1 is the sum of the ranks in sample 1.
An equal formula for the test statistic for sample 2 is

[42] https://libguides.library.kent.edu/spss/independentttest
[43] Implementation of WMW test is reported in the Appendix.

$$U_2 = R_2 - \frac{n_2(n_2+1)}{2}$$

Where n_2 is the sample size for sample 2 and R_2 is the sum of the ranks in sample 2.

This method is used for large samples. If instead, we have small samples, a direct method to calculate the test statistic is performed. The direct method follows these steps. First, we need to identify the sample with smaller ranks and name it "sample 1" and name the sample with larger ranks as "sample 2". Then, we need to take the smaller observation in sample 1 and count how many observations in sample 2 are smaller than the smaller observation in sample 1. If the observations are equal to the one from sample 1, count them as one half (e.g., if 8 is the observation and we have also one 8 in sample 2, it will be counted as ½ (8) = 4). All this process must be repeated for all observations in sample 1. All the totals from the previous steps need to be sum up, and this final sum represents the U statistic[44].

[44] https://www.statisticshowto.com/mann-whitney-u-test/

5. Results and Discussion

5.1 Descriptive Statistics

In our final sample of 140 students, 3% of the participants can be classified as compulsive buyers according to the CBB scale designed by Faber and O' Guinn (1992). The percentage of compulsive buyers is below the average interval revealed by previous studies, where the percentage fluctuated between 6% and 9%.

Regarding our new measures to evaluate people's spending behavior, on average students in the first survey spend more than 300 DKK in total across our five spending categories, and the total percentage of unanticipated spending is 33%, while the not strictly necessary one is higher, around 56%. In the second survey, students spend on average slightly less (288 DKK), with a percentage of unanticipated spending around 47% and a percentage of not strictly necessary spending around 53%.

The category where students spend the most is "Clothes" in both surveys, with average spending of 132 DKK in the first survey and 133 DKK in the second. Table 1 shows the average total spending for each category in both surveys. Furthermore, on average students in the first survey admit that 32% of their clothing spending is unanticipated and 64% is not strictly necessary. In the second survey, these percentages appear to equalize around 45% for either unanticipated or not strictly necessary spending. Tables 2 and 3 show the average total unanticipated and non-strictly necessary spending for each category.

The category in which students spent the least is "Make-up" in both surveys, with average spending of 25 DKK in the first survey, and 21 DKK in the second survey. Moreover, on average in the first survey, we detect that 35% of the spending on that category is unplanned and more than 50% is unnecessary. In the second survey, almost 30% of make-up spending is unanticipated, and slightly less than 50% is not strictly necessary.

Table 1: Average Total Spending (DKK)

Statistic		*Clothes*	*Make - up*	*Tech items*	*Shoes*	*Accessories*
Mean	1st survey	132.15	25.00	66.43	59.29	25.71
		(200.09)	(72.09)	(155.29)	(162.22)	(78.99)
	2nd survey	133.57	21.43	56.43	47.86	29.29
		(213.44)	(62.08)	(148.96)	(165.11)	(182.83)

Notes: the table shows the average total spending for each category expressed in DKK for both surveys. In parentheses, standard deviation.

Table 2: Unanticipated average spending per category

Statistic		*Clothes*	*Make - up*	*Tech items*	*Shoes*	*Accessories*
Mean	1st survey	42.36	8.79	15.71	17.21	7.79
		(99.43)	(40.91)	(67.42)	(71.41)	(40.07)
	2nd survey	60.14	6.29	28.00	14.93	23.86
		(133.22)	(28.77)	(98.07)	(85.39)	(96.85)
% unanticipated	1st survey	32.05%	35.16%	23.65%	29.03%	30.30%
	2nd survey	45.03%	29.35%	46.62%	31.20%	81.46%

Notes: the table shows the average unanticipated spending for each category expressed in DKK. In the bottom part of the table, we report the same number expressed in percentage value: % unanticipated is the ratio between the average amount of unanticipated spending and the average total spending for each category.
In parentheses, standard deviation.

Table 3: Not-strictly-necessary average spending per category

Statistic		*Clothes*	*Make - up*	*Tech items*	*Shoes*	*Accessories*
Mean	1st survey	84.64	13.78	15.71	17.21	7.79
		(163.22)	(53.13)	(70.86)	(71.41)	(65.46)
	2nd survey	71.00	10.21	37.07	15.36	20.00
		(147.40)	(40.15)	(114.15)	(119.53)	(88.54)
% not strictly necessary	1st survey	64.05%	55.12%	34.83%	63.01%	68.07%
	2nd survey	45.64%	47.64%	65.69%	32.09%	68.28%

Notes: the table shows the average not-strictly-necessary spending for each category expressed in DKK. In the bottom part of the table, we report the same number expressed in percentage value: % not strictly necessary is the ratio between the average amount of unanticipated spending and the average total spending for each category.
In parentheses, standard deviation.

On average students shop 22 minutes per day the week before the first survey, while 33 minutes before the second survey. In the first survey, almost 60% of the sample avoid superfluous shopping the week before the survey. Furthermore, none of the participants spend more than four days going shopping. In the second survey, half of the students did not go shopping the week prior to the questionnaire and only 3 out of 140 went shopping more than four days.

According to people's answers, we classify emotions into three different categories: positive, negative, and mixed emotions. Mixed emotions represent a situation in which participants expressed conflicting feelings; for example, some participants admit being both happy and regretful after shopping. In our sample, 92 students experience positive emotions before shopping, in particular, almost 50% of the participants declare to be happy in the moment just before shopping. Furthermore, 17% of the students declare to be excited before shopping. The percentage of happy students at the moment just after shopping remains constant at 50%, while the number of people who expressed to be relieved just after shopping increased from 4 to 21 concerning the moment just before shopping. A few hours after shopping, again 50% of students experience positive emotions, however the number of people who experience regret increase from 0 to 12 compared to the moment just before shopping.

Students who turn out to be compulsive buyers according to the self-reported CBB scale, experience positive emotions in all three phases, with the only exception of one student who felt regretful a few hours after shopping.

When asking generic questions about willingness to take risks, on average the sample of students reveal to have a tendency towards risk aversion, as they prefer to avoid taking risks and when directly asked, they state to dislike taking risks. As far as the specific tendency towards myopic behavior is concerned, the majority of students did not display this behavior. The only aspect where students show preferences towards immediate gratification was regarding the difficulty to resist "unhealthy but delicious food". In particular, on average participants declare to not spend too much money.

53% of the respondents were female. The average age was 23 years old. 85 students out of 140 declared to work. 107 students express not to have the desire to receive reminders and 57% of the sample is willing to spend some money to ensure their preferred options (on reminders) are implemented. All students who turn out to be compulsive buyers according to the CBB scale stated to prefer to not receive reminders, and one of them was willing to pay 1000 DKK to see her choice implemented.

The treatment group is composed of 76 individuals, while the control group of 64. According to the second survey, among all students who did not receive reminders, more than 90% admit that in any case reminders would have not been beneficial as a helping instrument to carefully think before shopping. Furthermore, only 36% of students who actually receive reminders find them helpful.

5.2 Analysis of Results

The analysis for this thesis was performed in Stata and Microsoft Excel.

5.2.1 Result 1: new CBB measures and self-reported CBB score

In general, previous studies explore compulsive buying behavior from psychological, sociological, and demographic perspectives (Roberts, 1998). In this thesis, we aim to fill the gap in the literature by developing new and quantifiable measures for both compulsive buying behavior and self-control mechanism[45]. We use the seven-item, five-point Likert scale, which is the widely used tool developed by Faber and O'Guinn to measure compulsive buying behavior as a reference for our measures. The newly developed measures allow us to analyze compulsive buying behavior from a different perspective with respect to the classical psychological self-reported scale.

Our measure of CBB is the ratio of total unanticipated spending across five different shopping categories over the total spending on all categories. This measure has been created for both first and second surveys.

H1: There is a positive relationship between the unanticipated spending ratio and self-reported CBB score.

[45] In section 5.2 we report only the analysis related to USR. In the Appendix a brief analysis for the NSNSR can be found.

As Table 4 shows, the strength of the correlations between the self-reported CBB and our CBB measure is found to be weak ($\rho = 0.0111$ for USR1 and $\rho = 0.117$ for USR2, where ρ is the correlation coefficient).

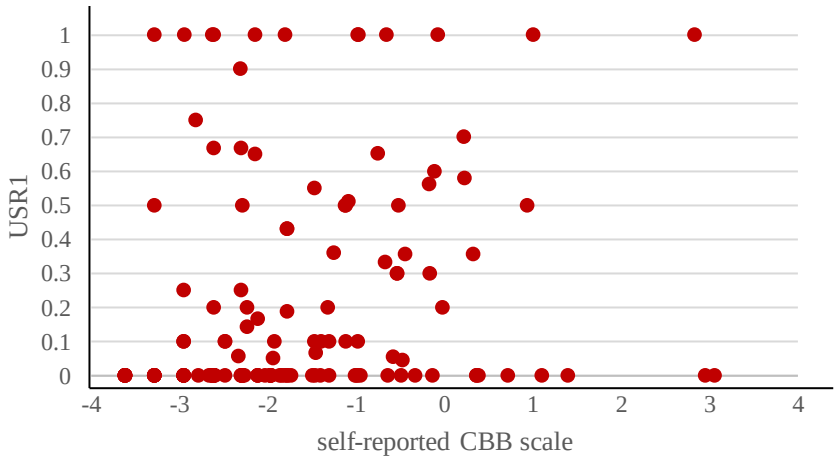
Moreover, as it is evinced from the scatterplots in Figure 2 and Figure 3, there is no clear relationship between the two measures of CBB. This lack of statistical power is due to our restricted sample size[46]. Even though we cannot affirm that there exists a strong positive relationship between self-reported CBB score and our USR measures, given the abovementioned limitations we still believe that unanticipated spending ratio can be a good starting point to develop a quantitative measure for compulsive buying behavior.

Table 4: Correlation between Self-reported CBB score and our first measure of CBB

Variables	CBB self-reported	USR 1	USR 2
CBB self-reported	1.000		
USR 1	0.111	1.000	
USR 2	0.117	0.146	1.000

Notes: This table displays the correlation coefficient between CBB self-reported scale and USR1 and USR2. USR1 and USR2 are the ratios of total unanticipated spending across five different shopping categories over the total spending on all categories in first and second survey, respectively.

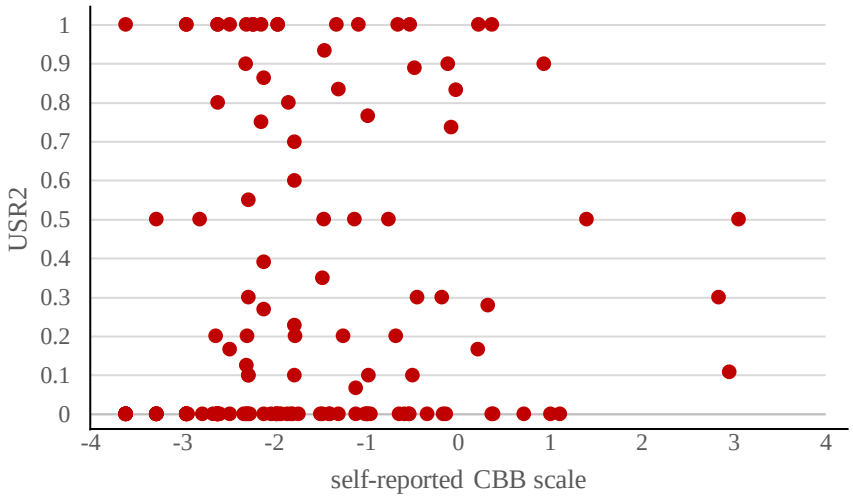
Figure 2: Scatterplot between self-reported CBB and USR1



Notes: This figure shows the scatterplot between the self-report CBB scale and the USR1 ("unanticipated spending ratio" from the first survey) – our measure of CBB.

[46] For more details regarding the lack of statistical power in our analysis, please refer to Section 7.1.

Figure 3: Scatterplot between self-reported CBB and USR2



Notes: This figure shows the scatterplot between the self-report CBB scale and the USR2 ("unanticipated spending ratio" from the second survey) – our measure of CBB.

5.2.2 Result 2: the Effect of the Treatment

The core of our research is based on the analysis of students' self-control abilities related to shopping behavior. We want to inspect whether students are able to control their spending behavior once they are exogenously made aware of their financial status. Thus, as the next step, we investigate the effect of the Reminders Program on the respondents' buying behavior, specifically how their self-control mechanism work under the exogenous factor.

H2: Students who took part in the Reminders Program (vs control group) are more likely to control their buying behavior, decreasing their frivolous spending.

In the previous part, we proposed the unanticipated spending ratios as plausible measures for compulsive buying behavior. In this part, we test the effect of the reminders using the above-mentioned quantifiable measures of CBB. We will test whether there is an effect of the Reminders Program on the ratio of total unanticipated spending across five different shopping categories over the total spending on all categories from the first survey to the second survey.

To see the extent of the change in self-control abilities, in this section, we use the change in the ratio of total unanticipated spending across five different shopping categories over the total spending on all categories from the first survey to the second survey. Therefore, we use the difference between USR2 and USR1. This change in the unanticipated spending ratio can be used as a proxy for the change in self-control abilities. On one hand, when the difference is negative, it means that the respondent's total unanticipated spending ratio is lower in the second survey compared to the first survey. On the other hand, when the difference is positive the respondent's total unanticipated spending ratio is higher in the second survey compared to the first survey. Regardless of an increase or a decrease in this ratio, since it may happen due to several other external factors, if we see a relatively lower increase or a relatively higher decrease in the treatment group, we can interpret it as the Reminders Program to potentially have a desirable effect on respondents' self-control abilities on their buying behavior.

Table 5: Effect of reminders on participants' spending behavior

	(1)	(2)
Model	OLS	OLS
Dependant variable	diffUSR	USR2
treatment	-0.133	-0.239***
	(0.128)	(0.087)
averagerisk	-0.006	0.013
	(0.396)	(0.026)
gender	-0.124	-0.072
	(0.131)	(0.088)
age	-0.118	-0.077
	(0.213)	(0.154)
agesqrd	0.003	0.001
	(0.004)	(0.003)
constant	1.559	1.567
	(2.634)	(1.887)
N. Observations	65	84

Notes: This table reports regression estimates of the effect of reminders on the students' spending behavior.
For column (1) the response variable is "DiffUSR", for column (2) is USR2. "DiffUSR" is the difference between USR2 and USR1. USR is the "unanticipated spending ratio", where 1 stands for the first survey and 2 for the second survey. "Treatment" is a dummy variable, which is equal to 1 for the treatment group, students who received reminders, and 0 for control group, students who did not receive reminders. "Averagerisk" is a proxy for risk taking. "Agesqrd" is the variable "age" squared. *** p<0.01, **p<0.5, *p<0.1.

In Table 5 we see that even though the result is not significant, receiving reminders (treatment = 1) decreases on average the difference in USR ("diffUSR"), which means that there is a decrease in unanticipated spending from survey 1 to survey 2 (p = 0.306), which is as we expected. The results also suggest that being in the treatment group decrease USR2, the total unanticipated spending ratio in the second survey (p = 0.007).

Moreover, looking at Table 6, the suggested but not significant results show that from the first survey to the second survey, the total unanticipated spending ratio increases in both groups (we have positive means in both groups: 0.149 for Control and 0.016 for Treatment). However, it increases relatively less for the treatment group (t(63) = 1.089, p = 0.280).

This can be interpreted as the Reminders Program to potentially have a positive effect on students' self-control abilities on their buying behavior.

Table 6: Two-sample t test with equal variances

Group	Obs	Mean	95% CI	
Control	34	0.149	-0.050	0.349
		(0.098)		
Treatment	31	0.016	-0.126	0.158
		(0.069)		
Difference		0.134	-0.111	0.378
		(0.122)		
Difference = mean(Control) - mean (Treatment)				
t = 1.089				
df = 63				
P-value (|T| > |t|) = 0.280				

Notes: This table reports the Two Sample *t*-test for the effect of reminders. The *t*-test is applied on the variable "diffUSR", the difference between USR2 and USR1. Control is the control group, students who did not receive reminders. Treatment is the treatment group, students who received reminders. 95% CI is the 95% confidence interval. t = 1.098 is the test statistic for H_0 : there is no difference in the means between treatment and control groups.

5.2.3 Result 3: Willingness to Pay

In the first survey, we asked the respondents how much they would be willing to pay between 0 and 1000 DKK to make sure their choice of receiving or avoiding reminders is implemented. For example, if someone chose "No, I would not like to receive reminders" and then say she was willing to pay 300 DKK, this means that 300 DKK is her WTP to make sure that she is not going to receive reminders. When WTP=0, this means that whichever option is chosen, the respondent is not willing to pay anything to make sure that the choice is implemented.

In our research, using the willingness to pay measure explained above, we also investigate to what extent the respondents are good at forecasting their needs for reminders or not, and whether they are aware of their biases.

H3: Students with higher unanticipated spending ratios in the first survey are more inclined to willing to receive reminders.

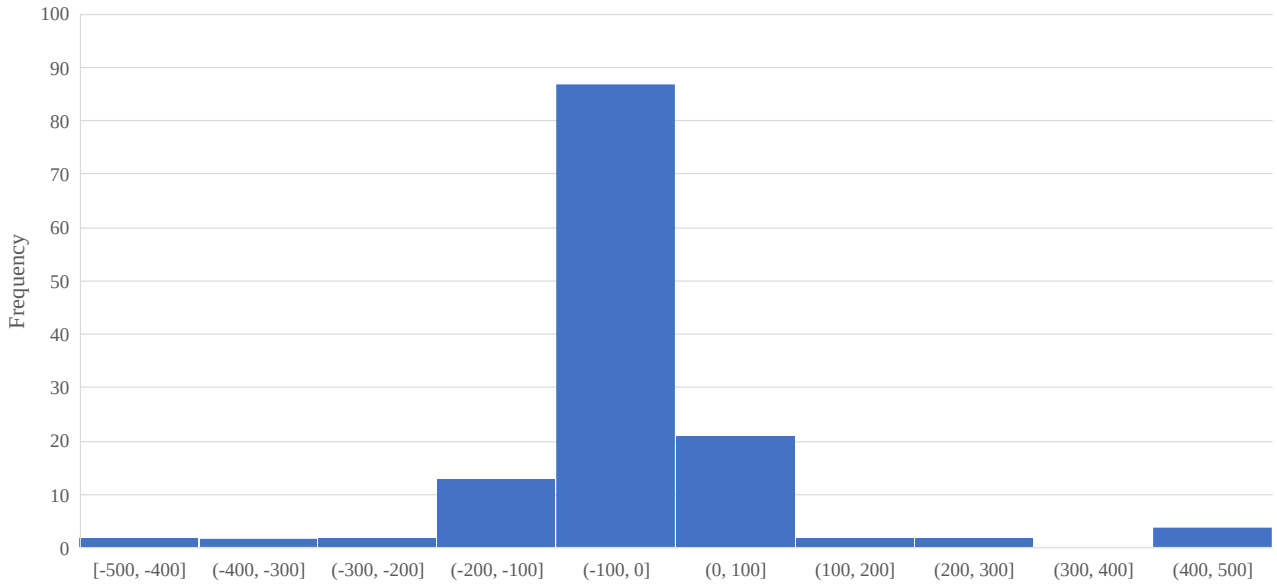
H4: Students with higher self-reported CBB scores are more inclined to willing to receive reminders.

Before diving into the findings, we transform our initial WTP variable into a scale from -1000 DKK to +1000 DKK, which we called "WTPnew"[47]. Negative amounts represent how much individuals are willing to pay to avoid reminders, while positive amounts represent how much they are willing to pay to receive the two reminders. Here, -1000 DKK represents the maximum amount to pay to avoid reminders and +1000 DKK represents the maximum amount to pay to receive reminders. As Figure 4 below depicts, the majority of the students are located in the (-100,0] interval, which means that they are willing to pay between 0 and 100 DKK to avoid reminders[48].

[47] In our initial WTP measure, for example 1000 DKK represented the maximum WTP for the favorite option, which could be either willingness to receive or avoid reminders.

[48] Figure 4 represents the histogram without outliers – 4 people declared to be willing to pay 1000 DKK to avoid reminders, and one student declared to be willing to pay 750 DKK in order to receive reminders. These values are excluded in the histogram in Figure 4. Figure 4 in the Appendix reports the histogram with outliers.

Figure 4: Distribution of WTP



Notes: this figure represents the distribution of WTP. Negative values of WTP reflect the preference to avoid reminders; positive values of WTP reflect the preference to receive reminders. Outliers with WTP greater than 500 or smaller than -500 have been excluded.

Additional results on WTP and measures of CBB can be extracted from Table 7. When we regress WTPnew on the total unanticipated spending ratio, USR1, from the first survey, we see that if USR1 increases by one percentage, the average willingness to pay increases by 0.855 ($p = 0.297$). The increase in the average willingness to pay is 0.855 because we divide the coefficient of 85.490 by 100 in the regression below since we have a proportion as the independent variable. Since the WTPnew increases by 0.855 when there is a one-unit percentage increase in USR1, the results suggest that as the total unanticipated ratio increases, students become more inclined to willing to receive reminders, which supports our Hypothesis 3. When we regress WTPnew on the self-reported CBB score, we see that if the self-reported CBB score increases by one unit, the average willingness to pay decreases by 15.624 ($p = 0.255$). This suggests that as the self-reported CBB score increases, students become more inclined to willing to avoid reminders, which contradicts our Hypothesis 4.

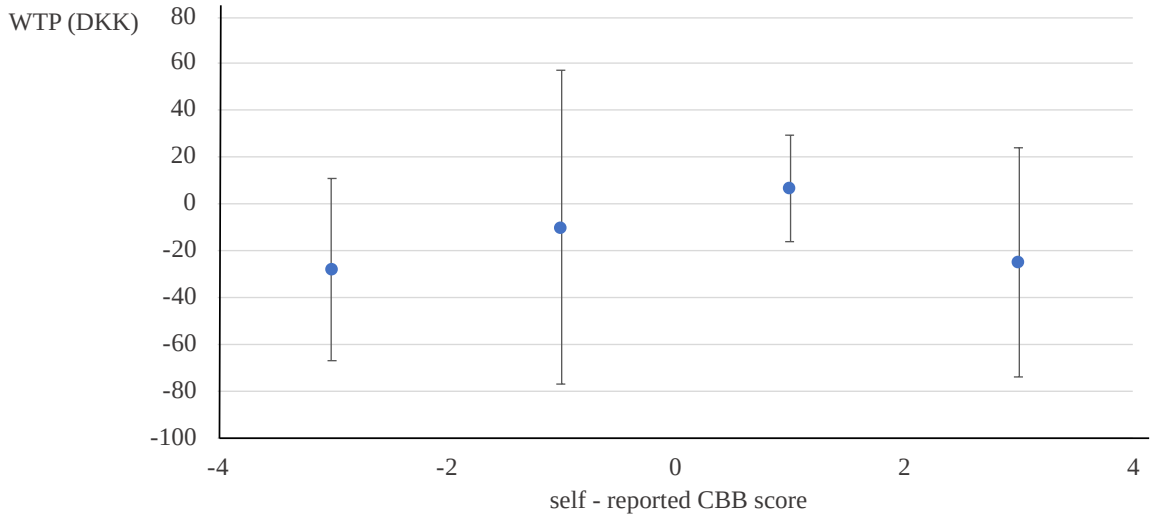
Table 7 : Degree of compulsive buying and WTP

	(1)	(2)
Model	OLS	OLS
Dependant variable	WTPnew	WTPnew
self-reported CBB	-15.624	
	(13.678)	
USR1		85.490
		(81.431)
Constant	-51.427*	-51.539
	(29.659)	(39.106)
N. Observations	140	88

Notes: this table reports regression estimates for the OLS regressions of WTP on measures of compulsive buying. "USR1" is the unanticipated spending ratio from survey 1. *** p<0.01, **p<0.5, *p<0.1.

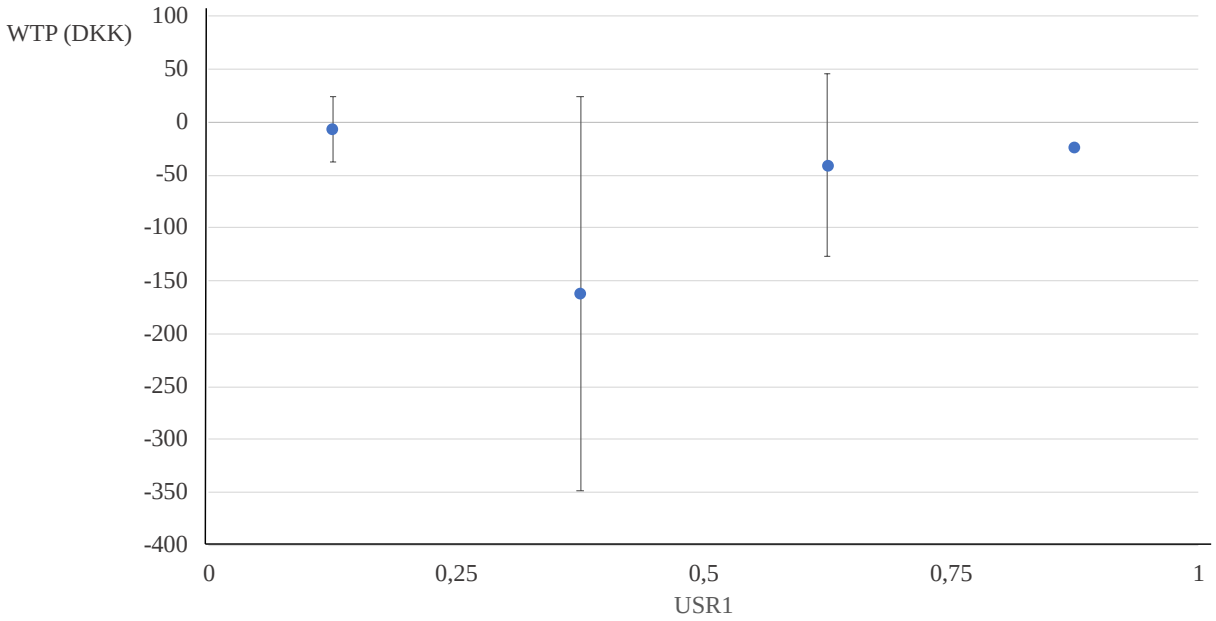
In Figure 5 below, the average willingness to pay to receive or avoid reminders is displayed for four different intervals of self-reported CBB scores with a 95% confidence interval. It is shown that the [-4,-2], (-2,0], and [2,4] intervals for self-reported CBB have an average WTP to avoid reminders, while the (0,2] interval has an average WTP to receive reminders. Thus, according to our results, among all the students, both the most and the least compulsive buyers are on average more likely to be willing to avoid reminders.

Figure 5: average WTP for different intervals of self-reported CBB scores



Notes: this figure plots the average willingness to pay to receive (or not) reminders for four different intervals of self-reported CBB score. Intervals of self-reported CBB score are [-4; 2], (-2; 0], (0; 2]; [2; 4]. Average WTP for each self-reported CBB score interval is depicted by the blue dots. Outlier for WTP in corresponding [2; 4] interval has been excluded. 95% confidence intervals are displayed.

Figure 6: average WTP for different intervals of USR1



Notes: this figure plots the average willingness to pay to receive (or not) reminders for four different intervals of USR1 – unanticipated spending ratio for first survey. Intervals of USR1 are [0; 0.25], (0,25; 0,5], (0,5; 0,75]; [0,75; 1]. Average WTP for each USR1 interval is depicted by the blue dots. Outliers for WTP in corresponding [2; 4] interval have been excluded. 95% confidence intervals are displayed.

In Figure 6 above, the average willingness to pay to receive or avoid reminders is displayed for four different intervals of USR1 with a 95% confidence interval. The figure shows that all intervals for USR1 have an average WTP to avoid reminders. Moreover, among all the students, the ones with the lowest and highest total USR1 seem on average to not be willing to pay to neither receive nor avoid reminders.

5.2.4 Result 4: Other Findings

H5: There is a positive relationship between time preferences - in relation to participation in risky behaviors - and CBB.

We hypothesized that participation in risky behaviors, as a representative of being present-oriented, has a positive impact on self-reported compulsive buying behavior scores. The more risk-loving people are, the more prone to CBB they may be. As shown in the first OLS regression in column (1) of Table 8, the results support that time preference – in relation to

participation in risky behaviors – and self-reported CBB have a positive relationship. In the first survey, we have six statements about risk preferences, where we ask the respondents to say how much each of those statements describes them as an individual. We aggregated all the measures about risk preference and this aggregated measure, called "averagerisk", has a positive and statistically significant ($p = 0.000$) coefficient when we regress self-reported CBB on various explanatory factors (column (1) in Table 8). The result can be interpreted as follows. A unit increase in "averagerisk", keeping everything else constant, increases on average self-reported CBB score by 0.286. An increase in self-reported CBB score implies a higher tendency to be compulsive buyers.

On the other hand, when we regress our measure of CBB on various explanatory variables (column (2) in Table 8), the coefficient of "average risk" shows an opposite sign with respect to column (1), which is a contradiction to our hypothesis. Result is again not significant ($p = 0.735$).

H6: There is a negative relationship between parental income and CBB.

As we stated before, we found no evidence regarding research between personal income and CBB, thus we did not state it as another hypothesis. However, we decided to analyze the relationship between personal income and CBB as well, since we believe this can be interesting to analyze due to the high number of students in Denmark who have a job and consequently a personal income.

To analyze income, we added the variables for parental income and personal income into the first two regressions in Table 8. However, when we do that, we lose the statistical significance of the other explanatory variables. For the regression with the self-reported CBB score, the statistically insignificant result suggests that both parental and personal incomes have a negative impact on self-reported compulsive buying behavior score ($p = 0.860$ for parental income, and $p = 0.758$ for personal income). The former implies that students whose parents have lower levels of income tend to score higher on the Faber and O'Guinn scale. The latter implies that students with higher personal income tend to score lower on the Faber and O'Guinn scale. As far as the regression with our measure for CBB is concerned, the

statistically insignificant result suggests that parental income has a positive impact (p = 0.193) on the total unanticipated spending ratio, while personal income has a negative impact (p = 0.137) on USR1.

Table 8: Explanatory factors of CBB

	(1)	(2)	(3)	(4)
Model	OLS	OLS	OLS	OLS
Dependant variable	self-reported CBB	USR1	self-reported CBB	USR1
averagerisk	0.286***	-0.009	0.197**	0.005
	(0.074)	(0.029)	(0.097)	(0.044)
gender	0.345	0.124	0.427	0.241*
	(0.233)	(0.090)	(0.300)	(0.139)
age	-0.175	0.270*	-0.559	0.114
	(0.442)	(0.147)	(0.870)	(0.332)
agesqrd	0.004	-0.005	0.011	-0.002
	(0.009)	(0.003)	(0.018)	(0.007)
negemotionsbefore	-0.782**	-0.268**	-0.435	-0.245
	(0.346)	(0.129)	(0.455)	(0.191)
negemotionsjustafter	-1.204**	-0.302	-1.73**	-0.352
	(0.599)	(0.368)	(0.817)	(0.399)
negemotionsafter	0.701*	0.043	0.551	0.049
	(0.385)	(0.124)	(0.507)	(0.163)
negativerefrain	0.974***	-0.068	1.443	-0.101
	(0.295)	(0.107)	(0.394)	(0.157)
income1			-0.0004	0.0006
			(0.001)	(0.0004)
income2			-0.00006	-0.0002
			(0.0003)	(0.0001)
constant	-1.329	-2.877	4.152	-1.173
	(5.355)	(1.820)	(10.301)	(3.970)
N. Observations	112	72	75	43

Notes: this table reports regression estimates for the various regressions of CBB measure on different explanatory variables. “USR1” is the unanticipated spending ratio from survey 1. “averagerisk” is the proxy for risk-taking behavior. “agesqrd” is the square of variable age. “negemotionsbefore” is a dummy variable for negative emotions before experienced before shopping. “negemotionsjustafter” is a dummy variable for negative emotions experienced just after shopping. “negemotionsafter” is a dummy variable for negative emotions experienced a few hours after shopping. “negeativerefrain” is a dummy variable for negative emotions experienced once individuals refrain from shopping. For all dummy variables regarding emotions, 1 indicate negative emotions, while 0 non-negative emotions. “income1” is a categorical variable for the personal income of students. “income 2” is a categorical variable for the income of the parents of the students. *** p<0.01, **p<0.5, *p<0.1.

Finally, we test the relationship between emotions and CBB.

H7.1: There is a positive relationship between negative emotions experienced before shopping and CBB.

H7.2: There is a positive relationship between negative emotions experienced few hours after shopping and CBB.

We have asked the respondents how they feel before they went shopping, just after they shopped, a few hours after shopping. Furthermore, we also asked them how they feel when they refrain from shopping. These four different time periods are important to us to investigate compulsive buying behavior. By the definition of compulsive buying behavior, negative emotions play an important role as an external factor. Indeed, compulsive buying can be seen as "chronic, repetitive purchasing that becomes a primary response to negative events or feelings" (O'Guinn and Faber, 1992). Compulsive buying also refers to "consumers' repetitive shopping, at time excessive, because of boredom, tension, or anxiety" (Solomon, 2002). Moreover, these behaviors can create an immediate gratification, which will disappear over time leading to negative long-term consequences (O'Guinn and Faber, 1989). Therefore, analyzing emotions, especially the negative state of the respondents' minds before shopping and a few hours after shopping, gives us some important insights about compulsive buying behavior. We can see how they feel before the act of purchasing and a few hours after the act of purchasing when they have the time to reflect upon their buying behavior.

When the dependent variable is self-reported CBB score (column (1)), the statistically significant results show that the respondents who experience negative emotions such as sadness, anger, regret before shopping ($p = 0.026$) are more likely to have a lower self-reported CBB score, which contradicts our Hypothesis 7.1. On the other hand, results support Hypothesis 7.2 since the respondents who feel negative emotions a few hours after shopping ($p = 0.072$) are more likely to have higher self-reported CBB scores. The results also show that the respondents who feel negative emotions just after shopping ($p = 0.047$) are more

likely to have a lower self-reported CBB scores. Those who feel negative emotions when refraining from shopping ($p = 0.001$) are more likely to have higher self-reported CBB scores. When we regress our measure of CBB (column (2)), we have again a statistically significant result for "negemotionsbefore", which shows that the respondents who experience negative before shopping ($p = 0.042$) are more likely to have lower total unanticipated spending ratio, which is contradictory to our Hypothesis 7.1. On the other hand, the suggestive but not significant result for "negemotionsafter" supports Hypothesis 7.2, since respondents who feel negative emotions a few hours after shopping ($p = 0.731$) are more likely to have a higher total unanticipated spending ratio.

Previous researches hypothesize that females are more likely to be compulsive buyers than males, and both in the regression with the self-reported CBB score and in the regression with our measure for CBB, the suggestive but not statistically significant results confirm previous literature. According to our results, being a female, when everything else is constant, indicates on average a higher self-reported compulsive buying behavior score ($p = 0.142$ for the regression with the self-reported CBB score, and $p = 0.175$ for the regression with USR1).

When we regress the self-reported CBB score, the suggestive but not significant result says that age has a negative impact on self-reported CBB score, which means that younger students are more likely to be a compulsive buyer relative to the older students ($p = 0.692$). As opposite, when we regress our measure of CBB, the coefficient of age has a positive sign ($p = 0.071$). Contradictory and insignificant results might be due to the lack of variance in the age in our sample since we surveyed only students who are approximately in the same age range.

5.3 Discussion

This thesis provides insights into the effectiveness of self-control abilities on compulsive buying behavior. First, we develop new and numerical ways to quantify compulsive buying behavior. Second, we investigate to what extent participants are able to control their buying behaviors when influenced by external instruments that remind them of their excessive spending. Third, we analyze to what extent participants are good at forecasting their need for reminders, which is concretely captured by the WTP measure.

5.3.1 Result 1: new CBB measures and self-reported CBB score

This thesis builds on previous studies to develop a new and quantifiable measure for both compulsive buying behavior and self-control abilities. In the first part, we propose total unanticipated spending ratios in survey 1 and survey 2 as measures for compulsive buying behavior. Positive correlation between CBB measures is found to be weak ($\rho = 0.111$ for USR1 and $\rho = 0.117$ for USR2). However, it is important to stress the fact that the lack of statistical power in our result is due to the small sample size. Moreover, we need to keep in mind that the respondents spending behavior was tracked for only two weeks. A longer time period could potentially lead to better and stronger results.

5.3.2 Result 2: the Effect of the Treatment

In the second part, we test the effect of the Reminders Program using our new measures for CBB. According to OLS regression in Table 5, we find that being in the treatment group decreases USR2, the total unanticipated spending ratio in the second survey ($p = 0.007$). Our *t*-test results show that from the first survey to the second survey, the total unanticipated spending ratio increases in both groups, however, it increases relatively less for the treatment group ($p=0.280$). This can be interpreted as the Reminders Program to potentially have a positive effect on students' self-control abilities on their buying behavior. Although there is an overall increase in total unanticipated spending ratio, which may occur due to several

external factors, one being the Easter Holiday right before the second survey, we would still expect to see that the increase is less for the treatment group. This is because reminders serve as a tool to make students aware of their financial status and excessive spending, inducing them to carefully think before shopping. In future studies, if the experiment is conducted for a longer time period, we might see a statistically significant effect of reminders on reducing the unanticipated spending ratio of the respondents, and so, enhancing the self-control mechanism.

5.3.3 Result 3: Willingness to Pay

Then in the third part, the WTP measure allows us to see whether the participants are good at forecasting their needs for reminders or not. Furthermore, asking people their WTP to receive or avoid reminders gives us insights to verify people's awareness regarding their biases. By regressing our transformed measure of WTP, called "WTPnew", we see that if USR1 increases by one percentage, the average willingness to pay increases by 0.855 ($p = 0.297$). The results suggest that as the total unanticipated ratio increases, students become more inclined to willing to receive reminders. We also see that if the self-reported CBB score increases by one unit, the average willingness to pay decreases by 15.624 ($p = 0.255$). This suggests that as the self-reported CBB score increases, students become more inclined to willing to avoid reminders. The reason why students with higher self-reported CBB scores would like to avoid reminders might be the case that they are fully sophisticated, and do not value reminders as a changing behavior instrument. They realize that reminders will probably make them feel bad, hence they decide to disregard this option. However, it might also be the case that they are fully naive, and believe that they are not going to need the reminders to control themselves.

5.3.4 Result 4: Other Findings

Norum (2008) states that present-oriented students are more exposed to CBB, where present orientation is measured through risky behaviors. In our research, using an aggregated measure

for participation in risky behaviors as a representative of being present biased, we test the relationship between time preference and CBB. Our statistically significant result supports Norum's (2008) findings, where present-oriented students are more exposed to CBB ($p = 0.000$). However, when we use our measure of CBB instead of the self-reported CBB scale, we find a statistically insignificant negative relationship between time preference and CBB ($p = 0.735$), which contradicts Norum's findings. This contradictory result may be still caused by our small sample size.

Our results regarding the parental income give suggested evidence ($p = 0.860$) to what is stated in Norum's paper (2008). She states that students whose parents have lower levels of income tend to score higher on the Faber and O'Guinn's CBB scale. She did not provide any explanation for these findings. In addition, we find a similar relationship between students' personal income and the Faber and O'Guinn's CBB scale as well ($p = 0.758$).

Previous literature indicates that negative feelings have highly predictive power on compulsive spending (Faber and O'Guinn, 1992). Thus, we investigated negative emotions as potential explanatory factors for CBB. The statistically significant results show that respondents who experience negative emotions a few hours after shopping, once they have time to reflect upon their purchases, are more likely to have a higher self-reported CBB score ($p = 0.072$). Faber and Christenson (1996) acknowledge the existence of a short-term gratification after purchases. Nonetheless, this feeling of fulfillment soon converts into negative emotions, bringing the compulsive buyers to an even lousier state of mind after the purchase is made. Thus, these behaviors can create an immediate gratification, which will disappear over time leading to negative long-term consequences (O'Guinn & Faber, 1989). It was expected to see the abovementioned relationship between negative emotions a few hours after shopping and compulsive buying behavior. However, in contrast to our Hypothesis 7.1, we have a statistically significant result stating that respondents who experience negative emotions before shopping ($p = 0.026$) are more likely to have lower self-reported CBB scores. This contradictory result can occur for a variety of reasons, mostly related to psychological

aspects of subjects. Furthermore, we continue to believe our small sample size could be the reason behind insignificant and contradictory results compared to past literature.

6. Conclusion

This thesis aims at analyzing to what extent students are able to control their buying behaviors when influenced by external instruments that remind them their excessive spending. We attempt to fill the research gap by conducting a between-group survey experiment to demonstrate whether students can rationally engage in self-control activities relevant for their purchasing habits. Our experiment consists of two online surveys released within a two weeks' interval. As part of the first survey, we created a "Reminder Program", a way in which students express their preference to receive or not emails reminders aimed at helping them realizing and reducing their potential excessive shopping habits. Additionally, we elicited students' willingness to pay to receive or avoid reminders through an incentive compatible mechanism.

Firstly, to reinforce the current literature focused on the estimation of compulsive buying measures, we conceived two newly quantitative measures of compulsive spending to measure participants' compulsive buying behavior. Our measures are compared and studied in relation with the commonly used psychometric self-reported Faber and O'Guinn scale. Subsequently, we investigated the effectiveness of email reminders, our external instruments, as supportive devices to help students controlling their potential problematic spending behavior. Afterward, using the WTP measure, we analyzed to what extent the respondents are good at forecasting their need for reminders or not, and whether they are aware of their biases.

Even though the strength of the correlations between the self-reported CBB and our CBB measures is not strong ($\rho = 0.0111$ for USR1 and $\rho = 0\ .117$ for USR2, where ρ is the correlation coefficient), our results recommend a good starting point to develop a quantitative measure for compulsive buying behavior.

Our research also seems to support the hypothesis that email reminders have a positive effect on respondents' self-control abilities on their buying behavior, although the test results are not statistically significant ($t(63)=1.089$, $p = 0.280$). Regarding the willingness to pay area of our research, we can identify three major findings. First, we find suggestive evidence that as

the total unanticipated ratio increases, students become more inclined to willing to receive reminders ($p = 0.297$), meaning that the more you spend unanticipatedly, the more you would be willing to pay to receive reminders, which is the expected relationship. Secondly, we find suggestive evidence that as the self-reported CBB score increases, students become more inclined to willing to avoid reminders ($p = 0.255$), which means that the more compulsive buyer you are, the more you would be willing to pay to avoid getting the reminders, which contradicts our expectations. Lastly, according to our results, among all the students, both the most and the least compulsive buyers are more likely to be willing to avoid reminders.

In the final part, we examine the relationship between CBB – both self-reported scale and our measures of CBB – and other explanatory variables within the sociological, psychological and economic field. We find significant results in both the economic and psychological area, where time preferences rate and emotions are identified as predictors for compulsive buying. Our results show that participation in risky behaviors as a representative of being present biased has a positive impact on self-reported compulsive buying behavior score ($p = 0.000$). Regarding emotions, the results show that the respondents who feel sadness, anger or regret before shopping ($p = 0.026$) are more likely to have lower self-reported CBB score, which is contradictory to previous literature. However, according to our results, the respondents who feel negative emotions a few hours after shopping ($p = 0.072$) are more likely to have higher self-reported CBB score, which is the expected outcome.

7. Limitations and Future Research

7.1 Limitations

First of all, our sample size is relatively small due to the difficulty we encountered in collecting data. One crucial reason behind the small sample size and the consequent lack of statistical power in our analysis can be associated with the Covid-19 pandemic. Following the country lockdown implemented in Denmark starting from December 9th, 2020, Copenhagen Business School agreed with the regulations and decided to close the campus until the beginning of April 2021. The campus' closure prevented us to conduct a proper laboratory experiment, forcing us to change the initial design of our experiment utilizing only online surveys.

Furthermore, due to Copenhagen Business School's internal rules, it has not been possible to spread our surveys via their internal email systems, hence it has been decided to spread out the two surveys only on social media. The involvement of people was only based on social media's initial post and the potential word of mouth.

All the research has been conducted remotely, with emails being the main means of communication. Of course, the emails system has its caveats: if emails end up in the spam bin, participants could not be able to terminate their tasks. Specifically, emails were the fundamental tools to track people and record their changes in behavior. If participants decide not to share their emails, they will be eliminated from the studies, leading to further limited sample size.

Moreover, due to time constraints related to the thesis process, the small sample size is also potentially related to the short period of time in which the first survey was available to the public. The first survey has been accessible to students only for five days. Thereafter, all the subsequent answers received in the next weeks were directly ignored because the research has already proceeded to the next phase. The first survey was open for a relatively short period of time to make it possible to have the necessary time to properly clean the data, create the

randomization, allocate people to treatment and control group and initiate the circulation of reminders. This limited-time in which the first survey has been available to students has potentially affected on the final size of our sample.

The two weeks interval between the two surveys is only a broad approximation and estimation of how people behave, their purchasing needs, and their spending pattern. Multiple reasons and external factors lead people to increase or decrease their spending behavior in those two weeks, the majority of which has not been captured by our experiment. One potential factor that could have created noise in the data is the time interval between the two surveys, which coincided with the Easter break. One of the possible reasons why spending increased in the second survey can be associate with students having more free time and potentially more reasons to spend money during the Easter holiday.

7.1.1 Response biases in experiments

In general, surveys which are self-reported studies, are prone to be characterized by response biases. Response bias is the tendency of people to answer questions on a survey untruthfully or inaccurately. We are aware that self-reported answers on spending behavior and beliefs in our surveys are susceptible to biases because they are of course inherently subjective. Hence all the results should be read considering these biases.

Below we enlist some common response biases.

Acquiescence bias, the “yea-saying”, is also known with the name of agreement bias, where participants tend to agree with all the questions asked. People tend to tell what others want to hear. The opposite is the “nay-bias”, where participants always disagree or deny any statements expressed in the survey.

Demand characteristics refer to a type of response bias where participants alter their response or behavior in order to better fit inside the experiment. This arises because participants are

actively engaged in the experiment and may try to figure out the purpose or adopt certain behaviors they believe belong in the experimental setting.

In a survey experiment, question order bias, or "order effects bias", is a type of response bias where a respondent may react differently to questions based on the order in which they appear in the survey. Question order bias is different from "response order bias" which addresses specifically the order of the set of responses within a survey question.

Finally, social desirability bias is perhaps the most critical bias in our research, due to the fact that our analysis is a self-reported research. Social desirability bias is a type of response bias that influences participants to deny undesirable traits and attribute to themselves socially desirable traits.
In essence, it is a bias that drives an individual to answer in such a way that makes them look better in the eyes of the experimenter. It can happen that some individuals may over-report good behavior, while others may under-report bad behavior. Precisely, Paulhus (1984) suggests two components of social desirability bias: impression management and self-deception. The former implies a presentation of ourselves in a way to better fit into an environment or please others. The latter is a situation where we tend to always maintain a positive self-identity.

7.2 Future Research

Our results and analysis leave open various future potential research areas. One of the purposes of this research is to create new measures to quantify CBB, finding an alternative to self-reported psychological scales. However, the complexity of these new measures has its roots in the fact that CBB is a concept that blends together different features and captures all these traits could be burdensome. Indeed, our measures of CBB only take into consideration one single aspect of compulsive spending and do not capture all the characteristics that define this behavior. As mentioned, CBB is a combination of different factors: repetitive unplanned or unnecessary purchases due to external factors such as anxiety, which can cause financial,

sociological, and psychological negative consequences. Taking into consideration only one aspect of CBB at a time may weaken the measure we are trying to create and prevent us to have a more exhaustive view of the issue. Future research should try to create a quantifiable measure of compulsive spending that includes various aspects, among which repetitiveness, one of the key elements of addictive purchasing.

Second, while our experimental design is easily implementable and incurs in zero costs, it can be surely enhanced via laboratory or even in-field experiment. Future research may change the experimental design, conducting a type of experiment where they can actually recreate real-life experiences and verify individuals' change in behavior. Moreover, different types of attention-increasing instruments may be used to induce people's awareness.

Third, this research focuses only on some factors relevant to study compulsive buying and observes whether students change their purchasing decisions when subjected to external shocks. However, other important characteristics influencing compulsive buying behavior might be included to either offer an even more detailed view of the problem or to recreate a more realistic environment. Yurchisin and Johnson (2004) found that perceived social status associated with buying has a significant, positive effect on compulsive buying of students. Moreover, they also underlined how self-esteem has a significant and negative relationship with compulsive buying. When studying compulsive buying among university students, a combination of economic factors and features like self-esteem and perceived social status associated with purchasing behavior should be taken into consideration to examine the problem more deeply and completely.

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9. Appendix

Please refer to the separate file.