

Erasmus University Rotterdam

Erasmus School of Economics

MSc thesis program: Economics and Business.
Behavioural economics – Marketing track

**How does Buddhist meditation affect regret
aversion?**

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Date: 02-07-2022

Note: The views states in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University of Rotterdam.

Abstract

This research investigated whether mindfulness meditation can reduce regret aversion. Previous research has found that mindfulness meditation can reduce feelings of regret. However, there has been limited research into the effects of mindfulness on decision making. Specifically, the way in which mindfulness techniques can help to decrease the effect of cognitive biases, such as regret aversion, has not been a major subject of studies. This research used a Buddhist meditation method to increase awareness among the participants with the aim of reducing the effect of regret aversion in decision making. Previous research also found that meditation decreases the effect of anxiety. The additional factor of anxiety with the help of time pressure was employed to measure the change in the effect of meditation when anxiety was induced. The accompanied prediction is such that the effects of mindfulness meditation are more salient under time pressure. In an online survey, I found that a short practice meditation did not affect people's tendency of exhibiting regret aversion, under both conditions of having time pressure or no time pressure. The conclusions do not change when robustness checks are applied to differentiate for different amounts of regret aversion or when specifically looking at people who have experience with meditation.

Key words:

Mindfulness, meditation, regret aversion, anxiety, decision making

Acknowledgements

I hereby acknowledge that the foundation of this research comes from the recommendation of my supervisor Chen Li, to use the paper of Han Bleichrodt & Peter Wakker (2015) about regret aversion. This paper served as a basis and starting point for this research. My sincerest gratitude goes to both Han Bleichrodt & Peter Wakker for this paper about regret aversion. My sincerest gratitude also goes to Chen Li for her guidance throughout the thesis writing process, with a special emphasis on her fast replies to the messages that I sent.

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Introduction

Do you know that feeling of kicking yourself when you should have chosen something different? Most people do, and this feeling gets even more apparent whenever you know what would have happened if you had chosen differently. This feeling signifies regret: An emotional and cognitive state in which you experience feelings of mistakes, losses, or limitations (Zeelenberg, 1999). Regret by definition is comparing the chosen option with other unchosen options (Chorus, 2014). Applying this to economic decision making, regret aversion is the tendency to avoid decisions that can potentially lead to regret afterwards (Schwartz et al, 2002). Regret aversion in economics can be deemed as a bias, because it can deter people from making the optimal decision or it can cause errors. The latter is the occurrence when someone deviates from what a rational economic model predicts. People who get affected by regret aversion, tend to avoid decisive actions because of the fear that they will make a decision that is sub-optimal. The literature shows several examples of how regret aversion negatively affects decision making. Due to regret aversion, investors make investing mistakes, people avoid feedback and are willing to pay a regret premium to avoid this feedback, and people tend to overbid in auctions (Sümeýra, 2015; Pompain, 2006; Zeelenberg, 1996; Bell, 1983; Engelbrecht-Wiggans & Katok, 2008). A prominent example of regret aversion in real life is the Dutch postal code lottery. In this lottery, a randomly selected postal code will be the winner of the lottery. The prizes range from millions to tens of millions, which will be split up among the people with the same postal code and those who bought a lottery ticket. This lottery will have an immense impact whenever you miss the opportunity to win the lottery. Feedback of the price winning postal code is hard to avoid since the winner will be all over the internet and tv and therefore, people protect themselves from severe regret by buying a lottery ticket (Zeelenberg, 1997)

With the help of mindfulness, this research will try to diminish the effect of regret aversion in decision making. Mindfulness is the attentive focus on experiences in the present moment without any judgement, and it is rising in popularity in academic research (Lutz et al, 2008). Evidence of mindfulness having positive impacts on mental well-being, as well as decreasing the impact of cognitive biases, improving decision making and increasing health are all examples of the positive impacts of mindfulness practices (Mani et al, 2015; Raglan & Schulkin, 2014; Creswell, 2014; Lutz et al, 2008). Meditation and yoga are examples of mindfulness. Economically, meditation can reduce the negative effects of biases such as the sunk-cost bias and the conjunction fallacy (Hafenbrack et al, 2014; Maymin & Langer, 2021).

Relating meditation and regret aversion, the minimal amounts of previous literature found that mindfulness could be used to diminish the possibility of regret after decision making by making people more alert and aware (Zou et al, 2015). Additionally, regret can be controlled by “*reducing thoughts that are repetitive, negative or focused on one-self, which are about the past and the future* “ (Liu et al, 2020, p862). To reduce these thoughts, meditation can be used since meditation induces attitudes of nonjudging and a nonevaluative stance towards thoughts or other inner experiences. Mindfulness can also diminish the attention to the past and the future, which leads to less anticipated regret. People are less influenced by anticipated emotions and events that occurred in the past (Hafenbrack et al, 2014). These examples show the effect of mindfulness on multiple areas, including regret aversion, but there is still little literature on how mindfulness and decision making can be combined. Decision sciences have focused on understanding the biases, heuristics and mistakes that are involved. However, the implication that mindfulness techniques can be helpful in diminishing the effects of biases needs more research (Raglan & Schulkin, 2014; Gigerenzer & Gaissmaier, 2011). Therefore, this research will investigate whether meditation can make decision-making more optimal by reducing the effect of the regret aversion bias.

This research will look at the effect of Buddhist Meditation on the effect of regret aversion on decision making. Buddhist meditation is a long existing form of mindfulness, where it focuses on “*Dhamma: seeing things how they really are*” (Bodhi, 2011). The buddha called his teaching the Dhamma, which serves as a “*body of principles and practices that sustains human being in their quest for happiness and spiritual freedom.*” It is focused on the sensations in the body and thoughts in the mind, such that someone does not judge or form any opinion of things that are happening inside of somebody, as well as the things that are happening around. There is also a specific focus on the present moment, on the here and now (Lama & Berzin, 1997; Khoury et al, 2017). It is expected that this type of meditation can decrease the negative effect of regret aversion in decision making, since past research has shown that this form of meditation can increase the awareness of the body and the mind, by observing emotional and cognitive processes with an accepting stance (Raglan & Schulkin, 2014; Khoury et al, 2017; Liu et al, 2020). This in turn, reduces the potential of having thoughts of anticipated regret in decision making (Hafenbrack et al, 2014).

Mindfulness is also helpful whenever people experience emotions such as anxiety. This research will try to see how anxiety affects the effects of mindfulness by adding time pressure to the questions for some participants.

Anxiety can affect decision making such that it makes people more risk averse, thus decreasing the likelihood to make an optimal decision. Time pressure is related such that it can induce defensive reactions, increase feelings of anxiety, and reduce performance. Anxiety and time pressure also increase the attention and importance to negative choice options (Ariely & Zakay, 2001; Kellogg et al, 1999). It is expected that the positive effect of Buddhist meditation is more salient when anxiety is being experienced. Mindfulness can have a regulating function by reducing the effects of anxiety, by increasing mental well-being of people and with the activation of parts in the brain (Lutz et al, 2008; Raglan & Schulkin, 2014).

Given all this, this leads to the following research question:

“How does Buddhist meditation affect the probability of having regret aversion in decision making?”

To answer this question, this research will use the following hypotheses:

1. Buddhist meditation decreases the probability of having regret aversion
2. The impact of Buddhist meditation on the probability of having regret aversion, is higher under time pressure

To answer the research question, this research will first provide a literature review of relevant topics to answer the question. After that, the methodology used will be outlined, including several examples of how the results will be analyzed and interpreted. After the methodology, the results will be outlined. Given the results, the discussion part will discuss a summary of the results, the implications of the results, limitations and the conclusion of this research.

Literature review

Mindfulness

Mindfulness can be defined as a state where one is attentive to and aware of what is taking place in the present moment (Brown and Ryan, 2003, p833). It relates to thinking, which is engaged and open, rather than automatic and unexamined. This indicates cognitive flexibility (Langer, 1989). Nyanaponika Thera (1972) introduced mindfulness as the construct of clear and single-minded awareness to everything that happens to us and in us at different moments of perception. One important distinction needs to be made:

Awareness and consciousness are not the same thing, but awareness is part of consciousness. Consciousness consists of both awareness and attention. Awareness can be described as the continuous monitoring of the inner and outer environment of oneself, where you can be aware of any form of internal or external stimulation without paying attention to it. Attention is focusing this conscious awareness, thus increasing the sensitivity to one stimulation (Brown & Ryan, 2003). Attention and awareness are related such that attention focuses on specific parts of awareness. These two concepts are constantly occurring, however being mindful is considered to effectively increase attention and awareness to the present moment. This indicates the core characteristic of mindfulness: *“open or receptive awareness and attention, which may be reflected in a more regular or sustained consciousness of ongoing event and experiences”* (Brown & Ryan, 2003, p822-823). Being attentive while walking is a perfect example, such that one can be highly aware of every step one takes, as well as any different stimuli that is accompanied with these steps. Mindfulness distinguished itself from cognitive operations that are focused on self-examination such as self-monitoring or self-reflectiveness. Mindfulness offers insights into what takes place, rather than focusing on the cognitive operations and having reflexive thought. The latter indicates the tendency to reflect on the mind itself, and that is precisely what mindfulness does not do: It lets you observe inner and outer stimuli, such as thoughts, impartially and without judgement (Brown & Ryan, 2003; Ruedy & Schweitzer, 2010). Lastly, everyone could be mindful, however there are clear differences in willingness to be mindful. This means that the mindfulness capacity differs among and within people, especially because it can also be increased or decreased by a variety of ways.

One of these ways is meditation, and for this research Buddhist meditation. (Brown & Ryan, 2003; Ruedy & Schweizer, 2010). Meditation trains the mind to observe one's experiences in an accepting way, which leads to a change in perception of the experiences for the observer, the meditator (Creswell et al, 2014). Meditation consists of attention to one's thoughts, emotions, and body sensations, by observing them as they occur and when they pass away. Mindfulness meditation consists of four key components, which interact to induce a process of enhanced self-regulation. The different components can occur randomly during meditation (Hölzel et al, 2011).

Attention regulation is the first factor, where people are supposed to focus on a single object. When the mind wanders off, he or she should return to the single object. For example, when observing the breath, one should focus on the in-and outcoming breath.

Whenever one gets distracted, try to calmly return to the breath to start again with the practice. This is called conflict monitoring (Hölzel et al, 2011). Meditators consequently report that they can focus their attention for a longer period, as well as distractions having less effect on their attention in both meditation practices and daily life. This is also supported by the literature (Jha et al, 2007; van den Hurk et al, 2010).

Body awareness is the second factor, which is also seen as the foundation of mindfulness. It is the ability to notice subtle bodily sensations (Mehling et al., 2009). With mindfulness, these sensations can be the sensory experiences of breathing, emotions, or other body sensations (Hölzel et al, 2011). The basis of this awareness is the origin and the temporary existence of these sensations. By understanding these two concepts, one can remain independent and refrain from engaging in internal reactivity to the stimuli and thus not get affected by these sensations. In practice, practitioners of meditation self-report greater awareness of body sensations and emotional awareness. Awareness of emotions is a requirement to regulate these emotions, which has been found crucial in treating several kinds of diseases (Hölzel et al, 2011). Lastly, body awareness constitutes in more empathy. Body awareness helps to accurately observe oneself, which is in turn required to understand others.

The third factor, emotion regulation, builds upon the second factor. Meditation improves the emotion regulation, by showing less emotional interference (Hölzel et al, 2011). It also decreases negative mood states, improved positive mood states as well as less distracting and repetitive thoughts (Jain et al, 2007). This manifests itself such that experienced meditators are less affected by their emotions. There are two distinct kinds of emotion regulation, being behavioral regulation and cognitive regulation. Behavioral regulation is about suppressing expressive behavior, while cognitive regulation is about selective attentional control or cognitive change. Selective attentional control lets one consciously have no attention to emotional stimuli or purposely perform distracting tasks. Cognitive changes are about controlling the emotional response by, for instance, reappraisal. Reappraisal is the reinterpretation of the meaning of a stimulus to change the emotional response to the stimuli (Hölzel et al, 2011). Reappraisal is a fundamental method to regulate emotions. It aims at a “positive reappraisal,” which is the adaptive process where for instance stressful emotions are recalibrated as beneficial, meaningful, or benign (Garland et al, 2011). Overall, emotional regulation is about facing unpleasant sensations, rather than turning away or distracting oneself.

It focuses on the stimuli rather than focusing the attention somewhere else. Practitioners can train to accept the emotions by exposure to these emotions, extinction of the usual response to these emotions or by reconsolidating how one can react to these emotions with the use of reappraisal.

The last factor of mindfulness meditation is the change of perspective on the self. The perception of the self is an ongoing mental process, which is enhanced through meditation such that experienced practitioners can observe mental processes with increased clarity (MacLean et al, 2010). This is particularly constituted by meta-awareness: a subjective experience in which one takes a nonconceptual perspective of conscious experiences and the processes that are involved (Hölzel et al, 2011). It detaches itself from the identification of oneself, such that the self is deconstructed and does not exist. This is the start of the process of liberation. This de-identification is not solely for experienced meditators, but it is also often experienced in the initial stages of meditation practice (Haimerl & Valentine, 2001).

Concluding, during mindfulness meditation, the goal is to *maintain attention to current internal and external experiences with a nonjudgmental stance, manifesting acceptance, curiosity, and openness* (Hölzel et al, 2011, p549). Emotional reactions can occur due to thoughts, sensations, memories, or external stimuli and with the help of meditation, one can maintain a mindful state. The first two factors, sustained attention and body awareness, lead to exposure to the sensations, the third factor uses reappraisal to prevent a response, instead reconsolidating no response and accepting the sensation that is occurring. In the end, this leads to a unique perspective on the self, since you can notice the self-changing due to more awareness and emotional control. Ultimately, the relevance of stimuli gets diminished.

Regret aversion

Regret theory was first defined by Loomes & Sugden (1982). Their theory was based on the first assumption that every individual has a choiceless utility function, which is unique to an increasing linear transformation. Every consequence is bound to a real-valued utility index, where this utility is defined as the “psychological experience of pleasure” given the satisfaction of the desire to get that consequence (Loomes & Sugden, 1982, p807). This is the pleasure or utility that an individual gets from the consequence, if that individual did not choose it, hence the choiceless utility. As an example, the person might have gotten it due to natural circumstances or it might have been imposed on him.

Secondly, if an individual experiences a particular consequence by choosing it, individuals might have regret after choosing a particular ‘action’. Suppose the individual can choose between action 1, A_1 and action 2, A_2 . If the individual chooses A_1 and state j occurs, the consequence would be X_{1j} . The individual then knows that if had chosen A_2 instead, he would have gotten X_{2j} . The psychological experience given that the individual got X_{1j} not only depends on X_{1j} , but also on X_{2j} . If X_{2j} was a more desirable consequence than X_{1j} , the individual might experience regret: The individual may reflect on what would have happened if he had chosen A_2 , thus reducing the pleasure that is derived from X_{1j} . On the other hand, the individual might also experience rejoicing: if the consequence of X_{1j} was more desirable than X_{2j} , the individual might experience extra pleasure, knowing that he has made the right decision. One example demonstrates this regret: comparing the sensation one would receive from having to pay €100 more on taxes, to the sensation of losing €100 from the value of cryptocurrency. People tend to find the latter experience to be worse, since they experience regret. When gaining €100 the same thing occurs: Gaining € 100 from cryptocurrency gives more pleasure than gaining €100 due to taxes (Loomes & Sugden, 1982)

These concepts of regret and rejoicing are incorporate in a so-called modified utility function. Given action i , A_i , and action k , A_k , and state j occurs, one could experience the consequences of X_{ij} and X_{kj} . When the utility function of $U(X_{ij})$ is defined as c_{ij} , as well as given outcome k the utility is c_{kj} , the individual experiences the modified utility of

$$m_{ij}^k = M(c_{ij}, c_{kj})$$

The function M signifies the real valued index assigned to “every ordered pair of choiceless utility indices” (Loomes & Sugden, 1982, p808). The difference between m_{ij}^k and c_{ij} is the increment or decrement of the sensations of rejoicing and regret: If action A_i is chosen, which is deemed to be the favorable action, the utility difference between m_{ij}^k and c_{ij} is the increment of utility. The extent to which a person may feel regret or rejoicing, the increment or decrement, depends only on the difference between the choiceless utilities associated with action A_i and A_k . Additionally, if $c_{ij} = c_{kj}$ then $m_{ij}^k = c_{ij}$: If what occurs is exactly as pleasurable as what might have occurred, there is no regret or rejoicing.

Under the assumption that individuals maximize their modified utility, the expected modified utility becomes as follows:

$$E_i^k = \sum_{j=1}^n p_j m_{ij}^k.$$

The individual will then prefer A_i , prefer A_k or be indifferent based on whether the E_i^k is greater than, less than or equal to E_k^i . This assumes that people who experience regret and rejoice, will try to maximize their expected modified utility (Loomes & Sugden, 1982). Thus, Regret theory is primarily based on two distinct functions: A utility function that captures the attitudes towards outcomes, as well as a function to capture the impact of regret. The $M(\cdot)$ function in the equation can be simplified, to accommodate a real-valued index to every possible increment or decrement of choiceless utility. This can be done by adding a regret-rejoice function with an $R(\cdot)$ function. The function then becomes:

$$m_{ij}^k = c_{ij} + R(c_{ij} - c_{kj})$$

Given the assumptions about M being the real-valued index of every choiceless utility indices, it follows that $R(0) = 0$ and $R(\cdot)$ will not decrease. Whenever $R(0) = 0$, there is no regret or rejoice, and it follows that regret theory would predict the same as expected utility theory. Thus, to differentiate from expected utility theory, $R(\cdot)$ is expected to be increasing. Then, if an individual must choose between two actions, A_i and A_k , the individual will only prefer A_i over A_k , if and only if the following holds:

$$\sum_{j=1}^n p_j [c_{ij} - c_{kj} + R(c_{ij} - c_{kj}) - R(c_{kj} - c_{ij})] \geq 0$$

Rewriting with a function of $Q(\cdot)$, which captures the utility differences and the regret and rejoicing of $R(\cdot)$, for every outcome of ϵ , the following simplified function then holds:

$$Q(\epsilon) = \epsilon + R(\epsilon) - R(-\epsilon)$$

Then, when incorporating the $Q(\epsilon)$ function, an individual values A_i over A_k , if and only if:

$$\sum_{j=1}^n p_j [Q(c_{ij} - c_{kj})] \geq 0$$

The underlying assumption is that $Q(\cdot)$ is an increasing function and it is also convex for all positive values of ϵ . When defining the equation of $[Q(c_{ij} - c_{kj})] = \epsilon$, which captures the utility differences and regret and rejoicing with $(c_{ij} - c_{kj})$, then for every value of ϵ , the symmetry between regret and rejoicing is as follows:

$$[Q(c_{ij} - c_{kj})] = -[Q(c_{ij} - c_{kj})]$$

$$Q(\epsilon) = -Q(-\epsilon)$$

Whenever ϵ is positive, it indicates rejoice. Whenever ϵ is negative, it indicates regret.

To conclude, regret theory is based on two fundamental assumptions: People compare the outcome that occurred to the outcome that would have happened, if that person made a different choice. This leads to the emotions of regret and rejoicing. Secondly, in decision making, these emotional consequences are considered when the decisions are being made: They are anticipated, thus anticipated regret and rejoicing occur. (Zeelenberg et al, 1996).

The key thing of the theory is that it can explain deviations from expected utility. Regret theory explains these deviations by indicating that decision makers are regret averse: *“The psychological intuition that people are disproportionately averse to large regrets”* (Bleichrodt et al, 2009, p161). The most prominent deviation that is explained by regret theory is the violation of transitivity, however researching this under regret theory is beyond the scope of this research. In practice, the ability to explain deviations from expected utility increases the interest in regret theory. Real-world implications are mostly in field data, since that kind of data is sometimes incompatible with expected utility, whereas it is compatible with regret theory.

Recent applications of regret theory can be found in several domains, such that it is becoming a fundamental theory in understanding and explaining behavior. In Economics, it has been used in the stock market (Barberis et al, 2006), the demand for insurances (Braun & Muermann, 2004) and auctions (Engelbrecht-Wiggans & Katok, 2008). It has also been used in the health and the neurotics domain (Ritov & Baron, 1995; Camille et al, 2004). The most apparent and explanatory example of regret aversion comes from the classical paper from Amos Tversky and Daniel Kahneman (1992, p301).

Suppose that there is a gamble of rolling a dice, which is shown in table 1, where you can observe the result X . X takes a value of 1 to 6, depending on the number rolled by the dice. If X is odd, you pay $\text{€}X$, if X is even, you receive $\text{€}X$. This means the player either wins or loses the amount that is rolled.

Table 1: Rolling dice (Tversky & Kahneman, 1992, p301)

Number rolled	1	2	3	4	5	6
$\text{€} X$	- €1	+ €2	- €3	+ €4	- €5	+ €6
Probability	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

This is an equiprobably gamble: A gamble where the probability of winning or losing is the same. However, the potential gain is higher than the potential loss. f will denote the possible consequences of earning or having to pay money after rolling the dice, with the corresponding probabilities of that consequence occurring. This probability is $\frac{1}{6}$ for every number on the dice. f then becomes as follows, where a “-” sign denotes paying, and a “+” sign receiving. $f(-5, \frac{1}{6}; -3, \frac{1}{6}; -1, \frac{1}{6}; +2, \frac{1}{6}; +4, \frac{1}{6}; +6, \frac{1}{6})$. The potential gain is $f^+ = (0, \frac{1}{2}; +2, \frac{1}{6}; +4, \frac{1}{6}; +6, \frac{1}{6})$ and the potential loss is $f^- = (0, \frac{1}{2}; -1, \frac{1}{6}; -3, \frac{1}{6}; -5, \frac{1}{6})$. Computing the expected outcome would result in a positive outcome of $\frac{3}{6}$. Thus, people should take the gamble if they want to increase their earnings. However, most people decide not to take the gamble due to anticipated regret (Loomes & Sugden, 1982).

These implications assume that regret theory really exists. This was proven by several studies, but the validity of these strategies was also challenged. Starmer (2000) and Starmer & Sugden (1993) concluded that the empirical support for the existence of regret aversion can be explained by event splitting, a phenomenon that argues that given a probability, an event is weighted more heavily if it consists of two subevents when compared to a singular event. The following examples clarifies this: People assign a greater subjective weight of importance to an outcome if that outcome is presented in two events rather than in one event, even though the objective probability of that outcome is the same in both cases. The existence of event splitting means that the effect of regret aversion in decision making is severely lower than that Loomes & Sugden (1982) suggested. The decisions are explained more by event splitting instead of regret effects (Starmer & Sugden, 1993).

Bleichrodt et al (2009) controlled for the heuristic of event splitting and they still found evidence of regret aversion in decision making. They did this by using the trade-off method by Wakker and Deneffe's (1996), which is usually used to measure expected utility. However, Bleichrodt et al (2009) and Bleichrodt & Wakker (2015) show that the trade-off method can be used under regret theory.

Mindfulness and regret aversion

As mentioned in the introduction, feelings of regret can be reduced by meditation as well as other meditative practices, such as Tai Chi. Their focus point is the improvement of the ability to not judge anything that happens within oneself, which subsequently diminishes regret. Repetitive or negative thoughts have less of an effect on the person (Liu et al, 2020). Meditation teaches a nonjudgmental stance to any present moment sensation that occurs and that is experienced. Novice meditators for instance have the tendency to react to their emotions or other inner experiences, whereas experienced meditators have more of an accepting stance. Therefore, for meditators, thoughts or emotions of regret will have less of an impact, since they are more accepted (Liu et al, 2020; Tang et al, 2015). Tai Chi practice is related to meditation such that Tai Chi also connects the mind and the body, especially due to the meditative component of the practice (Wayne et al, 2017). It has also been widely regarded as an example of meditation practices (Liu et al, 2020). Just like meditation, it reduces the judgement on thoughts and inner experiences by combining martial arts and meditative moments, accompanied with “yogic relaxation through deep breathing” (Liu et al, 2020, p862). Subsequently, this sense of acceptance reduces the impact of regret feelings on the practitioners when for instance faced with a poor outcome.

Finally, meditation can also decrease the focus on the past and the future. With relation to the sunk-cost bias, anticipated regret increases escalation of commitment. This means that people make decisions based on anticipated emotions in the future and by events that happened in the past, even when that behavior can be deemed as sub-optimal. This anticipated regret needs future and past focus, such that the anticipated regret in the future is based on the emotions of the past. Therefore, diminishing the focus on the past and the future will subsequently lead to less regret, because there are less emotions that anticipated regret can be based on. Research showed that meditation decreases the focus on the past and the future, indicating the effect of meditation on potential regret (Hafenbrack et al, 2014).

Is behavior under regret theory rational?

Regret theory by Loomes and Sugden (1982, p819) can explain the behavior with “*systematic violations of the conventional expected utility theory*”, but this behavior is not deemed as irrational by any means. This conveys the notions and axioms of the expected utility theory, which would deem the behavior as being irrational, because it is not the optimal choice. This is because the axioms under expected utility theory have a “*strong normative appeal as principles of rational choice*” (Loomes & Sugden, 1982, p819). Several economists argued that whenever people deviate from the expected utility theory, awareness of this deviation and accepting that they made an error, would cause the people to alter their behavior such that it corresponds with expected utility behavior again (Savage, 1951; Kahneman & Tversky, 1979; Morgenstern, 1979). Regret theory challenges this assumption, by arguing that “*these axioms are not the only rational choices under uncertainty*” (Loomes & Sugden, 1982, p820). For this, regret theory uses two fundamental assumptions. First, people experience sensations when having regret or rejoicing, and second, people anticipate these feelings of regret and rejoicing. These feelings of regret and rejoicing cannot be described under rationality terms. The choice made can be rational or irrational, but the sensations that one receives from making that choice cannot be deemed as rational or irrational. It is an experience. Secondly, taking these experiences into account when deciding, cannot be deemed as irrational. This does not mean that acting under regret theory is the only rational way of behaving, nor does it mean that the person must violate the expected utility axioms. It is an explanation of behavior that violates the expected utility axioms, without the person accepting that they have made an error. They might have made an error under the expected utility axioms; however, their decision was still rational under regret theory terms. Therefore, the person would potentially make the same decision in the future.

Ultimately, this research is based on the assumption that regret aversion is something that deviates people from making the optimal decision. Sümeýra (2015) shows that for investors for instance, hold on too long on a stock to avoid making the error of selling and thus make a loss if the stock rises in price again. The opposite can happen as well: Not selling the stock, whereas several indicators recommend selling the stock. Thus, investors that are regret averse, hold onto positions in which they should rather bail out and leave the market. Regret aversion also leads to the phenomena that people do not enter worthwhile and emerging financial markets, because that market recently accumulated a loss. Trustworthy indicators might indicate that people should invest in the market, besides a recent loss.

Regret averse people then tend to not invest, because of the fear of regret after another loss (Sümeýra, 2015). Related to this phenomenon is the next example of investments mistakes, which shows that investors tend to keep investing in subjectively big and good companies, whereas the indicators tell that a different stock has a higher expected return. One can argue that investing in a subjectively big and good company tends to be the safer option, however Pompian (2006) shows that whenever the safety of both stocks is regarded as the same, people still tend to invest in the stock with a lower expected return, due to the nature of the company. Lastly, regret averse people also tend to follow the crowd: deviating from the normal option and thus doing the unconventional thing can lead to more regret if that action turns out to be worse than the conventional thing. Doing the conventional action can thus limit the potential for regret in the future (Sümeýra, 2015).

Besides the impact of regret aversion for investors, regret aversion can more generally lead to the avoidance of threatening feedback on the foregone alternatives. This avoidance of feedback can first lead to the avoidance of learning from your mistakes in decision making (Zeelenberg, 1996), and it can also lead to the willingness of paying a “regret premium” (Bell, 1983, p1156). This premium is the money that people are willing to spend to avoid knowing what would have happened in the foregone alternative, thus avoiding negative feedback. The following example from Bell (1983) illustrates this: Imagine that you can get € 4000 for sure or play a lottery at which you either win € 10.000 at a 50% probability, or get € 0, also at a 50% probability. If you take the € 4000 for sure and then learn that you could have gotten € 10.000, you will feel regret. To avoid this regret, people are willing to pay a risk premium: get € 3500 for sure and not knowing what happened to the lottery. This avoids the regret that would occur when knowing that you could have earned a € 10.000.

Time pressure and anxiety

Whenever people make decisions, they must consume time to process the available information. Some decisions are heuristic decisions: decisions that are done out of habit without any intuitive analysis, thus not being based on extensive information processing (Ariely & Zakay, 2001). If decisions require more analytic and algorithmic skills, more time is needed to make the decision. For example, when computing expected values, which participants will do when faced with the decisions situations in this research. Dynamic decisions are decisions when time needs to be considered, where in this research this establishes itself since some participants will have limited time to make the decision.

The other participants will have static decisions to be made: the participants do not have to take time into account (Ariely & Zakay, 2001). When time is limited, time is an important feature for making the optimal decisions. Feelings of time-stress whenever the available time is less than that is needed, could potentially harm the potential of choosing the optimal decision. They might not choose the decision that is predicted by economic models, or the decision that nets the highest expected value (Ariely & Zakay, 2001). Therefore, it is important for this research: time pressure might opt people to have regret aversion in decision making.

People react differently to time-stress. For some people, a timed decision can lead to more thought and thus even make better decisions. Others will do much worse than whenever normal conditions would apply. In general, however, the relevant effects of induced time-stress are reductions in information search and processing, reductions in the consideration of different alternatives or dimensions, increased importance of negative information, the bolstering of the chosen alternative, the tendency to process the perceived important information first and lastly, a wrong judgement and evaluation in general.

The effects above signify the reduction of mental resources while making decisions under time pressure. One potential reason for this is the mental processing overload which is caused by the need of a lot of information processing under time-pressure. This decreases cognitive functioning, since it increases the possibility of sub-optimal cognitive processes as well as the occurrence of cognitive errors and biases, indicating psychological stress (Ariely & Zakay, 2001). To overcome this potential probability of making a sub-optimal decision, people respond by working faster first. If this is insufficient, people will focus on a specific subset of the information. If this is not sufficient either, people change their decision strategies to the ones that are cognitively simpler, effectively using a strategy selection which is a function of both costs and benefits: the effort required to employ a decision and strategy and the ability to select the optimal solution given the strategy (Ariely & Zakay, 2001).

Stroop test

This research will use a cognitive enhancing ability task for the control group. This will be discussed later in the methodology section of this research. The task used for the control group is the Stroop task from J.R. Stroop. This task looks to identify the effect of incompatible ink colors on reading the words aloud (Macleod, 1991), such that the colors of the word do not match the word itself.

For example, the word would be “Red”, whereas the color of this word would be green. The effect that was found is that naming the color of words that were printed in the same corresponding color, for example the word red being printed in a red color, was shorter than naming the color of colored words, which were printed in a different color, for example the word red in a green color (Penner et al, 2012; Stroop, 1992)

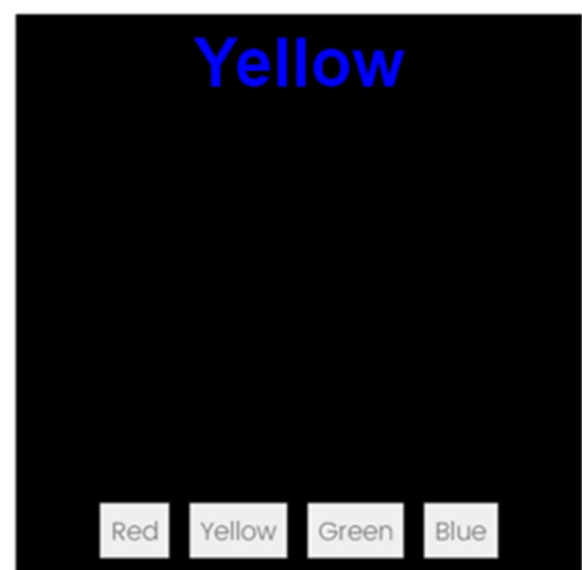
This research will specifically focus on the color-word interference test. This is one of the two experiments that Stroop conducted back in 1935 (Stroop, 1992). The reason that this task is viable, is because previous literature has shown that it affects concentration effectiveness, response inhibition and cognitive flexibility (Penner et al, 2012). It is also found to be a reliable and valid instrument, especially when response times scores are not relevant (Penner et al, 2012). The latter is important, because this research will use the Stroop task to temporarily enhance cognitive function. It is not about performing the Stroop task well, but the enhancement of cognitive function. The Stroop task will be used as a benchmark, the control group, to find the effect of mindfulness on regret aversion and subsequently on decision making. This is related to mindfulness and meditation, such that mindfulness and meditation also increases the ability to control and enhance cognitive abilities, thus making the Stroop task a viable instrument to compare to meditation.

Methodology

Experimental procedure and design

This research will make use of an online experiment to answer the research question. This experiment will be conducted using a program called Qualtrics, for which participants are invited with the use on an online link. To make sure that the experiment was ethically approved, the ethical approval questionnaire of the Erasmus University Rotterdam was answered. The results indicated that the experiment was ethically approved. The experiment starts with a briefing of the participants, which includes what the experiment is about, how long the experiment lasts and ending with a question which asks whether the participants give consent to participate in the experiment.

Figure 1



The briefing can be found at figure A1 in appendix A. After the briefing, participants get randomly allocated to either one of the two cognitive treatments: either a five-minute meditation, which consists of the main elements of meditation (Hölzel et al, 2011), or the Stroop task. John Davisi (Davisi, 2019) guides the meditation. The meditation and the Stroop task are provided in the Qualtrics program, which means that the participants do not have to leave the experiment. This increases the effectiveness of the experiment. Figure 1 shows a visual example of how the Stroop task is conducted.

The meditation focuses on the awareness by focusing on the breath, the mind, positive thoughts, and a good mental well-being. Attention regulation is trained by focusing on the breath, body awareness by the sensations of the breath, emotional regulation by forming negative thoughts into positive thoughts and lastly, the change in perspective in oneself is trained by the perception of improved well-being. The latter however, as Hölzel et al (2011) mentioned, is something that is achieved in the long term. The briefing of the participants is presented at figure A2 (Appendix A). The main aim of the briefing is to introduce the participants to the meditation, what is expected from them, and motivating them to take it seriously by giving examples of the benefits of meditation.

The other cognitive treatment possible is the Stroop task, of which the briefing can be found in figure A3 in appendix A. Participants get presented with the Stroop task with an elaborate explanation of how the Stroop task works, after which the participants are asked to manually start the task by clicking on one of the color buttons. Consistent with how the Stroop task works in other literature (Macleod et al, 1991), participants must click on the button with the right color. The right color is the color with which the word is printed. The Stroop task consists of 40 trials of words. The time to answer is 2 seconds, after which the participants get presented with feedback of whether their choice was wrong or right.

After the cognitive treatments, participants get presented with questions from the Mindfulness Awareness Attention scale (MAAS). The participants who had the mindfulness treatment, are also asked whether they were able to close their eyes throughout the practice. The MAAS scale is used to measure mindful awareness of the participants. The reason for using the MAAS scale is because it focuses on the attention and awareness of what is occurring in the present, rather than attributes such as trust, empathy, or various other characteristics that are correlated with mindfulness (Brown & Ryan, 2003; Van Dam et al, 2010). This contributes to the essence of this research which is focused on present moment consciousness. For this research, the three questions which provided the most information of

the participants were used (Van Dam et al, 2010, p809). The reason for not using the top three questions of Van Dam et al (2010) is because these questions would be too similar. Therefore, the three questions focus on doing things automatically, attention to activities, and the amount of attention on a goal. The questions can be found in appendix A at figure A4, question 3 to 5. The weighted average is taken of these three questions to develop an overall MAAS scale.

Decision situations

After the MAAS scale questions, regret aversion will be measured. Regret aversion is measured with the use of two decision situations, also called lotteries in this research, involving choices between payout options when considering the lotteries. Participants get randomly allocated into one of the timer treatments situations: Having a timer when they choose between lotteries, thus having time-pressure, or having no timer, subsequently having no timer pressure. The decision situations are based on tables 3 and 4 of the paper of Bleichrodt & Wakker (2015, p497 & 498). Participants get presented with a decision where there is an urn which contains 100 balls, which are numbered 1-100. One ball will be drawn randomly. The subjects get to choose between payout option 1, signifying no regret aversion, and payout option 2, which signifies regret aversion. Table 2 and 3 present these decisions.

The numbers 1 to 25, 26 to 50, 51 to 75 and 76 to 100 indicate the possible balls that can be drawn randomly. Payout option 1 and 2 signify the choice that participants must make. For instance, when looking at table 2, whenever ball 70 gets drawn, the payout when choosing payout option 1 would be €0. When choosing payout 2, the participant would get €20.

Table 2
Regret aversion versus expected utility (Decision 1)

Decision 1	1	25	26	50	51	75	76	100
Payout option 1	€40		€40		€0		€0	
Payout option 2	€30		€30		€20		€0	

Table 3:
Equivalence axiom violated; explained by regret theory (Decision 2)

Decision 2	1	25	26	50	51	75	76	100
Payout option 1	€30		€20		€10		€0	
Payout option 2	€20		€10		€0		€30	

The decision situation, a lottery, in table 2 can signify regret aversion such that many decision makers prefer payout option 2, because they regret the small utility loss between € 30 and € 40 “*much less than the double and more salient utility loss of €0 instead of € 20*” (Bleichrodt & Wakker, 2015, p497). Expected utility would assume that the two actions are equivalent, and thus there would be no reason to prefer one over the other. Under regret theory, one might prefer payout option 2, if and only if, the following holds:

$$\sum_{j=1}^n p_j [Q(c_{\text{payout option 2j}} - c_{\text{payout option 1j}})] \geq 0$$

Table 3 signifies regret aversion whenever participants choose payout option 2 as well. Bleichrodt & Wakker (2015, p498) explain that the overweighting of large utility differences induces participants to choose payout option 2: The difference in utility between €0 and €30 is far greater than the triple, less salient losses of €10 (i.e., €30 or €20, €20 or €10, €10 or €0). Convexity of gains explains these preferences. This rejects the so-called equivalence axiom of expected utility. This axiom states that whenever the two payout options are evaluated independently, and whenever the two actions are equivalent such that there are two identical probability distributions of consequences, there would be no reason of preferring any of the payout options over the other (Loomes & Sugden, 1982, p818). However, the preferences can be explained because participants experience regret and rejoicing after choosing a payout option. Participants must “choose between payout option 1 and simultaneously reject payout option 2” (Loomes & Sugden, 1982, p822). Probability wise, choosing payout option 1 depicts preferences of incurring a 25% probability of losing €30 as well as a 75% probability of gaining €10, when compared to payout option 2. Payout option 2 is vice versa: preferences of a 25% probability of gaining €30 as well as a 75% probability of losing €10, when compared to payout option 1. In the end, the same formula of the modified expected utility applies, if a participant chooses payout option 2 over payout option 1:

$$\sum_{j=1}^n p_j [Q(c_{\text{payout option 2j}} - c_{\text{payout option 1j}})] \geq 0$$

Concluding, these two lotteries cannot be regarded as equal, which expected utility assumes, but they are influenced by regret. When assuming that people are indifferent, people potentially choose randomly between the two options. The randomness will not favor one payout option over the other, where regret aversion will.

This is the reason for not including indifferent option: Participants must decide between the two options, thus creating the opportunity for participants to favor one payout option over the other while also increasing cognitive function. Bleichrodt et al (2010) did the same using two different options that participants could choose from, although the expected utilities were different in their lotteries.

Experimental procedure and design – extended

After the lottery questions, this research checks whether the anxiety treatment worked. For this, the Beck Anxiety Inventory Scale is used, which is also called the BAI scale (Beck et al, 1988). This scale measures anxiety among participants by asking several questions about anxiety symptoms. Five symptoms of anxiety will be asked to the participants, which are based on the highest factor loading of the BAI scale (Beck et al, 1988, p895). These five questions regarding the symptoms can be found in appendix A at figure A4, questions 8 to 12.

Lastly, the experiment ends with demographic questions. Participants are asked their age, gender, education, occupation, and income. Participants are also asked whether have experience with meditation, where if yes, participants are asked since when they have experience with meditation and how often they practice meditation.

This research uses two different decision scenarios, where it is important to mention that past decisions may be correlated with future decisions. The decision in the first lottery might be correlated with the second decision in lottery two. In the first lottery participants will create ideal weights of importance for the numerous factors, criteria, or attributes in the lottery, on which they will base their decision. For instance, a criterion might be to maximize the odds of winning at least a price when faced with a lottery. The past decision and the ideal weights of importance are used as input for decision situation 2, to accommodate their preferences (Ariely & Zakay, 2001). Making trade-offs in decisions consolidates the weights, which is applicable in this research since participants must make complex decisions on whether to lose money when specific balls are drawn, or even lower the chances of winning anything, given that the money won increases. Thus, given that past decisions are potentially correlated with future decisions, it can be expected that participants might choose either payout option 1 or 2 in both decisions. The results section will show whether this occurred.

To conclude, participants were recruited by inviting fellow master students, friends, and family to participate in this research. If needed, additional explanation was given. Everyone was eligible for participation, with no exceptions. G-power analysis indicates a needed effect size of 738 participants which can be seen and explained in appendix A5.

Description of data analysis

To analyze the data, regret aversion is defined by looking at the two lotteries. For the main analysis, whenever a participant chooses payout option 1 at least once in either of the decision situations, or whenever they choose payout option 1 in both lotteries, they will be regarded as having no regret aversion. Only participants who choose payout option 2 twice, will be regarded as being regret averse. By quantifying participants like this, it will be more evident that the participant is really regret averse. A robustness check will be used to verify these main results, by quantifying regret aversion in three different levels: Having *no* regret aversion, having *some* regret aversion, and having *full* regret aversion. For this, participants are classified as having *no* regret aversion whenever they choose payout option 1 in both lotteries, *some* regret aversion whenever they choose payout option 2 once out of both lotteries, and *full* regret aversion if payout option 2 is chosen in both lotteries.

To evaluate the effect of mindfulness and time pressure on regret aversion, this research uses logistic regression. This is the optimal method of analysis, because our dependent variable is binary. It is 0 if there is no regret aversion, whereas it is 1 whenever someone has regret aversion. This makes logistic regression the optimal method, since it assumes to have a binary dependent variable. The effect of mindfulness will be measured according to the treatment variable, which takes a value of 0 if the respondent had the Stroop task. It would take a value of 1 if the participant had the mindfulness treatment. In the regression output, this variable is defined as “*mindfulness*” or “*mindfulness treatment*” The time pressure variable takes the value of 0 whenever a participant had no timer at the lotteries, indicating no time-pressure and the value of 1 if the participant had a timer, thus having time-pressure. The variable name in the regression output is “*having a timer.*”

This research will focus on regret aversion for the whole sample, but additionally it will differentiate participants according to whether they had a timer pressure or not. This provides additional results on whether mindfulness has an effect. This helps to answer hypothesis 1 as a whole and it serves as a robustness check to answer hypothesis 2. These differentiations will be presented such that the regression output will show the following three columns: Participants who no time pressure at the lotteries, will be part of “*Having no timer*”. Participants with time pressure will be part of “*Having a timer*”, and all participants together will be in “*Observations including a timer and no timer*” or “*All observations*”. These three columns will answer hypothesis 1.

Two more columns are added to the regressions, which entail two different interactions between the cognitive and the time pressure treatments. This is based on the 2x2 treatment design, leading to the following situations: Having had the Stroop task under no time pressure circumstances, Stroop task with time pressure circumstances, mindfulness meditation under no time pressure circumstances or mindfulness meditation with time pressure circumstances. Two different interactions are used. Interaction 1 uses the Stroop task with no time pressure as the base category. Interaction 2 uses the Stroop task with time pressure as the base category. This allows for different analysis of the effect of mindfulness variable in both time pressure situations. To answer hypothesis 2, the effect of having had the mindfulness treatment will be compared among the two different time pressure situations. For interaction 1, the main effect is the effect of the mindfulness treatment under no time pressure, when compared to the Stroop task under no time pressure. The main effect for interaction 2 is the effect of the mindfulness treatment with time pressure, when compared to the Stroop task under time pressure. Comparing these two main effects will answer hypothesis 2: if the effect of mindfulness in the second interaction is higher than the effect in interaction one, hypothesis 2 is supported.

As will be mentioned in the demographic analysis part, there are 25 people who spend more than five minutes at the meditation. To evaluate the treatment effectively, a second logistic regression will be performed where only people are included who spend more than 300 seconds at the meditation page. Provided by the literature (Ariely & Zakay, 2003; Hölzel et al, 2011), it is assumed that people will only have the full effect of the treatment if they followed the whole meditation. Thus, removing people who spend less than five minutes at the meditation page will increase the chances to remain with the participants who had the full treatment effect. Additionally, in this second regression, only those participants who spend more than five minutes throughout the experiment will also be included. This is based on an additional assumption that people need at least five minutes throughout the whole experiment. If people have spent less than five minutes, it is assumed that they “rushed” through at least some of the experiment parts. Given that people might have had the Stroop task, it is expected that the participants spend at least 120 seconds at this page. This is because it takes about three seconds to respond to every trail, where the Stroop task consists of 40 trials.

Lastly, the research will report the effects of variables whenever the p-value is below 10%. Even though that significance level is higher than the more common 5% threshold, there is good reason for it. This study aims to lay the foundation for future research.

Thus, it is important to highlight all potential impact channels, since this avoids missing an effect that has the potential to be valuable. It is still unlikely that the result is found, considering the chance to get the result is 10%, or lower considering the p-value that is found (Fisher, 1955). Indeed, these channels need further verification. However, I believe that a broad discussion of all findings is most helpful for this matter.

Concluding, to get internally valid responses, the second regression only consists of people who spend more than five minutes during the experiment. As mentioned, for mindfulness participants there is another requirement: they must have spent more than five minutes at the meditation. These results will be the main results that are used for the discussion and the conclusion, since it is assumed that only these people have had the full effects of the cognitive treatment, indicating that these are the only reliable results. These participants are regarded as “*part of the sample*” in the regression columns.

Data analysis

Descriptive statistics

Table 4a descriptive statistics continuous variables

Variable	Observations	Mean	Std.Dev.	Min	Max
Time lottery 1	46	45.695	24.386	2.907	95.238
Time lottery 2	46	17.903	10.273	1.886	38.84
Age	109	30.761	11.334	20	67
MAAS	109	2.942	.978	1	5.333
MAAS meditation	50	2.927	.988	1.333	5.333
MAAS Stroop	59	2.955	.978	1	5.333
BAI	109	9.651	3.954	5	20
BAI meditation	50	9.2	3.769	5	19
BAI Stroop	59	10.034	4.098	5	20
Time meditation > 300	24	421.374	202.8321	308,702	1303.271
Duration experiment > 300	68	573,162	264.329	304	1445

Tables 4a and 4b show the descriptive statistics of the participants in the experiment. Table 4b, specifically the variable “*Finished*”, shows that 156 participants started the experiment. 110 participants finished the experiment, of which one participant did not consent to participate in the experiment. This follows from the “*Participation*” variable.

Table 4b: descriptive statistics categorical variables

<i>Variable</i>	<i>Frequency</i>	<i>Share in %</i>	<i>Variable</i>	<i>Frequency</i>	<i>Share in %</i>
<i>Finished</i>	156		<i>Education</i>	109	
No	46	29	Primary	2	2
Yes	110	71	High school	26	24
<i>Participation</i>	144		Bachelor	70	64
I do	143	99	Master	10	9
I do not	1	1	Professional training	1	1
<i>Income level</i>	109		<i>Occupation</i>	109	
€0 to €20.000	56	51	Working	38	35
€21.001 to €40.000	27	25	Working and studying	30	27
€40.001 to €70.000	22	20	Unemployed	3	3
€70.001 or more	4	4	Studying	38	35
<i>Gender</i>	109		<i>Eyes closed</i>	50	
Male	39	36	No	5	10
Female	69	63	No, partially	18	36
Prefer not to say	1	1	Yes, entire practice	27	54
<i>Cognitive treatment</i>	109		<i>timer treatment</i>	109	
Stroop	59	54	No time-pressure	63	58
Mindfulness	50	46	Time-pressure	46	42
<i>Regret aversion (RA)</i>	109		<i>Time spend (300 sec?)</i>	109	
No RA	69	63	< than 300	43	39
Having RA	40	37	> than 300	66	61
<i>RA no timer participants</i>	63		<i>RA timer participants</i>	46	
No RA	42	67	No RA	27	59
Having RA	21	33	Having RA	19	41
<i>Currently meditating?</i>	109				
No	72	66			
yes	37	34			
<i>Meditating since?</i>	37		<i>Meditating how often?</i>	37	
< a month	5	13	Every day	4	11
3 months	3	8	2-4 a week	11	30
6 months	3	8	Once a week	11	30
Year	7	19	Once every 2 weeks	1	3
2 years	5	14	Once a month	4	10
> 2 years	14	38	Less than once a month	6	16

Therefore, 109 observations were used in the data analysis. The variable “*cognitive treatment*” shows the allocation of the cognitive training randomization and the allocation to the lottery treatment. Of the 109 eligible participants, 59 participants had the Stroop task as their cognitive training and 50 participants had the mindfulness meditation. Additionally, 63 participants had no time pressure at the lotteries and 46 participants did have time pressure (“*timer treatment*” variable). The standard demographic variables show that 39 participants were male, 69 participants were female, and 1 participant preferred not to say (“*Gender*” variable). 2 participants only completed primary school, 26 participants completed high school, 70 participants completed a bachelor’s degree, 10 participants completed a master’s degree and lastly, 1 participant completed a professional or vocational training as their highest education (“*Education*” variable). 38 participants are currently working, 30 participants are working and studying at the same time, three participants are unemployed, and 38 participants are studying (“*occupation*” variable). 56 participants have an income between € 0 and 20.000, which is regarded as having a “*low income*” in this research. 27 participants earn € 20.001 to € 40.000, which is regarded as having an “*average income*”. 22 participants earn € 40.001 to € 70.000, being “*high income*” and 4 participants earn € 70.001 or more, being a “*very high income*”. The variable “*Currently meditating*” shows that 37 participants are currently meditating. The variables “*Meditating since*” and “*Meditating how often*” show for how long people have been meditating, as well as how often these people meditate nowadays. What catches the eye is that 14 out of 37 participants have been meditating for 2 years or longer and that 26 participants are meditating at least once every week.

For the participants with a mindfulness meditation, the variable “*Eyes closed*” shows that five participants did not close their eyes at all, 18 participants had trouble having their eyes closed throughout the whole meditation practice and 27 participants were able to keep their eyes closed during the entire meditation. The most important variables for this research come from the regret aversion variables. “*regret aversion (RA)*” shows that 40 participants were regarded as having regret aversion, whereas 69 participants had no regret aversion. “*RA no timer participants*” and “*RA timer participants*” differentiate these results for having no time pressure and having time pressure, respectively. 21 out of 63 Participants with no time pressure had regret aversion, whereas 19 out of 46 participants from the time pressure participants had regret aversion.

This already shows a difference in regret aversion when considering that people had time pressure or not at the lotteries. To differentiate in eligible participants for some of the data analysis, the variable “*time spend (300 sec?)*” shows that 43 people spend less than 300 seconds during the experiment, or for the meditation participants, spend less than 300 seconds at the meditation. 66 participants spend more than 300 seconds at the experiment and at the meditation, for the mindfulness treatment participants.

Table 4a shows the statistics for the continuous variables. Time spent at lottery one and two for the participants with time pressure amounted to 46 and 18 seconds on average, respectively. Considering that the eligible time for lottery one and two is 90 and 35 seconds respectively, these average times are below what was expected. However, the maximum time spend at lottery one and two is 95 and 39 seconds respectively, indicating that some of the participants still did not have enough time to answer the lottery questions. The participants had an average of 31 years old, meaning that the sample mostly consists of young adults. The average score on the mindfulness attention awareness scale (MAAS) is remarkably similar across the treatment groups. The whole sample has an average of 2.942 out of 6, and for the mindfulness and Stroop participants it is 2.927 and 2.955, respectively. This already indicates that the treatment did not have its desired effect, since the aim was to have more mindful participants after the meditation treatment, when compared to the Stroop task participants. There are bigger differences on the Beck Anxiety Index (Scale), where for the whole sample the average is 9.651. For the mindfulness and Stroop participants it is 9.2 and 10.034 respectively, indicating that Stroop participants are more anxious. Table 4a also shows the time spend during the meditation. 24 participants were eligible for the reliable “*part of the sample*” analysis. The average time spend during the experiment when considering only participants who spend more than 300, but less than 1500 seconds, is 573 seconds. This amounts to roughly 9,5 minutes spend during the experiment. The reason for the time spent at the experiment criteria is because of the assumptions that to get reliable answers, people need at least 300 seconds to complete the survey. Leaving out participants that spend more than 1500 seconds is because spending more time is logically speaking not necessary. It is therefore assumed that they left the survey and came back later.

Random allocation of treatments

It to be evaluated whether the random allocation of the two different treatments was successful. For the singular cognitive and lottery treatments, a binominal test is used which tells whether the probability of being assigned to one of the treatment groups is 50%.

Table 5a and 5b in appendix B show the results which indicate that the treatment allocation was successful. This is concluded from the insignificant p-values. A chi-squared test shows whether this also means that there is a random allocation for the two treatments together, the 2x2 treatment design. A chi-squared test is used, since it is deemed as the most effective, when for instance compared to a fisher-exact test (Bewick et al, 2004). This is since none of the four cells in the test has less than an expected frequency of five. Table 5c shows that the two samples of the cognitive treatment are evenly distributed among the timer treatment, indicating that the randomization has been successful. The other variables, including demographic and control variables, were also distributed randomly across the treatments. Table 5d to 5m show the chi-squared tests which look at the relationship between either the cognitive or the timer treatment, with the variables gender, educational level, occupation, income level and meditation. The Pearson's test statistic determines whether the observed outcomes are statistically different from the expected outcomes. The Pearson's test statistic is small enough for every relationship, besides the relationship between the timer treatment and the different income levels, table 5k. This indicates that the random allocation to the different treatments was successful. The random allocation of participants with different income levels was not successful, signified by the p-value of 0.0949 at table 5k, which means that there is a small significant relationship .

Mindfulness and time-pressure treatment checks

This research used two different types of treatments: First the main, cognitive treatment of having a mindfulness meditation or the Stroop task. Secondly, participants were randomly allocated to two groups where they either had no timer, no time pressure, or a timer at the lotteries, time pressure. To check whether this treatment worked and had the desired effect of inducing awareness, the results of the mindfulness attention awareness scale (MAAS) for both the meditation and the Stroop task participants will be compared. The same holds for the time-pressure treatment check, the Beck Anxiety Index scale (BAI).

Using a Mann-Whitney U test, this research will evaluate whether the two treatments worked. For the MAAS scale, the two samples of the mindfulness meditation and the Stroop task treatment are evaluated whether they come for the same population. All the observations are combined in one sample and then the rank of each observation is calculated, which creates a rank for both groups. When considering the null hypothesis, the two samples come from the same population and thus the rank for both groups should be the same.

If the ranks of both groups are significantly different, the alternative hypothesis is supported. For the induced time-pressure, the BAI scale, the same methodology holds: the BAI scores for both the groups are calculated. Then the average rank for both groups is calculated, after which the Mann-Whitney U test will tell whether the rank of both groups is the same, same population, or whether there is significant reason to believe that the ranking differs.

Table 6a, 6b, 6c and 6d show the results, which can be found in appendix C. Table 6a and 6b show that that the mindfulness treatment did not have the desired effect for both the whole sample and part of the sample: The samples come from the same population, since the p-values are above the significance margin of 10%: p-values of 0.61 and 0.66, respectively. Thus, the null hypothesis is supported. Table 6c and 6d show the same results for the BAI scale: there is no evidence of the samples coming from a different population: p-values of 0.28 and 0.104 have been found. The null hypothesis is also supported for the BAI scale.

The BAI scale can also be differentiated for the different treatment groups in terms of having the meditation or the Stroop task. According to Raglan & Schulkin (2014), mindfulness has a meditating effect on anxiety symptoms such as time-pressure. Therefore, it can be expected that for the meditation treatment people, the time pressure has less of an effect on feelings of time pressure, compared to the people who had the Stroop task.

Table 6e and 6f in appendix C show the results of the Mann Whitney u test, which looks at the BAI ranks with a differentiation for having had time pressure or not. Table 6e shows the results for the people with the meditation treatment, and table 6f shows the results for the people with the Stroop task. As expected, there is no evidence that the two samples come from a different population for the meditation participants. However, participants who had the Stroop task have different results: People with time pressure score significantly higher on the BAI scale, indicating that they feel more anxious. This effect is statistically significant at the 5% significance level. This gives reason to believe that the time pressure has had its desired effect on participants who had the Stroop task

Lastly, the Mann Whitney u test can also be used to evaluate whether people that have meditated already have more mindful awareness. For this, four Mann Whitney u tests were conducted, shown in table 6g until 6j in appendix C. Tables 6g and 6h show the results of the ranks on the MAAS scale considering two different groups: people that are currently meditating and people that are not.

6g shows the whole sample, 6h only the part of the sample. Both tests show no significant differences between people that are currently meditating and people that are currently not meditating. This indicates that having a meditation background, does not increase the mindfulness awareness significantly after any of the two cognitive treatments. Table 6i and 6j elaborate on this further by comparing the two different groups for when both groups had the meditation treatment. No significant differences are found again, indicating that people that have meditation experience, do not get influenced more by the meditation than the people that have no experience.

To conclude, the meditation treatment did not have its desired effect, however the time pressure did have its effect partially: people with the Stroop task and time pressure, had significantly higher scores on the BAI scale than people with the Stroop task and no time pressure. This in turn gives slight evidence that mindfulness meditation can diminish the effects of a time pressure on anxiety.

Main effects

Table 7a shows the marginal effects of the predictor variables on regret aversion. Table 7b in appendix D shows the results of the logistic regression. The results of the logistic regression can only be used for interpretation of the sign and the significance, which means that the marginal effects provide the most information, since the coefficient can also be interpreted. Table 7a shows that having a mindfulness meditation, when compared to having had the Stroop task, increases the probability of having regret aversion by 21,8 percentage points. This effect is statistically significant at the 10% significance level. This applies to the participants who had no time pressure at the lotteries, column 1.

Column 2 shows the results for participants who had time pressure. No significant results are found for the mindfulness treatment. Column 3 shows that having a mindfulness treatment, when compared to having a Stroop task, increases the probability of having regret aversion by 18,2 percentage points. This effect is statistically significant at the 5% significance level. These results do not support hypothesis 1: Having a mindfulness treatment has the opposite effect. It increases the probability, rather than decreasing it. Hypothesis 2 is answered with the use of the interactions in column 4 and 5. Interaction one in column 4 shows the effects of the variables, considering that the interaction between the Stroop task and no time-pressure is the base category.

Table 7a: Marginal effects including the whole sample

Marginal effects Dep. Var: Regret aversion	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Mindfulness	0.218* (1.88)	0.117 (0.80)	0.188** (2.12)		
Having a timer			0.0604 (0.65)		
				Base: Stroop with no timer	Base: Stroop with a timer
Timer treatment				0.0619 (0.66)	-0.0619 (-0.66)
Mindfulness treatment (No timer for interaction 1 With timer interaction 2)				0.244* (1.93)	0.135 (0.94)
Age	-0.0146* (-1.66)	-0.00330 (-0.32)	-0.000845 (-0.15)	-0.000386 (-0.07)	-0.000432 (-0.07)
Female	0.242 (0.19)	0.180 (1.16)	0.0525 (0.54)	0.0518 (0.57)	0.0579 (0.56)
Educational level					
Bachelor degree	-0.0223 (-0.16)	-0.441** (-2.57)	-0.220* (-1.91)	-0.220** (-1.98)	-0.243** (-1.98)
Master degree	0.167 (0.59)	-0.0724 (0.27)	0.0431 (0.22)	0.0147 (0.07)	0.0152 (0.07)
Occupation					
Working and studying	-0.277 (-1.50)	0.102 (0.45)	-0.0555 (-0.38)	-0.0557 (-0.40)	-0.0628 (0.40)
Unemployed			-0.0790 (-0.30)	-0.0997 (-0.41)	-0.113 (-0.40)
Studying	-0.116 (-0.48)	0.0276 (0.11)	0.0458 (0.26)	0.0313 (0.18)	0.0346 (0.18)
Income level					
Average income	0.226 (0.91)	0.133 (0.59)	0.128 (0.83)	0.107 (0.72)	0.119 (0.73)
High income	-0.185 (-0.92)	0.279 (0.95)	-0.0707 (-0.43)	-0.0818 (-0.52)	-0.0938 (-0.52)
Very high income	-0.0758 (-0.21)		-0.0869 (-0.31)	-0.113 (-0.45)	-0.130 (-0.44)
Currently meditating	0.123 (0.92)	0.0511 (0.29)	0.0422 (0.42)	0.0439 (0.46)	0.0491 (0.46)
BAI	-0.00116 (0.06)	0.0177 (0.97)	0.00873 (0.71)	0.00782 (0.66)	0.00873 (0.67)
MAAS	-0.0256 (-0.37)	0.0479 (0.49)	0.0805 (0.260)	0.0167 (0.33)	0.0186 (0.33)
Observations	59	44	106	106	106

Variables effect on regret aversion. T statistics in parentheses: * p<0.10, ** p<0.05.

Interaction 1 base category: Stroop task with no timer

Interaction 2 base category: Stroop task with a timer

Reference category "Mindfulness": "Stroop task"

Reference category "Having a timer": "Having no timer"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

The marginal effects are computed when having no time pressure, which enables analysis on the effect of having a mindfulness treatment, when compared to the Stroop task, under no time pressure circumstances. For interaction two, the marginal effects are estimated under time pressure circumstances. The variable of interest then becomes the mindfulness treatment variable in column 4 and 5. The coefficient shows the effect of having had the mindfulness treatment, when compared to having had the Stroop task, under no time-pressure conditions (column 4) or time-pressure conditions (column 5). To answer hypothesis 2, the effects of the mindfulness treatment needs to be compared in both time pressure conditions. From column 4 can be concluded that, having had the mindfulness treatment under no time-pressure conditions, when compared to having had the Stroop task, increases the probability of having regret aversion by 24.4 percentage points. This effect is statistically significant at the 10% significance level. Under time-pressure conditions, mindfulness had no significant effect on the probability of having regret aversion. This means that hypothesis 2 is not supported: the effect of mindfulness under time pressure conditions is not higher than under no time pressure conditions.

When looking at the demographic variable bachelor's degree, a significant relationship is found. When considering the participants who had time pressure (column 2), the whole sample (column 3) or the interaction samples (columns 4 and 5), having a bachelor's degree, when compared to having a high school degree, decreases the probability of having regret aversion by 44.1, 22, 22 and 24.3 percentage points. These effects are statistically significant at the 5%, 10%, 5% and 5% significance levels, respectively. To conclude the analysis, the mindfulness attention awareness scale (MAAS) and the Beck Anxiety Index scale (BAI) were found to have no effect. This indicates that being more mindful or feeling more anxious, does not affect regret aversion. This gives more evidence that hypotheses are not supported.

Table 7c shows the marginal results when only looking at "*part of the sample*". Table 7d with the logistic results can be found in appendix D. The mindfulness treatment has no significant effect on the probability of having regret aversion. Both hypotheses are therefore not supported: Mindfulness does not decrease the probability of having regret aversion (hypothesis 1) and the effect is higher under time-pressure conditions (hypothesis 2). To clarify, hypothesis 2 is not supported because there are no effects under both no time-pressure and time pressure conditions, signified by the interaction 1 and 2 (column 4 and 5).

Table 7c: marginal effects part of the sample

Marginal effects	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Dep. Var: Regret aversion					
Mindfulness	0.0415 (0.25)	0.386 (1.56)	0.138 (1.13)		
Having a timer			-0.153 (-1.23)		
Timer treatment				Base: Stroop with no timer -0.144 (-1.23)	Base: Stroop with a timer 0.144 (1.23)
Mindfulness treatment (No timer for interaction 1 With timer for interaction 2				0.178 (1.02)	0.0899 (0.54)
Age	-0.0385 (-1.51)	0.0378 (0.85)	-0.00779 (-1.03)	-0.00793 (-1.00)	-0.00665 (-1.01)
Female	0.0367 (0.20)	0.173 (0.61)	0.0912 (0.69)	0.0954 (0.69)	0.0800 (0.68)
Education level					
Bachelor degree	0.0950 (0.47)	-0.366** (-2.01)	-0.218 (-1.56)	-0.221* (-1.65)	-0.201 (-1.46)
Occupation					
Working and studying	-0.341* (-1.75)	0.494*** (3.74)	0.0104 (0.05)	0.0132 (0.06)	0.0111 (0.06)
Unemployed			0.273 (0.63)	0.254 (0.62)	0.252 (0.55)
Studying	-0.399* (-1.95)	0.262*** (2.99)	-0.0173 (-0.08)	-0.0225 (-0.10)	-0.0186 (-0.10)
Income level					
Average income	0.120 (0.34)	0.417*** (2.65)	0.158 (0.79)	0.154 (0.75)	0.139 (0.73)
High income	-0.265 (-1.00)		-0.243* (-1.74)	-0.293* (-1.69)	-0.197 (-1.64)
Currently meditating	0.0564 (0.28)	-0.622 (-1.40)	-0.0715 (-0.57)	-0.0720 (-0.55)	-0.386 (0.711)
MAAS	0.00593 (0.07)	-0.255 (-1.05)	-0.0179 (0.30)	-0.0211 (-0.34)	-0.0177 (-0.33)
BAI	0.0344 (1.23)	0.0129 (0.54)	0.0234 (1.55)	0.0230 (1.41)	0.0193 (1.51)
Observations	34	22	61	61	61

Variables effect on regret aversion. T statistics in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category “Mindfulness”: “Stroop task”

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Currently meditating”: “Not currently meditating”

The people who had time pressure (column 2) or when considering the interaction 1 sample (column 4), having a bachelor’s degree, when compared to a high school degree, decreases the probability of having regret aversion by 36.6 and 22.1 percentage points, respectively.

These effects are statistically significant at the 5% and the 10% significance level. When looking at occupation for the participants who had no time pressure specifically (column 1), working and studying at the same time or only studying, decreases the probability of having regret aversion by 34.1 and 39.9 percentage points respectively, compared to people who are only working. These effects are statistically significant at the 10% significance level. Participants with time pressure who are either working and studying or only studying, have an increased probability of having regret aversion of 49.4 and 26.2 percentage points, respectively. These effects are statistically significant at the 1% significance level. These results are quite contradictory since these results are opposite of each other. Having no time pressure decreases the probability of having regret aversion and having time pressure increases the probability of having regret aversion.

Lastly, for the participants who had time-pressure (column 2), having an average income, when compared to having a low income, increases the probability of having regret aversion by 41.7 percentage points. This effect is statistically significant at the 1% significance level. For the participants of the whole sample (column 3) or the interaction 1 sample (column 4), having a high income, when compared to having a low income, decreases the probability of having regret aversion by 24.3 and 29.3 percentage points, respectively. These effects are statistically significant at the 10% significance level.

To conclude the analysis, the mindfulness attention awareness scale (MAAS) and the Beck Anxiety Index scale (BAI) were found to have no effect for this part of the sample as well. This indicates even more that being more mindful or feeling more anxious, does not affect the probability of having regret aversion, thus not supporting the hypotheses.

Robustness checks

Logistic regression for meditation people

This research will also look at the results for people that have meditated in their life. It can be argued that the effect of the treatment will be more effective for people who had prior experience in meditation. People with experience with meditation know what to expect, know what to do and know what to focus on. They are also willing to be more mindful (Brown & Ryan, 2003). Hölzel et al (2011) confirms this by showing evidence that experienced meditations have increases sensory processing of body sensations, increases concentration and attention levels and better cognitive control.

Table 8a: marginal effects for participants that experience with meditation

Logistic regression Dep. Var: Regret aversion	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Mindfulness treatment	0.288 (1.50)	0.00320 (0.01)	0.188 (1.19)		
Having a timer			0.00965 (0.05)		
				Base: Stroop with no timer	Base: Stroop with a timer
Timer treatment				0.00570 (0.03)	-0.00570 (-0.03)
Mindfulness treatment				0.191 (0.52)	0.236 (0.87)
No timer for interaction 1 With a timer interaction 2					
Age	-0.0240 (-1.11)	-0.0432 (-0.62)	0.00213 (0.12)	0.00100 (0.04)	0.000976 (0.04)
Female	-0.0434 (-0.21)	2.104 (0.69)	0.266 (1.45)	0.272 (1.37)	0.264 (1.43)
Educational level					
Bachelor degree			-0.226 (-1.04)	-0.223 (-1.03)	-0.220 (-0.87)
Master degree			-0.0496 (-0.15)	-0.0374 (-0.11)	-0.0368 (-0.11)
Occupation					
Working and studying			-0.226 (-0.87)	-0.240 (-0.77)	-0.235 (-0.92)
Studying			-0.142 (-0.47)	-0.153 (0.46)	-0.150 (-0.49)
Income level					
Average income			0.375 (1.58)	0.383 (1.51)	0.375 (1.60)
High income			-0.0275 (-0.11)	-0.0191 (-0.07)	-0.0186 (-0.07)
Meditating since (cont.)	-0.0562 (-1.12)	0.399 (0.61)	0.0242 (0.50)	0.0253 (0.50)	0.0246 (0.53)
Meditating how often (cont.)	0.0244 (0.40)	-0.464 (-0.81)	-0.0390 (-0.63)	-0.0397 (-0.62)	-0.0386 (-0.66)
Mindfulness scale (MAAS)			-0.791 (0.889)	-0.116 (-0.90)	-0.113 (-1.00)
Beck Anxiety scale (BAI)			-0.0377* (-1.73)	-0.0379* (-1.66)	-0.0368 (-1.51)
Education level (cont.)	-0.251* (-1.86)				
Occupation (cont.)	-0.0528 (0.38)	0.0377 (0.17)			
Income (cont.)	0.154 (0.82)	1.166 (0.40)			
Observations	21	16	33	33	33

Variables effect on regret aversion. T statistics in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: Stroop task with no time pressure
 Interaction 2 base category: Stroop task with time pressure
 Reference category “Mindfulness treatment”: “Stroop task”
 Reference category “Having a timer”: “Having no timer”
 Reference category “Female”: “Male”
 Reference category “Educational level”: “High School”
 Reference category “Occupation”: “Working”
 Reference category “Income level”: Low income level”

Table 8b shows the results for the logistic regression (appendix D) and table 8a above shows the marginal effects. The results are differentiated for the different time pressure treatments. It is noteworthy that four observations of all the participants were removed due to a perfect relationship with the outcome variable regret aversion. This means that the predictor variable explains the outcome variable perfectly. For example, two out of the four observations are removed, which had primary school as their completed education. Having completed primary school meant that they reported no regret aversion. Thus, there is a perfect relationship between having completed primary school and regret aversion, indicating that the variable primary school would predict the outcome variable with 100% certainty. Subsequently, the effect of having completed primary school can be found without any estimation, which means that there is no justification of using primary school in the model.

Additionally, due to lack of observations, education, occupation, income “*meditating since*” and “*Meditating how often*” are used as continuous variables. The lack of observations made it impossible to estimate results when these variables as categorical. Using these variables as continuous variables is still viable if they can be treated as ordinal variables. For instance, it can be argued that having completed a bachelor’s degree, means a higher educational level when compared to having completed only primary school (Pasta, 2009).

When looking at the marginal effects in table 8a we can see that there is no significant mindfulness variable, indicating that the meditation had no significant effect on the probability of having regret aversion. Though, for the whole sample (column 3), and the interaction 1 sample (column 4), one more point at the BAI scale, decreases the probability of having regret aversion by 3.77 and 3.79 percentage points, respectively. These effects are statistically significant at the 10% significance level.

Looking at part of the sample, the results become clearer. Table 8c and 8d show these results, table 8c showing the marginal effects and table 8d the logistic regression (appendix D). Due to lack of observations, analysis and estimation on specifically participants who had no time-pressure or with time-pressure was not possible. Additionally, also the marginal effects of the interaction samples could not be estimated due to lack of observations, shown at table 8e in appendix D. For instance, there were only 2 participants who had both the mindfulness treatment under no time pressure conditions. As mentioned, these effects were not estimable. Therefore, table 8c only shows the effects of part of the sample, including both the participants who had no time-pressure or with time-pressure.

Considering table 8c, the mindfulness treatment has no significant impact. Thus, hypothesis 1 is not supported. Hypothesis 2 can be answered partially due to the missing marginal effects estimation. Table 8d shows the results of the logistic regression for the interaction samples, for which only the sign and the significance can be interpreted. No significant effects can be found for the mindfulness treatment under both the time-pressure situations, indicating that hypothesis 2 is not supported. The other variables however show some significant results. Table 8c shows that having had time pressure, compared to having had no time pressure, decreases the probability of having regret aversion by 94.4 percentage points. This effect is statistically significant at the 10% significance level. This is an exceptionally large effect, indicating the opposite of what could be expected.

Table 8c: marginal effects for people with experience with meditation – part of the sample

Marginal effects Dep. Variable: Regret aversion	(1) All participants who have meditated before
Mindfulness	0.814 (1.32)
Having a timer	-0.944* (-1.69)
Age	-0.109 (-0.98)
Female	-0.006 (-0.24)
Bachelor degree	0.271*** (4.10)
Occupation	
Working and studying	-0.318 (-0.81)
Studying	-0.363 (-0.86)
Income (continuous)	0.299 (1.29)
Meditating since (continuous)	0.199 (1.45)
Meditating how often (continuous)	0.0816 (0.54)
Mindfulness scale (MAAS)	0.013 (0.05)
Beck anxiety scale (BAI)	0.045 (0.65)
Observations	22

Variables effect on regret aversion. T statistics in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category "Mindfulness treatment": "Stroop task"

Reference category "Having a timer": "Having no timer"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Secondly, having completed a bachelor's degree, compared to having completed a high school degree, increases the probability of having regret aversion by 27.1 percentage points. This effect is statistically significant at the 1% level.

Table 8f and 8g (appendix D) elaborate further on people that have meditated. Table 8f shows the marginal effects, while comparing for how long people have been meditating as well as comparing the frequency of meditation. It shows that mindfulness or the timer treatment does not have a significant effect, but there is still a significant result while comparing meditation frequency: People who meditate once every week, have an increased probability of having regret aversion, when compared to people that meditate every day, of 43.6 percentage points. This effect is statistically significant at the 10% significance level.

The significance of income is of no meaning, since it is used as a continuous variable. Logically speaking, income is a categorical variable. To clarify, the categorical variables of Education, Occupation and income are still included in the regression, since they have enough explanatory power. This is due to a comparison of the pseudo-R-squared: while including the demographic variables the R-squared is 0.3072, whereas it is 0.1823 when the variables are not included. This comparison is applicable, since both models look at the same Pseudo R-squared, the same data, as well as the prediction of the same outcome (Long, 1997).

To conclude the analysis, all the models did not include the variable which looked at whether people had their eyes closed during the meditation, because then the impact of the cognitive treatment cannot be analyzed. If people had the meditation treatment, table 8h and 8i (appendix D) show the results. To get reliable results, only the participants who spend more than 300 seconds at the meditation are included in the logit regression. The results show no significant impact among any variable, indicating that the used demographic variables have no causal impact upon the probability of having regret aversion. The specific variables of interest are whether the participant is currently meditating or whether the participant had their eyes closed during the entire practice. Both variables had no significant impact when compared to their reference category, being not currently meditating, or not having had their eyes closed during their entire practice. The latter indicates that having your eyes fully closed during meditation, has no effect on the probability of having regret aversion.

The interpretation of these results can be concluded such that they support the main results and make the results more valid.

Hypothesis 1 is not supported for people that have meditated. A definitive answer to hypothesis 2 cannot be given due to lack of observations. Thus, the conclusions do not change when using different assumptions. However, having had time pressure decreases the probability of having regret aversion, whereas it was expected to increase regret aversion due to less optimal behavior (Ariely & Zakay, 2001). Secondly, having completed a bachelor's degree increases the probability of having regret aversion, signifying that educated individuals with experience with meditation are more prone to having regret aversion. The results of the timer treatment and the bachelor's degree do not match with the results of the main analysis. One important thing to mention though is for the part of the sample observations, table 8c, only five participants had the mindfulness treatment, and 17 had the Stroop task treatment. This gives reason to believe that the significant results are heavily influenced by a few observations, making them not dependable. This is another example of a lack of observations.

Robustness checks – Different levels of regret aversion

In the main analysis, participants have no regret aversion if they chose payout option 1 in both lotteries, or payout option 2 once out of both lotteries. This robustness check adds a different level of regret aversion: having *some* regret aversion, which applies whenever a participant chooses payout option 2 once out of both lotteries. Three levels then occur: Having *no* regret aversion, having *some* regret aversion or having *full* regret aversion. Using this alternative specification of regret aversion, the hypothesis can be evaluated again. For this robustness check, an ordered logit regression is used. This is the most effective analysis, since the outcome variable now corresponds to three different categories with an ordinal scale (Long & Freese, 2014). Table 9a underneath shows the marginal results for the whole sample. The ordered logit regression is in appendix D (table 9b). The results are differentiated for the three different levels of regret aversion. Only the variables which had an effect are shown in the table, because otherwise including every control variable would result in an exceedingly long table, since there are different levels of regret aversion. The coefficients show the effect of the corresponding variable on the specific level of regret aversion. For example, when looking at the sample who had no time-pressure (column 1), having had a mindfulness treatment, when compared to having had the Stroop task, increases the probability of having *full* regret aversion by 17.2 percentage points. This effect is statistically significant at the 10% significance level. Using all observations, column 3, the results show effects on every level of regret aversion. Having had a mindfulness treatment, when compared to the Stroop task, decreases the probability of having *no* regret aversion or *some* regret aversion by 6.34 and 9.03 percentage points, respectively. These effects are significant at the 10% level.

Table 9a: marginal effects ordered logit regression – whole sample

Marginal effects	(1)	(2)	(3)	(4)	(5)
	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Dep. Var: regret aversion					
Mindfulness treatment:					
No regret aversion	-0.0667 (-1.39)	-0.0127 (-0.24)	-0.0634* (-1.69)		
Some regret aversion	-0.106 (-1.51)	-0.0191 (-0.24)	-0.0903* (-1.81)		
Full regret aversion	0.172* (1.61)	0.0317 (0.24)	0.154* (1.90)		
				Base category: Stroop no timer	Base category: Stroop a timer
Mindfulness treatment					
No timer for interaction 1					
\ With timer interaction 2					
No regret aversion				-0.0901* (-1.72)	-0.0292 (-0.67)
Some regret aversion				-0.115 (1.60)	-0.0638 (-0.67)
Full regret aversion				0.205* (1.84)	0.0930 (0.68)
Timer treatment					
No regret aversion			-0.0285 (-0.79)	-0.0343 (-0.96)	0.0343 (0.96)
Some regret aversion			-0.0406 (-0.80)	-0.0308 (-0.53)	0.0308 (0.53)
Full regret aversion			0.0691 (0.81)	0.0651 (0.74)	-0.0651 (-0.74)
Bachelor degree					
No regret aversion	0.0239* (0.51)	0.113* (1.82)	0.0654* (1.94)	0.0767* (1.94)	0.0554* (1.83)
Some regret aversion	0.0396 (0.45)	0.333** (2.26)	0.135 (0.64)	0.126 (1.61)	0.168* (1.74)
Full regret aversion	-0.0635* (-0.48)	-0.447*** (-2.70)	-0.201* (-1.85)	-0.203* (-1.91)	-0.223* (-1.95)
Observations	63	46	109	109	109

Variables effect on regret aversion. T statistics in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category “Mindfulness treatment”: “Stroop task”

Reference category “timer treatment”: “Having no timer”

Reference category “bachelor’s degree”: “High School”

Additionally, having had a mindfulness treatment, when compared to having had the Stroop task, increases the probability of having *full* regret aversion by 15.4 percentage points. This effect is also statistically significant at the 10% significance level. These effects do not support hypothesis 1. The effect on full regret aversion is positive rather than negative, thus an opposite effect of what hypothesis 1 states. Mindfulness also decreases the probability of having *no* regret aversion, indicating that having regret aversion becomes more probably.

When looking at the interactions, significant effects are only found for the first interaction. Interaction one is the interaction between both treatments while having the Stroop task with no time-pressure as the base category. The marginal effects are computed when having no time pressure for interaction one, whereas for interaction two, the marginal effects are estimated under time pressure circumstances. For interaction one (column 4), having had the mindfulness treatment with no time-pressure, when compared to the Stroop task under no time-pressure, decreases the probability of having *no* regret aversion and increases the probability of having *full* regret aversion by 9.01 and 20.5 percentage points, respectively. These effects are statistically significant at the 10% significance level. These results do not support hypothesis 2, since no effect is found for interaction two. Therefore, the effects of mindfulness are not more salient under time pressure.

Having a bachelor's degree, when compared to having a high school degree, also has a significant impact on the three levels of regret aversion. All five analysis, the five columns, show a significant increasing impact on the probability of having *no* regret aversion, where the effect is the highest for the time pressure participants: 11.3 percentage points. All five effects are statistically significant at the 10% significance level. For the probability of having *some* regret aversion, both the time-pressure sample (column 2) and the interaction 2 sample (column 5) show significant effects. Having had a bachelor's degree, when compared to having a high school degree, increases the probability of having *some* regret aversion by 33.3 and 16.8 percentage points, respectively. These effects are statistically significant at the 5% and 10% significance level, respectively. The biggest effect on having *full* regret aversion is found with the time-pressure sample (column 2) as well. Having a bachelor's degree, when compared to having a high school degree, decreases the probability of having *full* regret aversion by 44.7 percentage points. This effect is statistically significant at the 1% significance level. The other four samples also have a significant decreasing impact on *full* regret aversion.

The results for part of the sample are found in table 9c underneath, where table 9d in appendix C shows the ordered logistic regression. When considering part of the sample, there is no effect found for the mindfulness treatment. This does not support hypothesis 1. Hypothesis 2 is also not supported, since there is no evidence that mindfulness has a larger effect under time pressure, when compared to having no time pressure. This follows from column 4 and 5, being the two interactions. Again, column 4 shows the marginal effects under no time pressure conditions and column 5 shows the effects under time pressure conditions.

Table 9c: marginal effects ordered logit regression – part of the sample

Marginal effects	(1)	(2)	(3)	(4)	(5)
	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Dep. Var: regret aversion					
<i>Mindfulness treatment:</i>					
No regret aversion	-0.0114 (-0.92)	-0.00404 (-0.04)	-0.0289 (-0.73)		
Some regret aversion	-0.129 (-1.05)	-0.000972 (-0.04)	-0.0510 (-0.73)		
Full regret aversion	0.141 (1.05)	0.00501 (0.04)	0.0799 (0.75)		
				Base category: Stroop no timer	Base category: Stroop a timer
<i>Mindfulness treatment</i>					
<i>No timer for interaction 1</i>					
<i> With timer interaction 2</i>					
No regret aversion				-0.0327 (-0.97)	-0.00179 (-0.02)
Some regret aversion				-0.120 (-0.92)	-0.00112 (-0.02)
Full regret aversion				0.153 (0.96)	0.00291 (0.02)
<i>Timer treatment</i>					
No regret aversion			0.0616 (1.38)	0.0589 (1.21)	-0.0589 (-1.21)
Some regret aversion			0.108 (1.56)	(0.109)* (1.72)	(-0.109)* (-1.72)
Full regret aversion			-0.170* (-1.65)	-0.167* (-1.69)	0.167* (1.69)
<i>Age</i>					
No regret aversion	0.00206** (2.16)	0.000213 (0.03)	0.00163 (0.72)	0.00112 (0.67)	0.00213 (0.65)
Some regret aversion	0.0234*** (2.68)	0.0000513 (0.03)	0.00288 (0.76)	0.00334 (0.69)	0.0132 (0.60)
Full regret aversion	-0.0254***	-0.0000265 (-0.03)	-0.00451 (-0.76)	-0.00446 (-0.70)	-0.00345 (-0.70)
<i>Bachelor degree</i>					
No regret aversion		0.185 (1.59)	0.0619 (1.57)	0.0469 (1.50)	0.0935 (1.59)
Some regret aversion		0.231 (1.32)	0.149 (1.47)	0.188* (1.68)	0.101 (1.02)
Full regret aversion		-0.416* (-1.82)	-0.211 (-1.63)	-0.235* (-1.79)	-0.195 (-1.57)
<i>Average income</i>					
No regret aversion	-0.0366 (-1.18)	0.0847 (0.36)	-0.0234 (-0.49)	-0.0155 (-0.45)	-0.0311 (-0.44)
Some regret aversion	-0.382*** (-3.06)	0.00778 (0.19)	-0.0586 (-0.45)	-0.0649 (-0.43)	-0.0346 (-0.39)
Full regret aversion	0.418*** (3.21)	-0.0925 (-0.42)	0.0820 (0.47)	0.0803 (0.43)	0.0657 (0.43)
<i>Beck anxiety scale (BAI)</i>					
No regret aversion	-0.00217 (-0.93)	-0.0212 (-1.44)	-0.00905 (-1.52)	-0.00664 (-1.43)	-0.0123 (-1.32)
Some regret aversion	-0.0246 (-1.20)	-0.00512 (-0.54)	-0.0159* (-1.77)	-0.0193* (-1.70)	-0.00760 (-0.97)
Full regret aversion	0.0268 (1.19)	0.0264* (1.78)	0.0250* (1.91)	0.0257* (1.81)	0.0199* (1.82)
Observations	38	28	66	66	66

Variables effect on regret aversion. T statistics in parentheses: * p<0.10, ** p<0.05, *** p<0.01

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category “Mindfulness treatment”: “Stroop task”

Reference category “timer treatment: “Having no timer”

Reference category “Bachelor degree”: “High School”

Reference category “Average income”: “Low income”

Time pressure on its own does have an effect, judged by “*timer treatment*” columns. Columns 3 and 4 show that having had time-pressure, when compared to having had no time-pressure, decreases the probability of having *full* regret aversion by 17 and 16.7 percentage points, respectively. These effects are statistically significant at the 10% significance level. The probability of having *some* regret aversion is only affected by time pressure for the interaction sample (columns 4). Having time pressure for that sample means that the probability of having *some* regret aversion is increased by 10.9 percentage points. This effect is statically significant at the 10% significance level.

When considering demographical variables, age has an effect for the no time pressure sample. One more year of age, increases the probability of having *no* and *some* regret aversion by 0.206 and 2.34 percentage points, respectively. These effects are statistically significant at the 5% and 1% significance level, respectively. One more year of age, however, also decreases the probability of having *full* regret aversion by 2.54 percentage points, at a significance level of 1%. Predominantly, having a bachelor’s degree, when compared to having a high school degree, decreases the probability of having *full* regret aversion. These effects are 41.6 and 23.5 percentage points for the time pressure and interaction one samples.

Average income also has an effect such that having an average income, when compared to having a low income, decreases the probability of having *some* regret aversion by 38.2 percentage points. This effect is statistically significant at the 1% significance level. However, the effect on *full* regret aversion is the opposite: it increases the probability of having full regret aversion by 41.8 percentage points at a 1% significance level. Lastly, feelings of anxiety measured by the Beck Anxiety scale (BAI) also have an effect. Columns 3 and 4 show that an increase of 1 in the BAI scale, decreases the probability of having *some* regret aversion by 1.59 and 1.93 percentage points, being statistically significant at the 10% significance level. The opposite effect is found for the probability of having *full* regret aversion when considering four of the five analyses. It states an increase of almost 2 percentage points for every sample, with a significance level of 10%

The results of this robustness check make the results of the main analysis more valid. The conclusions do not change, since the results do not support hypothesis 1 and hypothesis 2. The results of having a bachelor’s degree or an average income from the main analysis are also more robust.

Time spent at meditation or lottery

During the meditation for the mindfulness participants, a timer was used to check whether people spend at least 300 seconds at the page. This made it more likely that people conducted the meditation fully, which should last five minutes. This timer can also be used to check whether the time spend at the meditation has an influence on the probability of having regret aversion. Table 10a and 10b show the results of the marginal effects and the logit regression, respectively. To get a more accurate result, the time spend at the meditation has been divided by 10. This is because one second on a meditation of five minutes would not have much impact. The time spend at the meditation has no significant impact on the probability of having regret aversion. This holds for both the whole sample and the part of the sample. This signifies the notion that it does not matter whether people had the full treatment, the participants who spend more than 300 seconds at the meditation, or not. This gets emphasized by the small coefficients of -0.00193 and -0.000467 as well.

The participants who had time pressure at the lotteries can also be further analyzed with regards to their time spend to answer the lotteries. It can be argued that under time-pressure, people make hasty decisions and therefore they might make sub-optimal decisions (Ariely & Zakay, 2001). Therefore, it can be expected that the time spend, might have a significant impact on choosing payout option 2, the regret aversion choice, rather than payout option 1. The more time spend, the lower the probability of choosing payout option 2.

Tables 10c to 10f show the results. The time spend at lottery one has been divided by three to be able to analyze a worthwhile effect of the time spend. The results of lottery one, table 10c and 10d, indicate that the time spend does not have a significant influence for both the whole and part of the sample. For lottery two, table 10e and 10f, the same conclusion holds. The fact that somebody is currently meditating seems to matter however when looking at the choice of lottery one. When considering both the whole sample and part of the sample, currently meditating, when compared to not currently meditating, decreases the probability of choosing the regret aversion choice, payout option 2, by 19.7 and 33.9 percentage points, respectively. These effects are statistically significant at the 5% and 10% significance level.

Additional treatment checks

To further evaluate the effectiveness of the treatment, a chi-squared test is used to evaluate whether people who spend more than five minutes at the experiment, and more than five minutes at the meditation for the mindfulness participants (group long), have significant differences in regret aversion than the people who spend less than five minutes (group short).

A chi-squared test will tell whether there is a statistical association between the groups and regret aversion, such that the null hypothesis would be that there is no statistical association between regret aversion and the two different groups. The alternative hypothesis will be that there is a statistical association. Tables 11a, 11b and 11c shows the results. The results show the same trend: There is no statistical association between the groups and regret aversion for the whole sample (table 11a), but also specifically when comparing participants who had the mindfulness treatment (table 11b) or the Stroop task treatment (table 11c). These results all support the corresponding null hypotheses. Thus, it does not matter whether people successfully took the treatments, since spending less time did not effect the probability of having regret aversion.

Table 11a – time spent for all participants

Regret aversion	groups		
	Short	Long	Total
No regret aversion	26	43	69
Regret aversion	17	23	40
Total	43	66	109

Pearson Chi2 = 0.25 Prob = 0.6198

Short: Participants who spend less than five minutes at the experiment and less than five minutes at the meditation.

Long: Participants who spend more than five minutes at the experiment and more than five minutes at the meditation.

Table 11b - time spent for meditation participants

Regret aversion	groups		
	Short	Long	total
No regret aversion	13	14	27
Regret aversion	12	11	23
Total	25	25	50

Pearson Chi2 = 0.08 Prob = 0.7766

Short: Participants who spend less than five minutes at the experiment and less than five minutes at the meditation.

Long: Participants who spend more than five minutes at the experiment and more than five minutes at the meditation.

Table 11c – time spent for Stroop task participants

Regret aversion	groups		
	Short	Long	Total
No regret aversion	13	29	42
Regret aversion	5	12	17
Total	18	41	59

Pearson Chi2 = 0.01 Prob = 0.9073

Short: Participants who spend less than five minutes at the experiment and less than five minutes at the meditation.

Long: Participants who spend more than five minutes at the experiment and more than five minutes at the meditation.

Results of past decisions affecting future decisions

There is no evidence that the phenomenon of past decisions having a relationship with future decisions occurred. For this research, this means that the choice in lottery one will have had a relationship with the choice in lottery two. Table 12a to 12d in appendix D show the results of chi-squared tests, differentiated for the two categories of time pressure. There is no evidence found that the choice in lottery one is significantly correlated with the choice in lottery two for either the no time pressure or with time pressure situations. This supports the null hypothesis that there is no relationship between the choices of lottery one and lottery two. To clarify, these chi-squared test are not testing whether choice one affected choice two, because this is not possible with the data. It only indicates a relationship between the choice in lottery one and the choice in lottery two.

Discussion

This paper introduced a new method to effectively decrease the probability of having regret aversion in decision making. Using a cognitive enhancing training, being mindfulness meditation, this paper tried to induce mindful awareness to its participants such that this awareness diminished the vulnerability to regret aversion in decision making. This was compared to a reference category, being the cognitive enhancing training called the Stroop task. Regret aversion was measured using two different kinds of lotteries, where the additional treatment of having time pressure was added to also measure anxiety in decision making.

Using a 2x2 treatment design with a random allocation of the participants, multiple analyses were conducted. A causal relationship between mindfulness and the probability of having regret aversion has not been found when considering the reliable sample of participants: the participants who spend more than 300 seconds during the experiment and the meditation. These results do not support hypothesis 1. An interaction between both the cognitive treatment and the time pressure treatment showed no significant effects: having had a mindfulness treatment, under both the timer treatment situations, has no significant effect on the probability of having regret aversion. These results do not support hypothesis 2.

When considering the whole sample, mindfulness had a significant impact on the probability of having regret aversion. However, the sign of the mindfulness treatment was positive, and the significance found was at the low significance level of 10%. Still, having had a mindfulness treatment, when compared to the Stroop task, increases the probability of having regret aversion. These results do not support hypothesis 1. The interaction between both treatments showed a little effect under conditions of no time-pressure: having had a meditation increases the probability of having regret aversion. No effect was found under time pressure, thus no support for hypothesis 2 was found.

Robustness checks shows similar results for the people that have experience in meditation, as well as when having three levels of regret aversion. Having had a mindfulness treatment does not have an effect. This does not support hypothesis 1. The opposite effect of a time pressure was found for people with experience with meditation however: having time pressure at the lotteries drastically decreases the probability of having regret aversion. This is in contrast with what expected, such that it was expected that time pressure would increase the probability of having regret aversion (Ariely & Zakay, 2001). However, these results need to be taken with precaution, since the reliable part of the sample for people with experience

with meditation only consisted of 22 participants. When looking at the interactions, there is still no evidence that hypothesis 2 is supported.

The other variables that were found to impact the probability of having regret aversion are primarily in the education field, as well as some in the occupation and income field. Having a bachelor's degree, when compared to having a high school, leads to a significant decrease in the probability of having regret aversion. This conclusion holds for the whole sample and part of the sample, as well as when considering the robustness check of the three levels of regret aversion. In terms of occupation, when considering the part of the sample, both the participants that are either working and studying at the same time as well as the participants that are only studying, have an increased probability of having regret aversion when compared to people that are working. Having an average income also increases the probability of having regret aversion, when compared to having no or a low income. The robustness check with three different levels of regret aversion does support this notion. A small effect is found for people that meditate: meditating once every week increases the probability of having regret aversion, when compared to meditating every day.

Lastly, the treatments did not have its desired effect. Using a Mann Whitney U test, the differences in the Mindfulness Attention Awareness Scale and the Beck Anxiety Index scale showed no significant differences in the respective treatment groups. Thus, the desired effect of being more mindful due to the meditation and feeling more anxiety due to time pressure at the lotteries was not achieved. The time pressure did however have a small significant effect on the part of the sample who had the Stroop task: Participants who had time pressure had significantly higher scores on the BAI scale, indicating that they felt more time-pressure and anxiety. This subsequently indicates that meditation has a small effect on suppressing anxiety.

These results are not corresponding with the literature. The literature argued that mindfulness can decrease the effect of regret, control regret, as well as decrease anticipated regret by using mindfulness practices (Liu et al, 2020; Zou et al, 2015; Hafenbrack et al, 2014). Cognitive functioning is related such that meditation can increase cognitive functioning, which in turn can optimize decision making (Hafenbrack et al, 2014; Maymin & Langer, 2021). However, this research found no results that support these notions. Mindfulness, and in particular Buddhist Meditation, does not affect regret aversion.

One reason for this could be that the treatment did not have its desired effect. Participants were not significantly more mindful after having had the meditation; thus they did not have the effect that could optimize their decision making. Secondly, the lotteries might have induced different reasonings besides regret theory, which influenced the decision making. This is related to the nonexistence of the indifference option in this research. This research used two decision making processes where participants had to make a choice between two payout options. Loomes & Sugden (1982, page 809 and 822) mention that a participant can also be indifferent with regards to decision 1 and 2, supported by Bleichrodt & Wakker (2015) at page 497 and 498. Not including the indifference option can be favorable such that it induces the participants to think harder about the decision that they make, which subsequently avoids responses which have no good reasoning behind it. It therefore stimulates cognitive effort (Bleichrodt et al, 2009). It however can be a problem when participants are truly indifferent: They still must choose one of the options, where participants might choose randomly or use a specific rule to choose one of the payout options. The underlying rule would be convexity of gains under regret theory (Bleichrodt & Wakker, 2015).

However, another rule might be risk aversity, which could lead to choosing payout option 2 in both lotteries (Bleichrodt et al, 2009). For people picking payout option 2 in lottery one, besides deciding based on regret, could be based on maximizing the chance of getting a payout, in this case risk-aversion. Payout option 1 only has a 50% chance of getting €40, thus 50% chance of getting nothing. Payout option 2 has a 75% of earning money: 50% chance of getting €30 and 25% of getting €20. This might explain the big difference in choosing payout option 2 when compared to payout option 1: 86 participants out of 109 chose payout option 2 in lottery one.

Another reason for choosing payout option 2 is the assumptions of hedonic framing of Richard Thaler (1999). Hedonic framing assumes that the utility function for gains is concave, which is also true under the expected utility axioms (Kahneman & Tversky, 1979). This would mean that the marginal utility of gains is decreasing. This means that the extra utility gain of getting €20 instead of €0 at a 25% probability, would need to outweigh the extra utility gain of getting €40 instead of €30 at a probability of 50%, assuming a linear probability weighting function. Since the utility function is concave, it can be assumed that people value the utility gain from €0 to €20 with a probability of 25% more than a utility gain of €30 to €40 with a probability of 50%. For example, Thaler (1999) argues that the utility gain, when excluding probability, of €0 to €10 is higher than the utility gain of €30 to €40. The following equation illustrates this:

$$(v(\text{€}20) - v(\text{€}0)) * 0.25 > (v(\text{€}40) - v(\text{€}30)) * 0.5$$

These potential rules are not based on regret aversion and therefore give potentially biased results for this research. By not including the indifference option, this research found results that might be noisy and subsequently creating the opportunity to make false conclusions. Mindfulness was not found to decrease the probability of having regret aversion, but it might be the case that people chose payout option 2 because of different reasonings besides regret, which could partially explain the results that were found. Further research should include the indifference option, to further test how mindfulness affects regret aversion.

Further research should also use the findings of effects under the 10% significance level. These findings need further verification. This research finds small effects, 10% significance levels, for having had the mindfulness treatment when looking at the whole sample. For the demographical variables, small effects were found for people that are working and studying at the same time, are only studying, have a high income, have had time pressure, are meditating less frequently, and lastly, when having a higher score on the BAI Scale. These results are important for further research since they highlight potential impact of variables.

Limitations

This research has quite significant limitations. This research made use of two specific lotteries that have such implications that it can explain preferences under regret theory, rather than under an expected utility model. However, the trade-off method by Wakker and Deneffe (1996) is considered to be the best method to quantitatively measure regret in decision making. Therefore, further research should implicate a methodology that corresponds with the trade-off method. For instance, similar methodology of Bleichrodt et al (2009, p165-167).

Lack of observations is something that should be improved in further research as well. There are a total of 109 observations that were used for this research, however only 66 of them were reliable observations when considering an effective cognitive treatment and an appropriate completion time. Given that this research uses a 2x2 treatment design, four different groups of participants can be created. Using G-power analysis, the minimum number of observations is 738. This problem becomes even more prevalent when specifically looking at people that have experience with meditation. Proper analysis on the demographic variables of occupation, education level, income and the meditation variables were not possible. Even more importantly, the interaction between meditation and having no time pressure had too little observations to analyze. The marginal effects were not estimable either.

In this research there is evidence of sample bias. 39 of the 109 participants were male and 69 were female. This indicates an over representation of females in this research. The sample bias is even more apparent when looking at the educational level: 70 participants have completed a bachelor's degree as their highest education, which amounts to 65% of all the participants. Most people also had low-income levels, being 51% of all participants. Randomization among treatments groups is an effective method to avoid sample bias among treatments, however given these demographics it is likely that there is over-population in the different treatment groups. Further research needs to try to avoid this sample bias.

Another limitation is built on the premises of control over the participants for economic experiments, such that the five precepts must hold. The first is non-satiation, which means that people will always prefer more over less. In this research, this precept does not apply. The choices of the participants do not have any consequences which give a reward, which means that no control was achieved that way. Saliency is the second precept which states that participants cannot be deceived. There is no deception in this research: participants know what is happening and they are briefed when necessary. No monetary incentives are given, so the monetary saliency is not applicable. Thirdly, dominance states that the rewards of the experiment dominate the effort of participating. This precept does not hold either, since there are no rewards in the experiment. Therefore, any participation would be because participants like to participate in experiments, they like to help the researcher, they act out of goodwill, or any other reason which is not because of the dominance of rewards. The fourth precept of privacy holds, since the participants only see their own information. They do not see what other participants had as information. This only holds however, if participants who have already completed the experiment, do not give any information to participants who still must start. Lastly, the fifth precept states parallelism. This precept is of major concern for the external validity of this research. This precept states the assumption of applying the general laws of behavior everywhere. Thus, does the online experiment predict behavior in real life? It can, given the right context. If policy makers would want to decrease regret aversion for their clients, asking them to meditate by accessing an online meditation is easy to apply. The question arises whether the clients will conduct the meditation, but the essence still holds that the results found in this research, albeit with a lower magnitude, can be applicable in institutions. However, given the sample bias, a lot of students participated in this research. The willingness to conduct a meditation among clients who could be for instance employees, customers or patients could be different, therefore decreasing the validity of this research.

Further research should try to do the research in a lab, while using a guided meditation and a set-up computer for the Stroop task. This would increase the likelihood that people take the experiment more seriously. With no budget constraints, field experiments could also be conducted to increase the external validity even further. For these recommendations it is important that the five precepts of economic experiments hold, such that control over the participants can be achieved.

Is regret aversion a bias?

This research is based on the premises that regret aversion is some sort of a bias: it deviates people from the decision that would be best for them, the optimal decision. However, as Bleichrodt & Wakker (2015) and Loomes & Sugden (1982) explain, it is a theory that can explain behavior in decision making. It is not irrational when people make decisions based on regret and rejoicing. The sensations of regret and rejoicing can be rationally considered; thus, people can still make rational decisions, which are based on maximizing expected modified utility. (Loomes & Sugden. 1982). This deviates from the normal expected utility function, by incorporating rejoice and regret.

This research tried to diminish the probability of having regret aversion in decision making. The question that arises: is this even useful? Is it useful to reduce the probability of having regret aversion when it can still be deemed as rational behavior? People might not maximize expected utility when making choices under regret and rejoice, but it still rational behavior and therefore not sub-optimal perse. A quote by James March perfectly summarizes this: *"If behavior that apparently deviates from standard procedures of calculated rationality can be shown to be intelligent, then it can plausibly be argued that models of calculated rationality are deficient not only as descriptors of human behavior but also as guides to intelligent choice"* (March, 1978, p593; Gigerenzer & Gaissmaier, 2011). This really serves as an implication issue: are the results of this research applicable for policy makers? Is it wise trying to diminish regret aversion?

Conclusion

This paper is one of the first studies to investigate the impact of mindful awareness on regret aversion. Mindfulness did not have its purposed effect under both the situations of having no time-pressure or when having time pressure at decision making. Having a bachelor's degree decreases the probability of having regret aversion, when compared to having at most a high-school degree. Secondly, having an average income increases the probability of having regret aversion, when compared to having a low or no income.

Further research should focus on trying to replicate these results, especially for the results with a 10% significance level. If the treatment of meditation does not influence regret aversion again, different methods of specifically inducing mindfulness need to be applied to reduce regret aversion. Different treatments which are not related to mindfulness should be employed as well, to further enhance the literature on how to reduce regret aversion in decision making. Policymakers should be wary of implementing meditation to try and diminish the effect of regret aversion. Given the current implications of regret aversion in decision making, people should not use meditation to decrease regret aversion when making decisions related to the stock market, auctions, or gambling (Sümeýra, 2015; Pompain, 2006)

In sum, this research tried to build a starting point for further research on how to diminish the probability of having regret aversion in decision making. Further research should build on the treatment of mindfulness meditation as well as foremost of all, use different methods of treatments to effectively enhance decision making.

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Appendix

Appendix A

Figure A1: Briefing start experiment:

Welcome and thank you very much for participating in this experiment!

All the answers that you provide are anonymous and will be used for this research only. You will be asked to follow a short training, after which several questions will be asked. These include economic questions, as well as questions about how you feel. Lastly, general demographic questions will be asked.

We ask you to carefully think about the questions that are asked.

The experiment is divided into 3 sections and it will take roughly 8 to 12 minutes.

If you wish to participate, we ask you to comply with the consent-form below. If you do not want to participate, you can close down this window or answer the consent-form below with "No". In that case, the experiment will end automatically.

We thank you for your time in advance!

Figure A2: Briefing Mindfulness meditation

Underneath you can find a link to a guided meditation. Meditation practices can help managing stress, reduce negative emotions, increase your mental well-being and foremost of all being more positive in life. This meditation focuses on this positive attitude by creating awareness, while focusing on your breath. The meditation takes about 5 minutes to complete. We ask you to sit in a comfortable position, close your eyes and follow the guided meditation. It is important to follow the meditation for the entire 5 minutes to develop a connection between your breath and your state of mind. After you successfully followed the meditation, we ask you kindly to come back to the experiment and click on the next page to answer follow-up questions. If participants click submit before 300 seconds have expired, the following messages pops up:

Have you tried practicing the guided meditation for 5 minutes? If not, please reconsider doing so. You can then drag the progress bar of the video to the point where you left off. As mentioned, it is important to develop a good connection between your breath and state of mind. You can also go onto the next page.



Figure A3: Briefing Stroop task

Underneath you can find a task called the Stroop task. In this task, you will see color names (red, green, blue, yellow) in different "print" colors. You need to respond to the print color. For example, if you see **GREEN** you need to respond to the print color (red), and press the associated button ("Red"). The other buttons used in this study are "Green", "Blue", and "Yellow" for green, blue and yellow.

GREEN > press button "Red", because ink is red

YELLOW > press button "Yellow", because ink is yellow

BLUE > press button "Green", because ink is green

RED > press button "Blue", because ink is blue

It can be difficult, because the name and the ink color are conflicting (except for yellow in the example above). So concentrate and ignore the meaning of the color words, instead, look at the ink color. You get multiple trials and it takes around 5 minutes to complete.

To start, press any of the "Red", "Yellow", "Green, or the "Blue" buttons underneath.

Good luck!

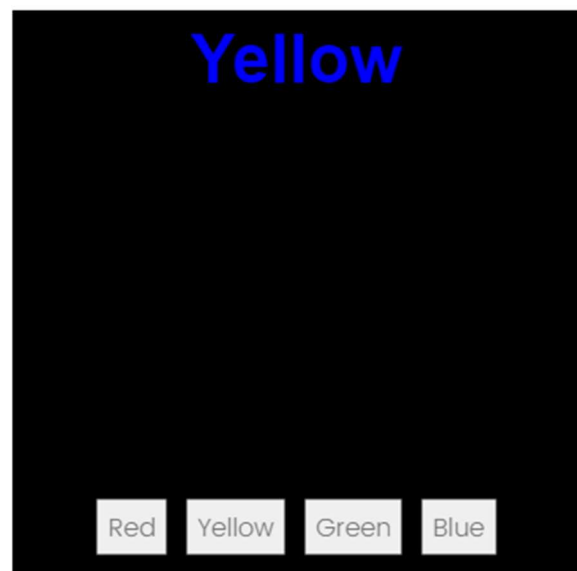
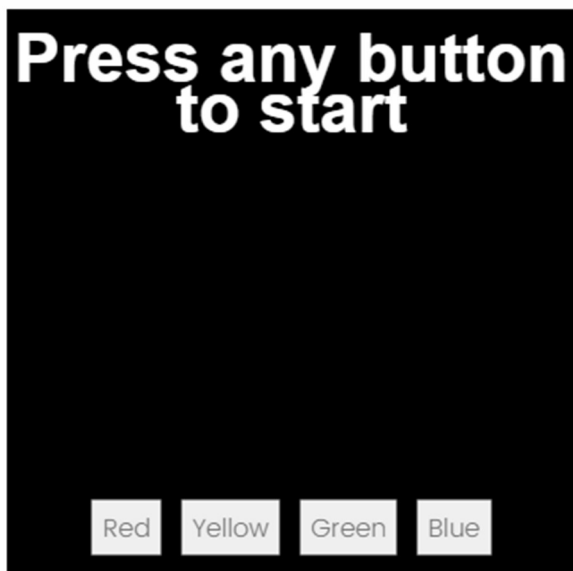


Figure A4: All questions that are asked during the experiment:

Question 1: I hereby agree to participate in this study, and give consent to use my answers for this research only:

- Yes
- No

Question 2 (Only for meditation participants): We hope you enjoyed your practice. Now that the meditation is finished, we want to know whether you were able to close your eyes during the whole meditation. If you did not, that is totally fine.

- No, I did not close my eyes at all during the meditation practice.
- No, I wasn't able to keep my eyes closed during the entire meditation practice.
- Yes, I had my eyes closed during the entire duration of the meditation practice.

Question 3-5 > Questions of the Mindfulness Attention Awareness Scale (MAAS) (Dam et al, 2010):

Question 3: I rush through activities without being really attentive to them

- Almost always
- Very frequently
- Somewhat frequently
- Somewhat infrequently
- Very infrequently
- Almost never

Question 4: I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there

- Almost always
- Very frequently
- Somewhat frequently
- Somewhat infrequently
- Very infrequently
- Almost never

Question 5: It seems I am "Running on automatic," without much awareness of what I am doing

- Almost always
- Very frequently
- Somewhat frequently
- Somewhat infrequently
- Very infrequently
- Almost never

Question 6 > Decision situation 1:

For the participants who get time pressure at the questions, the following message is at the top of the page:

“You have 90 seconds to answer the following question. There is a timer at the bottom of the page”

Now consider the following. There is an urn with 100 balls, which are numbered from 1 to 100. In the table below, you see two payout options, which pays you a different amount depending on the number of a randomly drawn ball.

For example, if the ball number 70 gets drawn,

- the payout option 1 gives € 0, since for balls between 51-75 this option pays you nothing.
- the payout option 2 gives € 20, since for ball between 51-75, this option pays you € 20.

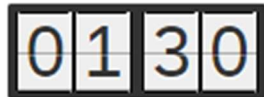
Since there are 100 balls, the chance of drawing a specific ball is 1%.

Balls	1-25	26-50	51-75	76-100
Payout option 1	€ 40	€ 40	€ 0	€ 0
Payout option 2	€ 30	€ 30	€ 20	€ 0

Which payout option in the table above do you prefer?

- Payout option 1
- Payout option 2

The participants with time pressure, got to see the timer shown underneath at their questions:



Question 7 > Decision situation 2:

For the participants who get a timer at the questions, the following message is at the top of the page:

“You have 35 seconds to answer the following question”

The set up of the urn is the same as in decision situation 1. The two options are presented in the table below.

Balls	1-25	26-50	51-75	76-100
Payout option 1	€ 30	€ 20	€ 10	€ 0
Payout option 2	€ 20	€ 10	€ 0	€ 30

The participants with time pressure, got to see the timer shown underneath at their questions



Question 8-12 > Questions of the Beck Anxiety Inventory scale (Beck et al, 1988).

Question 8 > I feel like I am unable to relax:

- Not at all
- Mildly, but it doesn't bother me much
- Moderately – It is not pleasant at times
- Severely – it bothers me a lot

Question 9 > I feel scared:

- Not at all
- Mildly, but it doesn't bother me much
- Moderately – It is not pleasant at times
- Severely – it bothers me a lot

Question 10 > I feel shaky:

- Not at all
- Mildly, but it doesn't bother me much
- Moderately – It is not pleasant at times
- Severely – it bothers me a lot

Question 11 > I feel that I am losing control:

- Not at all
- Mildly, but it doesn't bother me much
- Moderately – It is not pleasant at times
- Severely – it bothers me a lot

Question 12 > I feel that the worst is going to happen:

- Not at all
- Mildly, but it doesn't bother me much
- Moderately – It is not pleasant at times
- Severely – it bothers me a lot

Question 13 > What is your age?

Question 14 > What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

Question 15 > What is the highest education that you have successfully finished?

- Primary school
- High school
- Bachelor degree
- Master degree
- PhD
- Professional or vocational training

Question 16 > What is your occupation:

- Working
- Working and studying at the same time
- Unemployed
- Studying

Question 17 > What is your annual wage? If you are not working, please choose the option: € 0 to 20.000

- € 0 to € 20.000
- € 20.001 to € 40.000
- € 40.001 to € 70.000
- € 70.001 or more

Question 18 > Lastly, we want to ask you some questions about meditation practices. Are you currently meditating in your life sometimes?

- No
- Yes

Question 19 (Only for participants who answered yes at question 18) > How long have you been meditating in your life?

- Less than a month
- For about 3 months
- For about 6 months
- For about a year
- For about 2 years
- More than 2 years

Question 20 (Only for participants who answered yes at question 18) > How often do you meditate?

- Every day
- 2-4 times a week
- Once every week
- Once every 2 weeks
- Once a month
- Less than once a month

Figure A5 – G-power analysis with explanation (Faul et al, 2007)

z tests - Logistic regression

Options: Large sample z-Test, Demidenko (2007) with variable correlation

Analysis: A priori: Compute required sample size

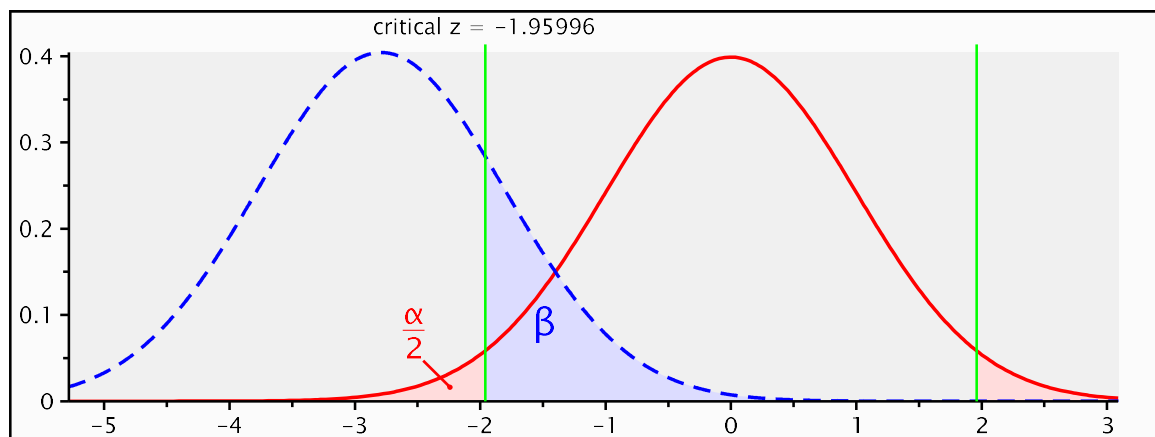
Input:

- Tail(s) = Two > *The effect could be negative or positive*
- Probability ($Y=1|X=1$) $H_1 = 0.2$. *This is the proportion of regret aversion for the treatment group, being the mindfulness meditation group. It is expected that the regret aversion is lower for the mindfulness treatment group, when compared to the Stroop task treatment group. To be on the conservative side, there should be a minimal difference of 10% between the two groups to find a reasonable effect.*
- Probability ($Y=1|X=1$) $H_0 = 0.3$. *This is the proportion of regret aversion for the control group, being the Stroop task group. It is expected that the regret aversion is lower for the mindfulness treatment group, when compared to the Stroop task treatment group. To be on the conservative side, there should be a minimal difference of 10% between the two groups to find a reasonable effect.*
- α err prob = 0.05. *Standard p-value in the literature (Fisher, 1955).*
- Power ($1-\beta$ err prob) = 0.8. *The standard level of statistical power.*
- R^2 other X = 0.2. *This is the variance that the other explanatory variables explain, besides mindfulness. To be on the conservative side, 20% seems logical*
- X distribution = Binomial. *The dependent variable is binomial.*
- X parameter mean = 0.5. *The treatment and control group should be evenly distributed.*

Output:

- Critical z = 1.9599640
- Total sample size = 738
- Actual power = 0.8001150

Corresponding plot:



Appendix B

Table 5a: Binomial test – Random allocation of Cognitive treatment

Binominal test: Random allocation Cognitive treatment					
Cognitive treatment	N	Observed k	Expected k	Assumed	Observed
Cognitive treatment	109	50	54.5	P:0.500	P:0.459
		Probability (k >= 50)	= 0.830907	(one-sided test)	
		Probability (k <= 50)	= 0.221835	(one-sided test)	
		Probability (k <= 50 or k >= 59)	= 0.443670	(two-sided test)	

Table 5b: Binomial test – Random allocation of time pressure treatment

Binominal test: Random allocation Lottery treatment					
Lottery Treatment	N	Observed k	Expected k	Assumed	Observed
Lottery treatment	109	46	54.500	P:0.500	P: 0.422
		Probability (k >= 46)	= 0.957889	(one-sided test)	
		Probability (k <= 46)	= 0.062502	(one-sided test)	
		Probability (k <= 46 or k >= 63)	= 0.125005	(two-sided test)	

Table 5c: Chi-squared test – Cognitive and time pressure treatment

Chi-squared test of cognitive treatment and timer treatment

Cognitive treatment	Timer treatment		
	No timer	With a timer	Total
Stroop task	34	25	59
Meditation	29	21	50
Total	63	46	109

Pearson Chi2 = 0.00 Prob = 0.9687

Table 5d: Chi-squared test – Cognitive treatment and gender

Chi-squared test of cognitive treatment and Gender

Cognitive treatment	Gender		
	Male	Female	Total
Stroop task	22	37	59
Meditation	17	32	49
Total	39	69	108

Pearson Chi2 = 0.08 Prob = 0.7799

Table 5e: Chi-squared test – Time pressure treatment and gender

Chi-squared test of timer treatment and Gender

Timer treatment	Gender		
	Male	Female	Total
No timer	22	40	62
With a timer	17	29	46
Total	39	69	108

Pearson Chi2 = 0.02 Prob = 0.8748

Table 5f: Chi-squared test – Cognitive treatment and educational level

Chi-squared test of cognitive treatment and education level

Cognitive treatment	Education level					Total
	Primary school	High school	Bachelor degree	Master degree	Training	
Stroop task	1	14	40	3	1	59
Meditation	1	12	30	7	0	50
Total	2	26	70	10	1	109

Pearson Chi2 = 3.46 Prob = 0.4835

Table 5g: Chi-squared test – Time pressure treatment and gender

Chi-squared test of timer treatment and education level

Timer treatment	Education level					Total
	Primary school	High school	Bachelor degree	Master degree	Training	
No timer	1	16	40	5	1	63
With a timer	1	10	30	5	0	46
Total	2	26	70	10	1	109

Pearson Chi2 = 1.19 Prob = 0.8796

Table 5h: Chi-squared test – Cognitive treatment and occupation

Chi-squared test of cognitive treatment and occupation

Cognitive treatment	Occupation				Total
	Working	Working and studying	Unemployed	studying	
Stroop task	19	16	2	22	59
Meditation	19	14	1	16	50
Total	38	30	3	38	109

Pearson Chi2 = 0.68 Prob = 0.8789

Table 5i: Chi-squared test – Time pressure treatment and occupation

Chi-squared test of timer treatment and occupation

Timer treatment	Occupation				Total
	Working	Working and studying	Unemployed	studying	
No timer	24	18	2	19	63
With a timer	14	12	1	19	46
Total	38	30	3	38	109

Pearson Chi2 = 1.55 Prob = 0.6705

Table 5j: Chi-squared test – Cognitive treatment and income level

Chi-squared test of cognitive treatment and income level

Cognitive treatment	Income level				Total
	€ 0 to € 20.000	€ 20.001 to € 40.000	€ 40.001 to € 70.000	€ 70.001 or more	
Stroop task	30	17	11	1	59
Meditation	26	10	11	3	50
Total	56	27	22	4	109

Pearson Chi2 = 2.37 Prob = 0.4986

Table 5k: Chi-squared test – Time pressure treatment and income level

Chi-squared test of timer treatment and income level

Timer treatment	Income level				Total
	€ 0 to € 20.000	€ 20.001 to € 40.000	€ 40.001 to € 70.000	€ 70.001 or more	
No timer	30	13	16	4	63
With a timer	26	14	6	0	46
Total	56	27	22	4	109

Pearson Chi2 = 6.37 Prob = 0.0949

Table 5l: Chi-squared test – Cognitive treatment and currently meditating

Chi-squared test of cognitive treatment and currently meditating

Cognitive treatment	Meditation		Total
	Not meditating	Currently meditating	
Stroop task	36	23	59
Meditation	36	14	50
Total	72	37	109

Pearson Chi2 = 1.46 Prob = 0.2276

Table 5m: Chi-squared test – Time pressure treatment and currently meditating

Chi-squared test of timer treatment and currently meditating

Timer treatment	Meditation		Total
	Not meditating	Currently meditating	
No timer	42	21	63
With a timer	30	16	46
Total	72	37	109

Pearson Chi2 = 0.02 Prob = 0.8746

Appendix C

Table 6a – Mann Whitney U test for differences in MAAS scores – whole sample

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – whole sample

Treatment	Observations	Rank sum MAAS	Expected MAAS
Stroop task	59	3329	3245
Meditation	50	2666	2750
combined	109	5995	5995
unadjusted variance	27041.67		
adjustment for ties	-367.75		

adjusted variance	26673.92		
Null hypothesis: MAAS(Stroop task) = MAAS(Meditation)			
z = 0.514			
Prob >	z	=	0.6070
Exact Prob = 0.6095			

Table 6b – Mann Whitney U test for differences in MAAS scores – part of the sample

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – part of the sample

Treatment	Observations	Rank sum MAAS	Expected MAAS
Stroop task	41	1407	1373.500
Meditation	25	804	837.500
combined	66	2211	2211
unadjusted variance	5722.92		
adjustment for ties	-68.93		

adjusted variance	5653.99		
Null hypothesis: MAAS(Stroop task) = MAAS(Meditation)			
z = 0.446			
Prob >	z	=	0.6559
Exact Prob = 0.6606			

Table 6c – Mann Whitney U test for differences in BAI scores – whole sample

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – whole sample

Lottery Treatment	Observations	Rank sum BAI	Expected BAI
Lottery with no timer	63	3288.500	3465
Lottery with a timer	46	2706.500	2530
combined	109	5995	5995
unadjusted variance	26565.00		
adjustment for ties	-296.52		

adjusted variance	26268.48		
Null hypothesis			
BAI(Lottery with no timer) =			
BAI(Lottery with a timer)			
z = -1.089			
Prob >	z	=	0.2762
Exact Prob = 0.2781			

Table 6d – Mann Whitney U test for differences in BAI scores – part of the sample

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – Part of the sample

Lottery Treatment	Observations	Rank sum BAI	expected BAI
Lottery with no timer	38	1148.500	1273
Lottery with a timer	28	1062.500	938
combined	66	2211	2211
unadjusted variance	5940.67		
adjustment for ties	-81.23		

adjusted variance	5859.44		
Null hypothesis			
BAI(Lottery with no timer) =			
BAI(Lottery with a timer)			
z = -1.626			
Prob >	z	=	0.1039
Exact Prob = 0.1049			

Table 6e – Mann Whitney U test for differences in BAI scores – part of the sample and mindfulness meditation participants

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – part of the sample and meditation treatment

Lottery Treatment	Observations	Rank sum BAI	Expected BAI
Lottery no timer	12	160.500	156
Lottery with a timer	13	164.500	169
combined	25	325	325
unadjusted variance	338.00		
adjustment for ties	-4.03		

adjusted variance	333.97		
Null hypothesis: BAI(Lottery no timer) = BAI(Lottery with a timer)			
z = 0.246			
Prob >	z	=	0.8055
Exact Prob = 0.8201			

Table 6f – Mann Whitney U test for differences in BAI scores – part of the sample and Stroop task participants

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – Part of the sample – Stroop task

Lottery treatment	Observations	Rank sum BAI	Expected BAI
Lottery no timer	26	460.500	546
Lottery with a timer	15	400.500	315
combined	41	861	861
unadjusted variance	1365.00		
adjustment for ties	-23.30		

adjusted variance	1341.70		
Null hypothesis: BAI(Lottery with no timer) = BAI(Lottery with a timer)			
z = -2.334			
Prob >	z	=	0.0196
Exact Prob = 0.0188			

Table 6g – Mann Whitney U test for differences in MAAS scores – whole sample comparison among whether people have experience with meditation or not

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – Whole sample

Groups	Observations	Rank sum MAAS	Expected MAAS
Not meditating people	72	4006.500	3960
Meditating people	37	1988.500	2035
combined	109	5995	5995
unadjusted variance	24420.00		
adjustment for ties	-332.09		

adjusted variance	24087.91		
Null hypothesis :			
MAAS(Not meditating people)			
= MAAS(Meditating people)			
z = 0.300			
Prob >	z	=	0.7645
Exact Prob = 0.7668			

Table 6h – Mann Whitney U test for differences in MAAS scores – part of the sample comparison among whether people have experience with meditation or not

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – part of the sample

Groups	Observations	Rank sum MAAS	Expected MAAS
Not meditating people	43	1451	1440.500
Meditating people	23	760	770.500
combined	66	2211	2211
unadjusted variance	5521.92		
adjustment for ties	-66.51		

adjusted variance	5455.41		
Null hypothesis:			
MAAS(Not meditating people)			
= MAAS(Meditating people)			
z = 0.142			
Prob >	z	=	0.8870
Exact Prob = 0.8905			

Table 6i – Mann Whitney U test for differences in MAAS scores – Whole sample for people that had the meditation treatment. Comparison among whether people have experience with meditation or not.

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – whole sample for meditation participants

Groups	Observations	Rank sum MAAS	Expected MAAS
Not meditating people	36	957.500	918
Meditating people	14	317.500	357
combined	50	1275	1275
unadjusted variance	2142.00		
adjustment for ties	-39.39		

adjusted variance	2102.61		
Null hypothesis; MAAS(Not meditating people) = MAAS(Meditating people)			
z = 0.861			
Prob >	z	=	0.3890
Exact Prob = 0.3971			

Table 6j – Mann Whitney U test for differences in MAAS scores – Part of the sample for people that had the meditation treatment. Comparison among whether people have experience with meditation or not.

Two-sample Wilcoxon rank-sum (Mann-Whitney) test – part of sample for meditation participants

Groups	Observations	Rank sum MAAS	Expected MAAS
Not meditating people	19	257	247
Meditating people	6	68	78
combined	25	325	325
unadjusted variance	247.00		
adjustment for ties	-3.51		

adjusted variance	243.48		
Null hypothesis: MAAS(Not meditating people) = MAAS(Meditating people)			
z = 0.641			
Prob >	z	=	0.5216
Exact Prob = 0.5467			

Appendix D

Table 7b: Logistic regression whole sample

Logistic regression Dep. Var: Regret aversion	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Mindfulness	1.237* (0.722)	0.599 (0.764)	0.931** (0.470)		
Having a timer			0.299 (0.461)		
Stroop with no timer				0 (0)	0.606 (0.670)
Stroop with a timer				0.606 (0.670)	0 (0)
Mindfulness with no timer				1.217* (0.659)	0.611 (0.653)
Mindfulness with a timer				1.230* (0.669)	0.624 (0.671)
Age	-0.0828 (0.0533)	-0.0169 (0.0535)	-0.00419 (0.0271)	-0.00202 (0.0275)	-0.00202 (0.0275)
Female	0.137 (0.717)	0.923 (0.831)	0.260 (0.480)	0.270 (0.479)	0.270 (0.479)
Educational level					
Bachelor degree	-0.126 (0.803)	-2.164** (1.048)	-1.022* (0.534)	-1.069** (0.540)	-1.069** (0.540)
Master degree	0.877 (1.477)	-0.379 (1.383)	0.189 (0.870)	0.0655 (0.893)	0.0655 (0.893)
Occupation					
Working and studying	-1.687 (1.241)	0.525 (1.205)	-0.283 (0.747)	-0.299 (0.745)	-0.299 (0.745)
Unemployed			-0.411 (1.457)	-0.557 (1.484)	-0.557 (1.484)
Studying	-0.638 (1.387)	0.146 (1.358)	0.222 (0.867)	0.159 (0.866)	0.159 (0.866)
Income level					
Average income	1.160 (1.362)	0.693 (1.193)	0.601 (0.725)	0.531 (0.731)	0.531 (0.731)
High income	-1.153 (1.338)	1.429 (1.621)	-0.369 (0.884)	-0.456 (0.896)	-0.456 (0.896)
Very high income	-0.423 (2.035)		-0.460 (1.559)	-0.651 (1.598)	-0.651 (1.598)
Currently meditating	0.694 (0.771)	0.261 (0.904)	0.209 (0.496)	0.229 (0.500)	0.229 (0.500)
BAI	-0.00655 (0.101)	0.0907 (0.0964)	0.0433 (0.0615)	0.0408 (0.0614)	0.0408 (0.0614)
MAAS	-0.145 (0.393)	0.245 (0.505)	0.0805 (0.260)	0.0869 (0.260)	0.0869 (0.260)
Constant	1.279 (3.113)	-2.830 (3.422)	-1.795 (2.071)	-1.943 (2.086)	-1.337 (2.059)
Observations	59	44	106	106	106

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category "Mindfulness": "Stroop task"

Reference category "Having a timer": "Having no timer"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 7d: Logistic regression part of the sample

Logistic regression Dep. Var: Regret aversion	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Mindfulness	0.252 (1.000)	2.991 (2.274)	0.766 (0.699)		
Having a timer			-0.848 (0.716)		
Stroop with no timer				0 (0)	0.677 (0.956)
Stroop with a timer				-0.677 (0.956)	0 (0)
Mindfulness with no timer				0.923 (0.919)	1.600 (1.086)
Mindfulness with a timer				-0.117 (0.914)	0.560 (1.036)
Age	-0.233 (0.171)	0.292 (0.358)	-0.0433 (0.0435)	-0.0425 (0.0435)	-0.0425 (0.0435)
Female	0.222 (1.128)	1.343 (2.275)	0.507 (0.748)	0.511 (0.750)	0.511 (0.750)
Education level					
Bachelor degree	0.596 (1.344)	-2.941 (2.480)	-1.163 (0.776)	-1.184 (0.778)	-1.184 (0.778)
Occupation					
Working and studying	-2.312 (1.917)	12.35 (9.256)	0.0576 (1.122)	0.0701 (1.123)	0.0701 (1.123)
Unemployed			1.432 (2.414)	1.372 (2.428)	1.372 (2.428)
Studying	-2.704 (2.164)	10.01 (7.487)	-0.0980 (1.176)	-0.121 (1.177)	-0.121 (1.177)
Income level					
Average income	0.681 (1.991)	3.890 (2.846)	0.810 (1.031)	0.765 (1.042)	0.765 (1.042)
High income	-1.903 (2.489)		-1.967 (1.626)	-2.043 (1.657)	-2.043 (1.657)
Currently meditating	0.342 (1.211)	-4.818 (3.953)	-0.397 (0.709)	-0.386 (0.711)	-0.386 (0.711)
MAAS	0.0359 (0.541)	-1.970 (2.023)	-0.0995 (0.336)	-0.113 (0.340)	-0.113 (0.340)
BAI	0.208 (0.182)	0.100 (0.190)	0.130 (0.0891)	0.123 (0.0920)	0.123 (0.0920)
Constant	4.541 (5.115)	-8.667 (11.04)	0.0493 (3.186)	0.0920 (3.182)	-0.585 (3.310)
Observations	34	22	61	61	61

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category "Mindfulness": "Stroop task"

Reference category "Having a timer": "Having no timer"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 8b: logistic regression for participants with experience in meditation

Logistic regression Dep. Var: Regret aversion	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Mindfulness treatment	2.092 (1.653)	0.0309 (4.267)	1.305 (1.190)		
Having a timer			0.0669 (1.387)		
Stroop with no timer				0 (0)	0.0456 (1.866)
Stroop with a timer				0.500 (1.582)	0 (0)
Mindfulness with no timer				0.745 (1.739)	1.194 (1.988)
Mindfulness with a timer				2.007 (1.393)	1.411 (1.678)
Age	-0.175 (0.172)	-0.417 (0.698)	0.0148 (0.128)	0.00688 (0.156)	0.00688 (0.156)
Female	-0.316 (1.484)	20.32 (31.07)	1.845 (1.389)	1.860 (1.392)	1.860 (1.392)
Educational level					
Bachelor degree			-1.476 (1.445)	-1.451 (1.466)	-1.451 (1.466)
Master degree			-0.298 (1.957)	-0.223 (2.124)	-0.223 (2.124)
Occupation					
Working and studying			-1.612 (1.960)	-1.697 (2.192)	-1.697 (2.192)
Studying			-0.944 (2.070)	-1.010 (2.205)	-1.010 (2.205)
Income level					
Average income			2.457 (1.696)	2.487 (1.741)	2.487 (1.741)
High income			-0.198 (1.882)	-0.136 (2.014)	-0.136 (2.014)
Meditating since (cont.)	-0.409 (0.406)	3.855 (6.659)	0.168 (0.338)	0.174 (0.343)	0.174 (0.343)
Meditating how often (cont.)	0.177 (0.442)	-4.485 (5.970)	-0.271 (0.437)	-0.272 (0.436)	-0.272 (0.436)
Mindfulness scale (MAAS)			-0.791 (0.889)	-0.797 (0.889)	-0.797 (0.889)
Beck Anxiety scale (BAI)			-0.261 (0.170)	-0.260 (0.171)	-0.260 (0.171)
Education level (cont.)	-1.825 (1.227)				
Occupation (cont.)	-0.384 (1.011)	0.364 (2.145)			
Income (cont.)	1.124 (1.439)	1.600 (4.085)			
Constant	8.591 (8.713)	-29.07 (45.97)	2.047 (5.736)	-2.517 (4.771)	2.245 (5.321)
Observations	21	16	33	33	33

Variables effect on regret aversion. Std. errors in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category “Mindfulness treatment”: “Stroop task”

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Table 8d: Logistic regression for participants with experience with meditation – part of the sample

Logit regression	(1)	(2)	(3)
Dep. Variable: Regret aversion	All observations	Interaction 1	Interaction 2
Mindfulness treatment	8.903 (7.774)		
Having a timer	-10.33 (7.579)		
Stroop with no timer		0 (0)	2.630 (3.053)
Stroop with a timer		-2.630 (3.053)	0 (0)
Mindfulness with no timer		0 (0)	0 (0)
Mindfulness with a timer		-2.892 (3.342)	-0.262 (2.579)
Age	-1.187 (1.311)	-0.261 (0.236)	-0.261 (0.236)
Female	-0.690 (2.917)	-0.123 (1.762)	-0.123 (1.762)
Educational level			
Bachelor degree	7.934 (7.876)		
Occupation			
Studying and working	-3.621 (6.260)		
Studying	-4.122 (6.779)		
Income (continuous)	3.274 (2.820)		
Meditating since (continuous)	2.182 (1.765)	0.877 (0.791)	0.877 (0.791)
Meditating how often (continuous)	0.892 (1.678)	-0.295 (0.654)	-0.295 (0.654)
Mindfulness scale	0.142 (2.807)	-1.866 (1.619)	-1.866 (1.619)
Beck anxiety scale	0.495 (0.788)	0.00444 (0.264)	0.00444 (0.264)
Constant	8.176 (17.09)	9.592 (10.79)	6.961 (9.627)
Observations	22	21	21

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Variables effect on regret aversion. Std. error in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category “Mindfulness treatment”: “Stroop task”

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Table 8e: Marginal effects, including interactions, for people with experience with meditation

Marginal effects	(1) Interaction 1	(2) Interaction 2
Dep. Variable: regret aversion		
Interaction		
Base category: Stroop with no timer		
Mindfulness with no timer	No observations (-)	
Age	Not estimable (-)	Not estimable (-)
Female	Not estimable (-)	Not estimable (3-)
Bachelor degree	Not estimable (-)	Not estimable (-)
Income (continuous)	Not estimable (-)	Not estimable (-)
Meditating since (continuous)	Not estimable (-)	Not estimable (-)
Meditating how often (continuous)	Not estimable (-)	Not estimable (-)
Interaction		
Base category: Stroop with a timer		
Mindfulness with a timer		Not estimable (-)
Observations	20	20

Variables effect on regret aversion. t statistics in parentheses: * p<0.10, ** p<0.05.

Interaction 1 base category: Stroop task with no time pressure

Interaction 2 base category: Stroop task with time pressure

Reference category “Female”: “Male”

Reference category “Bachelor’s degree”: “High School”

Table 8f: Marginal effects for people with experience in meditation – analysis on the impact of how long people have been meditating and the meditation frequency

Marginal effects	(1)
Dep. Variable: Regret aversion	People that are currently meditating
Mindfulness	0.233 (1.60)
Having a timer	-0.0588 (-0.37)
Age	-0.0158 (-1.19)
Female	0.162 (0.82)
Education level (continuous)	-0.104 (-0.75)
Occupation (continuous)	-0.0781 (-0.77)
Income (continuous)	0.204* (1.94)
Meditating since	
For about 3 months	0.399 (1.30)
For about 6 months	0.258 (0.74)
For about a year	0.0898 (0.35)
For about 2 years	0.167 (0.72)
More than 2 years	0.260 (1.06)
Meditating frequency	
2-4 times a week	0.160 (0.81)
Once every week	0.436* (1.77)
Once a month	0.0815 (0.34)
Less than once a month	0.374 (1.48)
Observations	36

Variables effect on regret aversion: t statistics in parentheses* p<0.10, ** p<0.05, * p<0.01**

Reference category “Mindfulness”: “Stroop task”

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Income level”: Low income level”

Reference category “Meditating since”: “Less than a month ago”.

Reference category “meditating frequency”: “Meditating every day”

Table 8g: Logistic regression for people with experience in meditation – analysis on the impact of how long people have been meditating and the meditation frequency

Logit regression Dep. Variable: Regret Aversion	(1) People that are currently meditating
Mindfulness	1.616 (1.126)
Having a timer	-0.407 (1.115)
Age	-0.110 (0.0975)
Female	1.123 (1.419)
Education level (continuous)	-0.720 (0.984)
Occupation (continuous)	-0.541 (0.723)
Income (continuous)	1.414* (0.845)
Meditating since	
For about 3 months	3.044 (2.645)
For about 6 months	2.078 (2.849)
For about a year	0.824 (2.379)
For about 2 years	1.421 (2.096)
More than 2 years	2.087 (2.285)
Meditating frequency	
2-4 times a week	1.807 (2.402)
Once every week	3.804 (3.081)
Once a month	1.060 (3.132)
Less than once a month	3.389 (3.007)
Constant	-3.532 (6.248)
Observations	36

Effect of variables on regret aversion. Standard errors in parentheses: ** p<0.05, * p<0.1

Reference category “Mindfulness”: “Stroop task”

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Income level”: Low income level”

Reference category “Meditating since”: “Less than a month ago”.

Reference category “meditating frequency”: “Meditating every day”

Table 8h: Marginal effects for people with experience with meditation – eyes closed analysis

Marginal effects Dep. Variable: Regret aversion	(1) Mindfulness participants
Having a timer	-0.370 (-1.18)
Age	-0.0465 (-0.88)
Female	-0.0139 (-0.04)
Bachelor degree	-0.232 (-0.75)
Occupation	
Working and studying	-0.447 (-1.02)
Studying	-0.0795 (-0.18)
Income level	
Average income	0.152 (0.29)
High income	-0.106 (-0.15)
Currently meditating	0.259 (0.83)
Eyes closed during practice	0.266 (0.79)
Observations	20

Variables effect on regret aversion. T statistics in parentheses: ** p<0.05, * p<0.1.

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Bachelor degree”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Meditation”: “Not currently meditating”

Reference category “Eyes closed during practice”: “Not being able to keep my eyes closed during the entire practice”.

Table 8i: logistic regression for people with experience with meditation – eyes closed analysis

Logistic regression Dep. Variable: Regret aversion	(1) Mindfulness participants
Having a timer	-2.002 (1.886)
Age	-0.252 (0.305)
Female	-0.0752 (1.901)
Bachelor degree	-1.238 (1.791)
Occupation	
Working and studying	-3.188 (3.540)
Studying	-0.451 (2.608)
Income level	
Average income	0.824 (2.953)
High income	-0.599 (4.161)
Currently meditating	1.401 (1.774)
Eyes closed during practice	1.459 (2.128)
Constant	7.740 (8.778)
Observations	20

Variables effect on regret aversion. Standard errors in parentheses: ** p<0.05, * p<0.1.

Reference category “Having a timer”: “Having no timer”

Reference category “Female”: “Male”

Reference category “Bachelor degree”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Meditation”: “Not currently meditating”

Reference category “Eyes closed during practice”: “Not being able to keep my eyes closed during the entire practice”.

Table 9b: robustness check different levels of Regret aversion. Logit regression whole sample

Logit regression	(1)	(2)	(3)	(4)	(5)
Dep. Var: regret aversion	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Mindfulness treatment	0.970 (0.632)	0.167 (0.697)	0.765* (0.418)		
Having a timer			0.344 (0.430)		
Stroop task and no timer				Base category: Stroop no timer 0 (0)	Base category: Stroop a timer -0.622 (0.585)
Stroop task and a timer				0.622 (0.585)	0 (0)
Mindfulness and no timer				1.028* (0.563)	0.406 (0.602)
Mindfulness and a timer				1.052* (0.604)	0.430 (0.630)
Age	-0.0471 (0.0356)	-0.0244 (0.0511)	-0.00454 (0.0237)	-0.00225 (0.0239)	-0.00225 (0.0239)
Female	0.431 (0.665)	0.173 (0.701)	0.229 (0.442)	0.242 (0.441)	0.242 (0.441)
Educational level					
Primary school	-19.90 (11,341)	-1.575 (2.712)	-3.198* (1.669)	-3.177* (1.674)	-3.177* (1.674)
Bachelor degree	-0.340 (0.704)	-2.164** (0.964)	-0.916* (0.491)	-0.964* (0.496)	-0.964* (0.496)
Master degree	0.876 (1.342)	-0.267 (1.327)	0.371 (0.828)	0.250 (0.845)	0.250 (0.845)
Professional training	14.12 (1,226)		14.23 (1,241)	14.08 (1,095)	14.08 (1,095)
Occupation					
Working and studying	-1.276 (0.996)	0.317 (1.003)	-0.338 (0.657)	-0.325 (0.654)	-0.325 (0.654)
Unemployed	-3.602* (2.125)	13.75 (1,202)	-1.298 (1.397)	-1.423 (1.399)	-1.423 (1.399)
Studying	-0.259 (1.200)	-0.364 (1.177)	0.115 (0.778)	0.0804 (0.778)	0.0804 (0.778)
Income level					
Average income	0.923 (1.083)	-0.0792 (1.110)	0.544 (0.670)	0.487 (0.675)	0.487 (0.675)
High income	-0.807 (1.039)	1.365 (1.418)	-0.311 (0.721)	-0.371 (0.726)	-0.371 (0.726)
Very high income	0.133 (1.584)		-0.00733 (1.255)	-0.143 (1.271)	-0.143 (1.271)
Currently meditating	0.437 (0.656)	-0.269 (0.784)	0.109 (0.446)	0.122 (0.447)	0.122 (0.447)
Mindfulness scale (MAAS)	0.00192 (0.346)	0.0730 (0.426)	0.124 (0.238)	0.137 (0.239)	0.137 (0.239)
Beck Anxiety scale (BAI)	-0.0516 (0.0861)	0.130 (0.0857)	0.0196 (0.0553)	0.0186 (0.0552)	0.0186 (0.0552)
/cut1	-4.045 (2.767)	-3.007 (2.673)	-1.750 (1.788)	-1.596 (1.802)	-2.218 (1.746)
/cut2	-0.474 (2.689)	0.171 (2.662)	1.331 (1.780)	1.501 (1.798)	0.879 (1.726)
Observations	63	46	109	109	109

Legend:

Variables effect on regret aversion. Std. error in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: "Stroop task with no time pressure"

Interaction 2 base category: "Stroop task with a time pressure"

Reference category "Mindfulness treatment": "Stroop task"

Reference category "Having a timer": "Having no timer"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating".

Table 9d: robustness check different levels of Regret aversion. Logit regression part of the sample

	(1)	(2)	(3)	(4)	(5)
Logit regression	Having no timer	Having a timer	All observations	Interaction 1	Interaction 2
Dep. Var: regret aversion					
Mindfulness treatment	0.875 (0.875)	0.0349 (0.958)	0.445 (0.600)		
Having a timer			-0.947 (0.604)		
				Base category: Stroop no timer	Base category: Stroop a timer
Stroop task and no timer				0 (0)	0.655 (0.762)
Stroop task and a timer				-0.655 (0.762)	0 (0)
Mindfulness and no timer				0.768 (0.799)	1.423 (0.904)
Mindfulness and a timer				-0.636 (0.835)	0.0195 (0.912)
Age	-0.158** (0.0653)	-0.00184 (0.0620)	-0.0251 (0.0334)	-0.0231 (0.0334)	-0.0231 (0.0334)
Female	0.905 (0.960)	0.339 (1.266)	-0.203 (0.620)	-0.212 (0.622)	-0.212 (0.622)
Educational level					
Primary school		-2.204 (3.219)	-0.312 (2.531)	-0.177 (2.542)	-0.177 (2.542)
Bachelor degree		-2.284* (1.384)	-1.061 (0.655)	-1.137* (0.667)	-1.137* (0.667)
Master degree		15.97 (2,810)	16.79 (1,852)	16.89 (1,783)	16.89 (1,783)
Professional training			15.50 (3,152)	15.56 (3,152)	15.56 (3,152)
Occupation					
Working and studying		-0.558 (1.772)	-0.0511 (0.912)	0.0294 (0.920)	0.0294 (0.920)
Unemployed		14.73 (2,810)	-1.629 (2.309)	-1.789 (2.268)	-1.789 (2.268)
Studying		-0.766 (1.746)	-0.0990 (0.995)	-0.0901 (0.993)	-0.0901 (0.993)
Income level					
Average income	2.790** (1.237)	-0.685 (1.748)	0.436 (0.924)	0.402 (0.924)	0.402 (0.924)
High income	-0.405 (1.281)	-0.223 (1.696)	-0.804 (1.036)	-0.905 (1.051)	-0.905 (1.051)
Very high income	1.724 (5.296)		-0.256 (2.396)	-0.143 (2.407)	-0.143 (2.407)
Currently meditating	0.522 (0.977)	-0.339 (1.283)	-0.513 (0.617)	-0.518 (0.624)	-0.518 (0.624)
Mindfulness scale (MAAS)	-0.311 (0.464)	0.0710 (0.769)	-0.0741 (0.316)	-0.0930 (0.319)	-0.0930 (0.319)
Beck Anxiety scale (BAI)	0.166 (0.147)	0.184 (0.116)	0.139* (0.0780)	0.133* (0.0789)	0.133* (0.0789)
/cut1	-8.755* (4.488)	-1.845 (4.545)	-4.114* (2.498)	-4.136* (2.507)	-3.480 (2.513)
/cut2	-0.919 (3.418)	1.388 (4.498)	-0.435 (2.439)	-0.450 (2.445)	0.206 (2.475)
Observations	38	28	66	66	66

Variables effect on regret aversion. Std. error in parentheses: * p<0.10, ** p<0.05, * p<0.01**

Interaction 1 base category: "Stroop task with no time pressure"

Interaction 2 base category: "Stroop task with time pressure"

Reference category "Mindfulness treatment": "Stroop task"

Reference category "Having a timer": "Having no timer"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating".

Table 10a: Marginal effects time spend at meditation

Marginal effects	(1)	(2)
Dep. Variable: Regret aversion	Whole sample	Part of sample
Lottery with a timer	-0.0363 (-0.25)	-0.177 (-0.73)
Age	-0.00237 (-0.23)	-0.0295 (-0.51)
Female	-0.0568 (-0.43)	0.000312 (0.00)
Educational level		
Bachelor degree	-0.161 (-0.96)	-0.257 (-1.06)
Master degree	0.0176 (0.07)	
Occupational level		
Studying and working	-0.434** (-2.07)	-330 (-0.72)
Studying	-0.161 (-0.60)	-0.0269 (-0.06)
Income level		
Average income	0.362* (1.94)	0.290 (0.99)
High income	-0.195 (-0.72)	-0.0856 (-0.13)
Very high income	-0.354 (-1.36)	
Currently meditating	0.279* (1.80)	0.242 (0.93)
Time spend at meditation	-0.00193 (-0.68)	-0.000467 (-0.39)
Observations	48	22

Variables effect on regret aversion. T statistics in parentheses. * p<0.01, ** p<0.05, * p<0.1**

Reference category "Lottery with a timer": "Lottery with no timer".

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupational level": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 10b: Logistic regression for time spend at meditation

Logit regression	(1)	(2)
Dep. Variable: Regret aversion	Whole sample	Part of sample
Lottery with a timer	-0.203 (0.808)	-1.027 (1.445)
Age	-0.0133 (0.0569)	-0.171 (0.344)
Female	-0.318 (0.748)	0.00181 (1.833)
Educational level		
Bachelor degree	-0.895 (0.954)	-1.560 (1.785)
Master degree	0.0980 (1.330)	
Occupational level		
Studying and working	-2.755 (1.701)	-2.371 (3.376)
Studying	-0.927 (1.707)	-0.155 (2.496)
Income level		
Average income	2.570* (1.536)	1.862 (2.344)
High income	-1.106 (1.798)	-0.508 (4.170)
Very high income	-2.306 (2.536)	
Currently meditating	1.563 (0.966)	1.408 (1.607)
Time spend at meditation	-0.0108 (0.0162)	-0.00271 (0.00698)
Constant	2.555 (3.009)	5.779 (9.520)
Observations	48	22

Variables effect on regret aversion. Standard errors in parentheses: * p<0.01, ** p<0.05, * p<0.1**

Reference category "Lottery with a timer": "Lottery with no timer".

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupational level": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 10c: Logistic regression for the effect of time spent at lottery 1 on choice lottery 1

Logit regression	(1)	(2)
Dep. Variable: Lottery 1 choice	Whole sample	Part of sample
Mindfulness	-0.960 (1.063)	-0.0631 (1.399)
Age	-0.0435 (0.0574)	-0.00467 (0.0662)
Female	0.179 (1.222)	-3.266 (2.452)
Occupation		
Studying and working	1.680 (1.434)	1.097 (2.165)
Studying	0.550 (1.602)	2.813 (2.497)
Income level		
Average income	0.233 (1.676)	0.0488 (1.949)
Currently meditating	-1.679* (0.968)	-2.547 (1.664)
Time spend at lottery 1	0.0719 (0.0734)	0.123 (0.105)
Constant	1.770 (2.758)	4.881 (4.755)
Observations	39	23

Variables effect on regret aversion. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Reference category "Mindfulness": "Stroop treatment"

Reference category "Female": "Male"

Reference category "Occupational level": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 10d: Marginal effects for the effect of time spent at lottery 1 on choice lottery 1

Marginal effects	(1)	(2)
Dep. Variable: Lottery 1 choice	Whole sample	Part of sample
Mindfulness	-0.112 (-0.93)	-0.00839 (-0.05)
Age	-0.00510 (-0.78)	-0.000621 (-0.07)
Female	0.0209 (0.15)	-0.434 (-1.54)
Occupation		
Studying and working	0.193 (1.07)	0.162 (0.52)
Studying	0.0814 (0.33)	0.335 (1.29)
Income level		
Average income	0.0269 (0.14)	0.00646 (0.03)
Currently meditating	-0.197** (-1.97)	-0.339* (-1.90)
Time spend at lottery 1	0.00842 (1.02)	0.0164 (1.33)
Observations	39	23

Variables effect on regret aversion. T statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Reference category "Mindfulness treatment": "Stroop treatment"

Reference category "Female": "Male"

Reference category "Occupation": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 10e: Logistic regression for the effect of time spent at lottery 2 on choice lottery 2

Logit regression	(1)	(2)
Dep. Variable: lottery 2 choice	Whole sample	Part of sample
Mindfulness treatment	0.774 (0.725)	-0.0897 (1.025)
Age	-0.0114 (0.0517)	0.00193 (0.0610)
Female	0.0926 (0.736)	1.295 (1.239)
Educational level		
Bachelor degree	-1.104 (0.973)	-1.454 (1.290)
Master degree	0.0972 (1.301)	
Occupational level		
Studying and working	-0.227 (1.044)	0.229 (1.452)
Studying	-0.0272 (1.194)	-0.605 (1.407)
Income level		
Average income	0.829 (1.072)	
High income	0.473 (1.491)	
Currently meditating	0.479 (0.774)	0.281 (1.075)
Time spend at lottery 2	0.0191 (0.0390)	-0.0243 (0.0540)
Constant	-0.377 (2.564)	-1.339 (3.467)
Observations	44	25

Variables effect on regret aversion. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Reference category "Mindfulness treatment": "Stroop treatment"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupational level": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 10f: marginal effects for the effect of time spent at lottery 2 on choice lottery 2

Marginal effects	(1) Whole sample	(2) Part of sample
Dep. Variable: lottery 2 choice		
Mindfulness treatment	0.169 (1.12)	-0.0175 (-0.09)
Age	-0.00250 (-0.22)	0.000377 (0.03)
Female	0.0202 (0.13)	0.253 (1.13)
Educational level		
Bachelor degree	-0.254 (-1.17)	-0.317 (-1.18)
Master degree	0.0213 (0.08)	
Occupational level		
Studying and working	-0.0495 (-0.22)	0.0490 (0.16)
Studying	-0.00599 (-0.02)	-0.115 (-0.42)
Income level		
Average income	0.183 (0.80)	
High income	0.104 (0.32)	
Currently meditating	0.105 (0.63)	0.0549 (0.26)
Time spend at lottery 2	0.00418 (0.50)	-0.00474 (-0.46)
Observations	44	25

Variables effect on regret aversion. T statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Reference category "Mindfulness treatment": "Stroop treatment"

Reference category "Female": "Male"

Reference category "Educational level": "High School"

Reference category "Occupational level": "Working"

Reference category "Income level": Low income level"

Reference category "Currently meditating": "Not currently meditating"

Table 12a: Logistic regression for analysis of the effect of the choice in lottery 1 on lottery 2 – no timer

Logit regression - no timer Dep. Variable: Lottery 2 choice	(1) Whole sample	(2) Part of the sample
Lottery 1 regret aversion choice	-0.728 (0.772)	
Mindfulness	0.179 (0.669)	0.148 (0.949)
Age	-0.0916** (0.0452)	-0.182 (0.120)
Female	0.0468 (0.694)	-0.314 (1.129)
Educational level		
Bachelor degree	-0.265 (0.738)	0.792 (1.287)
Master degree	1.264 (1.421)	
Occupation		
Working and studying	-1.962* (1.150)	-2.421 (1.815)
Unemployed	-0.308 (3.174)	
Studying	-0.672 (1.296)	-2.921 (2.180)
Income level		
Average income	0.569 (1.204)	-0.414 (1.915)
High income	-0.610 (1.169)	-1.716 (2.366)
Very high income	0.486 (1.767)	
Currently meditating	0.813 (0.669)	0.629 (1.248)
Constant	2.878 (2.509)	6.231 (4.936)
Observations	61	30

Variables effect on the choice in Lottery 2. Standard errors in parentheses: * p<0.01, ** p<0.05, * p<0.1**

Reference category “Lottery 1 regret aversion choice”: “Lottery 1 not the regret aversion choice”

Reference category “Mindfulness”: “Stroop task”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Currently meditating”: “Not currently meditating”

Table 12b: Marginal effects for analysis of the effect of the choice in lottery 1 on lottery 2 – no timer

Marginal effects – no timer Dep. Variable: Lottery 2 choice	(1) Whole sample	(2) Part of the sample
Lottery 1 regret aversion choice	-0.142 (-0.97)	
Mindfulness	0.0350 (0.27)	0.0265 (0.16)
Age	-0.0179** (-2.29)	-0.0326* (-1.73)
Female	0.0914 (0.07)	-0.0563 (-0.28)
Educational level		
Bachelor degree	-0.0521 (-0.36)	0.135 (0.67)
Master degree	0.229 (1)	
Occupation		
Working and studying	--0.369** (-2.10)	-0.337* (-1.89)
Unemployed	-0.0572 (-0.09)	
Studying	-0.128 (-0.55)	-0.416** (-2.30)
Income level		
Average income	0.109 (0.49)	-0.0758 (-0.22)
High income	-0.118 (-0.53)	-0.282 (-0.93)
Very high income	0.0932 (0.28)	
Currently meditating	0.159 (1.27)	0.113 (0.51)
Constant	2.878 (2.509)	6.231 (4.936)
Observations	61	30

Variables effect on the choice in Lottery 2. t statistics in parentheses: * p<0.10, ** p<0.05, *** p<0.01

Reference category “Lottery 1 regret aversion choice”: “Lottery 1 not the regret aversion choice”

Reference category “Mindfulness”: “Stroop task”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Currently meditating”: “Not currently meditating”

Table 12c: Logistic regression for analysis of the effect of the choice in lottery 1 on lottery 2 – with timer

Logit regression – with a timer Dep. Variable: Lottery 2 choice	(1) Whole sample	(2) Part of the sample
Lottery 1 regret aversion choice	0.575 (1.076)	1.940 (1.798)
Mindfulness	0.792 (0.730)	0.229 (1.175)
Age	-0.00764 (0.0518)	0.127 (0.220)
Female	0.0252 (0.740)	0.386 (1.450)
Educational level		
Bachelor degree	-1.067 (0.986)	-1.026 (1.519)
Master degree	0.0192 (1.273)	
Occupation		
Working and studying	-0.327 (1.057)	1.055 (2.090)
Studying	0.00836 (1.203)	1.066 (2.022)
Income level		
Average income	0.739 (1.013)	2.170 (1.772)
High income	0.124 (1.437)	
Currently meditating	0.583 (0.778)	0.239 (1.173)
Constant	-1.087 (2.872)	-7.167 (6.800)
Observations	44	22

Variables effect on the choice in Lottery 2. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Reference category “Lottery 1 regret aversion choice”: “Lottery 1 not the regret aversion choice”

Reference category “Mindfulness”: “Stroop task”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Currently meditating”: “Not currently meditating”

Table 12d: marginal effects for analysis of the effect of the choice in lottery 1 on lottery 2 – with timer

Marginal effects – with a timer Dep. Variable: Lottery 2 choice	(1) Whole sample	(2) Part of the sample
Lottery 1 regret aversion choice	0.126 (0.54)	0.343 (1.18)
Mindfulness	0.173 (1.14)	0.0404 (0.20)
Age	-0.00167 (-0.15)	0.0224 (0.59)
Female	0.00551 (0.03)	0.0683 (0.27)
Educational level		
Bachelor degree	-0.246 (-1.11)	-0.195 (-0.67)
Master degree	0.00428 (0.02)	
Occupation		
Working and studying	-0.0709 (-0.31)	0.160 (0.57)
Studying	0.00184 (0.01)	0.162 (0.63)
Income level		
Average income	0.163 (0.74)	0.397 (1.56)
High income	0.0268 (0.09)	
Currently meditating	0.127 (0.77)	0.0422 (0.20)
Observations	44	22

Variables effect on the choice in Lottery 2. t statistics in parentheses: * p<0.10, ** p<0.05, *** p<0.01

Reference category “Lottery 1 regret aversion choice”: “Lottery 1 not the regret aversion choice”

Reference category “Mindfulness”: “Stroop task”

Reference category “Female”: “Male”

Reference category “Educational level”: “High School”

Reference category “Occupation”: “Working”

Reference category “Income level”: Low income level”

Reference category “Currently meditating”: “Not currently meditating”