BSc International Bachelor Economics and Business Economics

BACHELOR THESIS

Behavioral & Health Economics

Mindfulness-based intervention for mindfulness-based interventions: How can a brief practice of mindfulness meditation induce university students to sign up for mindfulness-based stress reduction programs?

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Abstract

Mindfulness practices have been shown to help tackling stress and mental problems, yet not many students in higher education – the population that is very vulnerable to the two said problems, are participating in mindfulness-based initiatives provided on campus. This thesis explores if a brief mindfulness meditation session could increase students' likeliness to sign up for a mindfulness-based stress reduction (MBSR) course. Ninety-nine students who took the survey for this study were randomized into a mindful and a non-mindful treatment group where they either did a five-minute Buddhist mindfulness guided meditation or watched a series of short entertaining videos from the TikTok platform. Results show that the treatment successfully manipulated the respondents' mindfulness level as measured with the Langerian LMS14 scale. However, the treatment did not have an effect on the respondents' information-seeking behavior and willingness to sign up.

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1. Introduction

Students enrolled in higher education are commonly found to experience significant stress (Aherne, 2001; Robotham & Julian, 2006). According to Dutch National Institute for Public Health and the Environment (2021), over a half of students in Dutch research universities and universities of applied sciences are suffering from mental health issues, namely stress, pressure to achieve, sleeping problems and loneliness. At Erasmus University Rotterdam, where this study is based and conducted at, around 50 to 70 percent of the students "*suffer from higher-than-normal stress, anxiety and depression levels and severe loneliness*" (EUR Student Wellbeing Monitor, 2021). These mental problems among students adversely affect academic performance, physical and mental health conditions, and increase substance use (Pascoe et al., 2020), and only seem to escalate with the recent Covid-19 crisis, which caused university education to move onto online platforms (Elsalem et al., 2020; von Keyserlingk et al., 2022).

One widely known and used way to tackle stress and mental problems is mindfulness practices. Characterized by meditation practices with the aim of self-control of one's attention, awareness, and acceptance of thoughts without reactivity and judgement (Kabat-Zinn, 2003; Malinowski, 2013), mindfulness-based interventions (MBIs) on students has been shown to mitigate stress and anxiety (Shapiro, Schwartz, & Bonner, 1998; Creswell et al., 2014; Bamber & Schneider, 2016; Bamber & Morpeth, 2019) and improve emotional awareness, mental and physical wellbeing and academic performance (Lutz et al, 2008; Maynard et al., 2017).

Given this growing literature on how MBIs benefit students, it is unsurprising that we could observe waves of initiatives to provide MBIs to students in universities across the globe. In the Netherlands, it is easy for university students to search on their university websites for MBIs initiatives, or more commonly addressing stress reduction and hence referred to as Mindfulness Based Stress Reduction (MBSR), given in the form of organized-by-university formal courses (Utrecht University, 2021), series of workshops or informal courses (University of Amsterdam, 2021; Tilburg University) or students-for-students initiative (LifeVersity, Community of Learning and Innovation - Erasmus University Rotterdam). However, as data (where made available on these websites themselves) suggests, these initiatives only reach and benefit a relatively small

proportions of students. Reason might stem from the organization of these initiatives, such as insufficient promotional activities and low capacity of courses, but also from the students' intention to sign up and participate in these initiatives.

For the forementioned reason, this thesis research aims to explore how a brief mindfulness meditation session could be integrated into the promotional activity of these MBIs to increase likelihood to sign up for those MBIs. Existing literature in marketing has shown that trials, or more commonly known by the term "product sampling", significantly increase the probability of consumers purchasing the product tried right after the intervention (Heiman et al., 2001). However, it is noteworthy that compared with other type of customers acquiring strategies, customers acquired with "free trials" programs often come with much lower average customer lifetime value (Datta et al., 2015), which implies lower potential to stick with the product or service in the long-term. In the context of this study where the long-term effect is not yet of major concern, integrating a brief meditation session into the promotional activity of a MBSR program can be considered a trial that might directly increase the probability to sign up immediately. The mechanism hypothesized is that this brief session itself can help induce information seeking behavior, and given in the context of providing information on a local MBI initiative, increase likelihood of signing up for such a program. Research question is formulated as follows*:*

How does a brief guided mindfulness meditation session increase students' likelihood to join a mindfulness-based intervention initiative?

One of the central concepts in the research is mindfulness and mindfulness practices, regarding which literature has been growing during the past few decades. Mindfulness, as an abstract idea, traces back to the over-2500-year-old eastern Buddhist concept and practices of unjudgementally bringing focus and awareness to present happenings, both internally and externally (Lama & Berzin, 1997; Thera, 2005; Bodhi, 2011). This differs to the Langerian socio-cognitive mindfulness concept that has been growing in literature since the studies of Langer et al. (1978, 1989), which is about how one is aware and receptive to changes in the surroundings, new information, ideas, and perspectives and makes use of them. Despite the differences, the

two school of thoughts on mindfulness share the idea of "*consciousness as an interaction between the mind, the body, and the outside world*" (Khoury et al., 2017, p. 1168).

Inheriting the forementioned link found between mindfulness' different conceptualizations, this thesis aims to use a very simple, basic practice of Buddhism mindfulness meditation as the treatment of study design, and measure the participants' mindfulness level afterwards with Langer mindfulness methodology to examine the relationship, the first hypothesis of the study formulates as follows:

> ***H1:*** *Does a brief (Buddhist) mindfulness meditation session can enhance one's degree of mindfulness, as measured with Langer Mindfulness Scale?*

Though the link between eastern and western concepts of mindfulness has been investigated in depth (McIntosh, 1997; Khoury et al., 2017), these studies are solely of qualitative analysis. In this thesis, the link regarded will be investigated quantitatively, which potentially contributes to the understanding of mindfulness and application of mindfulness practices.

The second and third hypotheses, directly addressing the central research question, are formulated as:

> ***H2:*** *Does a brief mindfulness meditation session induce information seeking behavior regarding MBIs initiatives?*
>
> ***H3:*** *Does a brief mindfulness meditation session induce people to sign up for MBIs initiatives?*

In hypothesis 2, information seeking behavior will be measured via two observables: total time duration spent reading the program advertisement text, and whether the participant choose to read more on this information or not. The results from data analysis testing these two hypotheses will contribute to the literature of effects of mindfulness practices, and give insights how more students could be induced to join these initiatives.

Following this section, the main concepts relevant to the research questions and hypotheses will firstly be discussed in a theoretical framework. The thesis will subsequently

proceed with a detail description of data, survey and experimental design, and quantitative analysis methodology. Results from the analysis will then be presented and discussed, and a conclusion will be at the end of this thesis with discussion of limitations.

2. Theoretical framework

To assess the central research question and the forementioned hypotheses, firstly, the fundamental concepts will be thoroughly discussed in this chapter. These are the concept of mindfulness in both schools of thought, information seeking behavior, and existing literature on brief mindfulness meditation interventions.

2.1. Mindfulness

Literature on mindfulness has been growing in the last few decades, mainly under the realm of two schools of thought: Buddhist mindfulness and Langerian mindfulness. This section explores the origin of the concept, how it has been defined and previously studied under both schools of thought, as well as how differences and similarities of Buddhist and Langerian mindfulness has been discussed qualitatively.

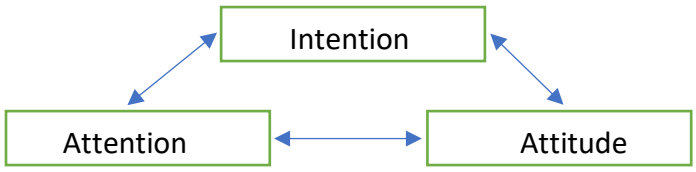
Though it can also be found in other religions or spiritual practices of long traditions, such as Christianity, Taoism, and Sufism (Alidina, 2014; Trammel, 2017), it is common knowledge that the concept of mindfulness roots back to the Buddhist idea of staying focus and aware of the present happenings inside and outside of one's body and mind without making judgement (Lama & Berzin, 1997; Thera, 2005; Bodhi, 2011). The "mindfulness" concept in Buddhism serves as the "heart" of the meditation practice but differs from the activity itself (Kabat-Zinn, 2003; Thera, 1962). Inheriting from this long-standing school of thought, Jon Kabat-Zinn developed a mindfulness meditation program in a therapeutic setting, which is now commonly known as the Mindfulness-Based Stress Reduction (MBSR) program (Kabat-Zinn, 1990).

A lot of studies have stemmed out since then, proving the benefits of the mindfulness meditation intervention on both mental and physical health (Baer 2003; Grossman et al., 2004), providing measures for mindfulness (Bishop, 2002; Baer et al., 2006; Brown & Ryan, 2003) and

attempting to model the mechanism behind mindfulness (Shapiro et al., 2006). In attempt to encode how mindfulness works, Shapiro et al. (2006) theorized that mindfulness is defined by and can be achieved through a "*moment-to-moment*" process that interlinking three key axioms, namely intention, attention, and attitude; and in other words, these three axioms majorly account for the transformation one undergoes when practicing mindfulness.

Figure 1

The interweaving relationship of the three axioms of mindfulness: Intention, Attention, and Attitude.



Note. Adapted from "Mechanisms of Mindfulness," by Shapiro, Carlson, Astin, & Freedman, 2006, *Journal of clinical psychology*, *62*(3), p. 375.

Langerian socio-cognitive mindfulness concept - since the studies of Langer et al. (1978, 1989) – is about how one is receptive and aware to new things, information, ideas, and perspectives and makes use of them. Mindfulness here is characterized by involvement and consciousness, and oftentimes defined in contrast to the state of our mind relying on autopilot mode, or in other words, mindlessness (Langer & Moldoveanu, 2000; Langer, 2009). Hart et al. (2013) decoded Langerian mindfulness as a combination of one's self-control over and away from their own automatic thoughts and behaviors, the ability to stay aware of stimuli surrounding oneself, and the active and meaningful engagement one could maintain with these external stimuli. This study also argued that socio-cognitive mindfulness enhances several cognitive abilities, including curiosity, flexibility, and creativity. Other studies which investigated the relationship between Langerian mindfulness and cognitive patterns via field experiments seem to be consistent with this notion. For example, Davenport and Pagnini (2020) concluded that Langerian mindfulness strategies fostered students' creativity, critical thinking and communicating skills, while Pirson et al. (2018) studied adult development under social settings and found that mindfulness also improves their creativity and decision-making.

Though differently conceptualized, the two school of thoughts on mindfulness share the idea of "*consciousness as an interaction between the mind, the body, and the outside world*" (Khoury et al., 2017, p. 1168). McIntosh (1997) was among the first to put both the Zen Buddhist mindfulness and socio-cognitive mindfulness on the table and examined their relationship qualitatively. Looking into how existing literature had defined and studied about how *to be mindful* could be achieved and could influence one's wellbeing, the author concluded that even though there are much difference in literal descriptions, conceptually the overlap is clearly major. Also looking into the two school of thoughts, Khoury et al. (2017) examined how each side conceptualizes and operationalizes mindfulness through the lens of embodiment theory and, in the end, was able draw the common connection between them. Unifying under the term *embodied mindfulness*, the authors suggested that through effective interventions, the same primary mechanism takes place and improves one's *body – mind – outside world* connection.

The above-mentioned studies have addressed a literature gap and brought together the varying streams of thought on mindfulness from the Buddhist traditions and modern social psychology. However, these studies were solely of qualitative nature. In this thesis, this relationship will be investigated quantitatively by testing at how a Buddhist-based brief mindfulness meditation can improve one's mindfulness level on a Langerian scale.

2.2. Information-seeking behavior

Information seeking is defined as the process in which people search for and potentially make use of the information (Fairer-Wessels, 1990). For example, Kakai, Ikoja-Odongo, and Kigongo-Bukeny (2004) found that information-seeking behavior among undergraduate students mostly stems from the need to complete research papers, course assignments, or preparing for discussion in classes or seminars.

In this thesis, information-seeking behavior is hypothesized to be the major mechanism of how being in a more mindful state can lead to higher willingness to get to know more and to sign up for the course mentioned. As mentioned previously, curiosity is one of the cognitive processes that could be enhanced thanks to a higher socio-cognitive mindfulness level (Hart et al., 2013). Curiosity and information-seeking are largely overlapping concepts, both are cognitive

processes that comes from certain intrinsic urges or extrinsic rewards and results in behaviors such as active exploring and learning (Gottlieb et al., 2013). In the context of this thesis, we can expect that by going through a brief mindfulness meditation and getting into a more mindful state of mind, one would become more curious, would be more likely to seek further information and, ultimately, to sign up to practice mindfulness with the presented course.

2.3. MBIs

In existing literature, there are a few studies that had a similar treatment set-up with the one conducted in this thesis, where only one brief mindfulness meditation session was incorporated into a survey. Also having higher-education students as the study population, Vinci et al. (2014) had their mindfulness treatment group experiencing a 10-minute meditation and found thereafter that the mindfulness intervention increased state mindfulness and relaxation, but did not influence responses to substance-use negative affect induction (which has proved implication on the urge to drink among college student drinkers – the key outcome variable of the study). The author suggested that a potential reason for this is that the intervention was not sufficiently robust for the initial gains to be maintained for long enough. More studies were done with a larger design format, where participants were instructed to do the brief meditation on a regular basis and followed up for a relatively long time period. The results found from a lot of these studies were significant, pointing out the intervention helped with students' stress and heart rate variability (Shearer et al., 2016), anxiety symptoms and systolic blood pressure (Chen et al., 2013), academic performance (Calma-Birling & Gurung, 2017). Even though the gap in possible outcome realization is clear, this study will still stick with the smaller experiment design, for it being under the timely and monetary limit and scope of a Bachelor-level thesis.

3. Data & Methodology

3.1. Data

Data for this study was collected by means of an experimental survey using Qualtrics survey software. 103 students at Erasmus University Rotterdam were invited to participate in the survey on campus in the first week of June 2022. All survey participants did the survey on a suitable

device with headphones and was instructed to do the survey in a quiet place, where they could sit comfortably and focus on completing the survey. The survey includes six distinct parts, namely the consent, the baseline questions, the treatment, the mindfulness-manipulation check, the MBIs initiative course text, and the demographic questions. Data curation has been done to exclude individuals who do not give consent to the use of their information or did not fully complete the survey. The resulting dataset consists of 99 observations.

3.2. Survey description and experimental design

After reading the general information about the study and the survey, in the case where the participants gave consent, they were asked a few baseline questions, namely the frequency that they practice (mindfulness) meditation or any other types of mindfulness practices (never, rarely, occasionally - a few times a week, daily), whether they know about MBIs initiatives provided for students at this university, and whether they have signed up for/had the intention to sign up for such programs. The data collected from this section and the demographic section in the end of the survey allows a balance check to be performed to assess whether the two treatment groups on average share the same distribution of characteristics.

In the treatment section, by the Qualtrics platform's randomization function, the participants were randomly assigned to one of the two treatment groups. In the mindful treatment group, participants were required to watch a video that guides them through a five-minute mindfulness meditation session. The link to the original video can be found in Appendix A. In the non-mindful treatment group, participants were asked to watch a video that compiles a series of random short videos from the social media platform TikTok. These videos are not related to the topic of mindfulness, and participants were allowed to skip ahead while watching to see the next short videos, which simulated how people use TikTok in real life. Total time that a participant in the non-mindful treatment group spent watching these TikTok videos also added up to 5 minutes.

In the mindfulness-manipulation check section, the participants from both treatment groups had to rate themselves on a scale of 7 (from *1 - strongly disagree* to *7 - strongly agree*) on 14 statements from the Langer Mindfulness Scale Survey (LMS14) (Pirson et al., 2012). This scale

has been proven to be a reliable and robustly valid measure of mindfulness (Pirson et al., 2012; Pirson et al., 2018). The 14 statements are built upon three notions: five indicating novelty-seeking (NS), five novelty-producing (NP), and four regarding engagement (E), and then total mindfulness score as well as scores regarding each notion will be calculated. Full list of 14 statements and mindfulness score computation is included in Appendix B. The Cronbach's alpha score will be computed to examine the internal consistency of the scale as a whole and each notion separately.

The second-to-last section provided participants information about the course *Mindfulness-based Stress Reduction* (2022) by LifeVersity, which is a student-for-student initiative to help EUR students developing their soft skills. After seeing a flyer presenting the general information about the course's aim and content, participants had the options to either read more on the full course week-by-week details, or to skip that information. This action of choosing to read more or not was recorded along with the total time duration spent reading the advertisement as measures on the survey participant information-seeking behavior with the given course information. The last question of the section was whether the participant would sign up for the course, where possible answer choices are (1. *No*; 2. *I am not sure*; 3. *Yes if it is free*; 4. *Yes, and I even would pay some money to learn this course*). If answer choice number 4. is chosen, participant will be asked the maximum amount of money they would spend on signing up for this course.

As mentioned, in the end, participants answered a few demographic questions regarding age, gender identity, number of years of formal education, nationality. The respondents' nationality was later transformed into the *Dutch* dummy variable, being 1 for those from the Netherlands and 0 otherwise. The reason behind is that, given that the context of this study is in Rotterdam, the Netherlands, Dutch students might be more familiar and have better access to activities and student initiatives offered on campus next to core curriculum.

3.3. Analysis details

The data collected was imported to and analyzed with statistical software Stata. After data curation was done, leaving the data set with 99 observations that gave consent and fully completed the survey, descriptive statistics was inspected as shown in Table 1 below.

Table 1

Sample descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Age	22.63	2.99	18	31
Male	0.36	0.48	0	1
Dutch	0.28	0.45	0	1
Number of years of formal education	15.53	3.23	5	23
Frequency of practicing mindfulness meditation				
0 - Never	0.37	0.49	0	1
1 - Rarely – Occasionally	0.51	0.50	0	1
2 - A few times a week - Daily	0.12	0.33	0	1
Students' awareness of MBIs on campus				
0 - Not aware	0.40	0.49	0	1
1 - Low	0.43	0.50	0	1
2 - Aware	0.16	0.37	0	1
Students' participation in such MBIs				
0 - Not interested	0.33	0.47	0	1
1 - Interested only if convenience	0.46	0.50	0	1
2 - Interested, just not yet aware	0.17	0.38	0	1
3 - Already participated before	0.03	0.17	0	1
Mindful treatment	0.46	0.50	0	1
Non-mindful treatment	0.54	0.50	0	1
Information-seeking				
0 - Would not read more	0.53	0.50	0	1
1 - Read for less than 25 seconds	0.29	0.46	0	1
2 - Read for more than 25 seconds	0.18	0.39	0	1
Willingness to sign up				
0 - No	0.20	0.40	0	1
1 - Uncertain	0.46	0.50	0	1
2 - Yes, given the course is free	0.31	0.47	0	1
3 - Yes – even for a fee	0.02	0.14	0	1

Note. The variables *Frequency of practicing mindfulness meditation*, *Students' awareness of MBIs on campus*, *Students' participation in such MBIs, Information-seeking level*, and *Willingness to sign up* are all ordered categorical variables, and the ranked numerical values are next to options that respondents chose in the survey.

Given that the data sample size is relatively small with only 99 observations, it is possible that the law of large number may have not be effective for this experiment. In other words, the average of the variables being observed, measured and analyzed here might deviate from the true population's average. Also, randomization, though conducted completely randomly by the software, might not work. Therefore, a balance check was first conducted to see if the two treatment groups are similar across all characteristics before they got the treatment. This is done via a basic regression model where the mindful treatment acts as the outcome variable. Results are shown in Table 2 below.

Table 2

Balance Test

Variable	Mindful treatment	
	Estimated coefficient	Std. Dev.
Age	0.005	0.017
Male	-0.005	0.108
Dutch	0.016	0.122
Number of years of formal education	0.008	0.016
Frequency of practicing mindfulness meditation		
1 - Rarely – Occasionally	0.307***	0.115
2 - A few times a week – Daily	0.050	0.188
Students' awareness of MBIs on campus		
1 - Low	-0.097	0.115
2 - Aware	0.000	0.178
Students' participation in such MBIs		
1 - Interested only if convenience	-0.126	0.122
2 - Interested, just not yet aware	-0.104	0.163
3 - Already participated before	0.204	0.408
Constant term	0.168	0.473
Observations	99	
R-squared	0.103	

Note. The variables Frequency of practicing mindfulness meditation, Students' awareness of MBIs on campus, and Students' participation in such MBIs are all ordered categorical variables, where in this table the ranked numerical values are put next to options that respondents chose in the survey. Reference categories are respectively *Never, Not aware,* and *Not interested*, all with numerical values of 0. *** p<.01, ** p<.05, * p<.1

The balance test results suggest that except for the proportion of students who said that they practice mindfulness meditation rarely to occasionally, the two treatment groups can be

considered to be balanced. Significant at 1% level, students who rarely – occasionally practiced mindfulness meditation are 30.7% more likely to be in the mindful treatment group than those who did not practice mindfulness at all. This indicates that randomization did not fully work here. Therefore, frequency of practicing mindfulness before will be included in the regression analysis for testing the study's hypotheses.

To assess the first hypothesis, the ordinary least squares (OLS) method will be employed, regressing *mindfulness score* (as calculated from answer to the LMS14 survey section) on dependent variable *mindful treatment.*

Analyzing the second hypothesis, first we will create a categorical variable *Information-seeking*, which decodes skipping the second part of information to be 0, having read second part of information in less than 25 seconds to be 1, and having read second part of information in at least 25 seconds to be 2. As it is expected that on average one would need around 25 seconds to read through and understand the second part of the information presented about the course, if the participant spends less than 25 seconds to read, it is very likely that the person does not read at all and hence has the lowest willingness to learn about the information presented. An ordered probit model will then be put in use, regressing ordered categorical variable *information-seeking* on independent variable *mindful treatment*.

To test the third hypothesis, again, we will create a categorical variable *Willingness to sign up*, which decodes answer to the relevant question in the survey *No* to be **0**; *I am not sure* to be **1**; *Yes if it is free* to be **2**; *Yes, and I even would pay some money to learn this course* to be **3** where amount of money filled in is less than 50 euro, and *Yes, and I even would pay some money to learn this course* to be **4** where amount of money filled in is more than 50 euro (no observation in this data sample fall into this category). An ordered probit model will be used, regressing ordered categorical variable *Willingness to sign up* on independent variable *mindful treatment.*

The ordered probit model suits the outcome variables of analysis for the second and third hypotheses well because these variables are ordered categories. Compared with using linear regression for such outcome variables, using an ordered probit model avoids problems such as heteroskedasticity, prediction for probability being outside of the unitary interval, etc. The

ordered probit models estimate a relationship between predictors x_j (treatment variable and controls) and a latent variable z, reflected via an equation:

$$z_i = \beta_j \times x_{ji} + u_i$$

Unobservable value of z_i can be reflected through observable value k of the outcome variable y (*information seeking* for hypothesis 2 or *willingness to sign up* for hypothesis 3) as follows:

$$y_i = k \; if \; cut_{k-1} \; < \; z_i \leq cut_k$$

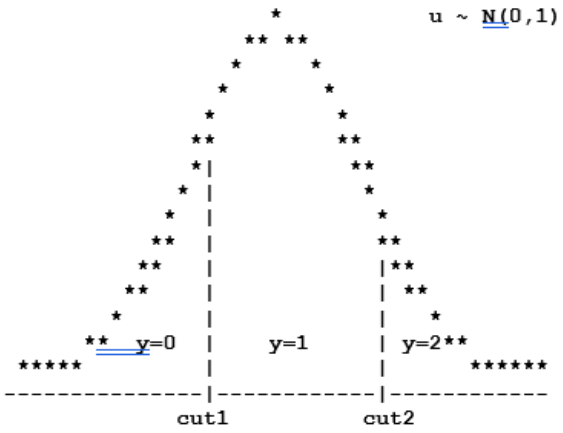
The probability Pr_{ik} that observation i will be in category k is computed as:

$$Pr_{ik} = Pr_{y_i=k} = \; Pr_{cut_{k-1} < z_i \leq cut_k} = F\left(cut_k - \; \beta_j \times x_{ji}\right) - \; F(cut_k - \beta_j \times x_{ji}),$$

where F is the standard normal cumulative distribution function.

Figure 2

Illustration of cut_k coefficients on the normal distribution in the case of an outcome variable with three ranked values.



In all three forementioned regression model, non-mindful treatment group is the reference category, and the students' frequency of practicing mindfulness is also controlled for in the model, following the balance check result. If result shows significant effect of frequency of practicing mindfulness on the outcome variables of hypotheses 2 and 3, additional models with the addition of interaction terms between the treatment and the frequency variable will be estimated to see if treatment worked the most among students in certain categories of frequency of practicing mindfulness.

Also, models similar to the ones for testing hypotheses 2 and 3 with total LMS14 mindfulness score as the independent variable (instead of mindful treatment) will also be estimated. This is to report significantly large correlation observed in the data sample, but no causal inferences could be drawn from the results.

4. Results

4.1. Cronbach's Alpha

Computing the Cronbach's alpha for the whole 14 items of the LMS14 results in a coefficient of 0.7914. Reversed items (ones that have an opposite effect on the mindfulness level measured), namely items 2, 4, 5, 9, 12 and 14, are accounted for during the computation. Being higher than 0.70, this indicates an acceptable internal consistency of the LMS14 scale when employed in this data sample. For the three notions novelty-seeking, novelty-producing, and engagement, the Cronbach's alpha computed are 0.7584, 0.6945, 0.6517, respectively.

4.2. Hypothesis 1

Testing the first hypothesis, this study employs a model regressing the total LMS14 score on being in the mindful treatment group, while controlling for the frequency at which the student practiced mindfulness before the survey.

As shown in the column (1), Table 3, the constant term is estimated to be 20.072, and is significant at 1% level. This means that a student who received the non-mindful treatment and never practiced mindfulness would have a total mindfulness score of 20.072 points on average. The regression result also suggests that students who did the brief mindfulness meditation would, on average, have a total LMS14 score that is 5.196 points higher than those who were in the non-mindful treatment group watching TikTok videos. This is statistically significant at 5% level. This is evidence supporting the first hypothesis, showing that compared to when using social media platforms such as TikTok, by doing a mindfulness meditation as brief as 5-minute long, one can significantly improve their mindfulness level as measured on the Langerian LMS14 scale.

Table 3

OLS regressions of LMS14 mindfulness scores on being in the mindful treatment

	(1) LMS14 total score	(2) Novelty-seeking score	(3) Novelty-producing score	(4) Engagement score
Mindful treatment	5.196**	1.608*	1.972*	1.22**
	(2.048)	(0.947)	(1.043)	(0.555)
Frequency of practicing mindfulness meditation				
1 - Rarely – Occasionally	-2.465	-1.368	-0.274	-0.049
	(2.163)	(0.984)	(1.082)	(0.574)
2 - A few times a week – Daily	4.613	2.105	3.712**	0.066
	(3.499)	(1.406)	(1.564)	(1.135)
Constant	20.072***	26.776***	4.631***	-5.639***
	(1.769)	(0.747)	(0.725)	(0.477)
Observations	99	99	99	99
R-squared	0.095	0.076	0.099	0.047

Note. Each column is an OLS regression model with outcome dependent variables as indicated in the column titles. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1

Moreover, the evidence of the effectiveness of the mindful treatment relative to the non-mindful treatment on increasing mindfulness level is also shown regarding the score for each of the three separate notions, namely novelty-seeking (NS), novelty-producing (NP), and engagement (E). As shown in column (2), (3) and (4), Table 3, for any same frequency of practicing mindfulness before partaking in this experiment and compared to when receiving the non-mindful treatment, at 10% significance level, receiving the mindful treatment increases the NS and NP score by 1.608 and 1.972 points, respectively; and at 5% significance level, the mindful treatment increases students' E score by 1.220 points. These results are in favor of the previous remark on how the treatments successfully manipulated the students' mindfulness level. On a side note, as shown in column (3), a student in either group who already practiced mindfulness as frequently as a few times a week to daily would have a NP score that is 3.712 points higher than those who never practiced mindfulness, significant statistically at 5% level.

4.3. Hypotheses 2 and 3

Figures 3 and 4 below show at a quick glance how the outcome variables *information-seeking level* and *willingness to sign up (for the given MBSR course)* differ per treatment group. Proportionally speaking and in relative to the mindful treatment group, in the non-mindful treatment group, there are slightly more students who would not read more at all (0) regarding *information-seeking behavior*, and slightly more students who show no to uncertain interest in signing up for the course (0 to 1) regarding *willingness to sign up*.

Figure 3

Pie charts of students having different information-seeking levels in the two treatment groups.

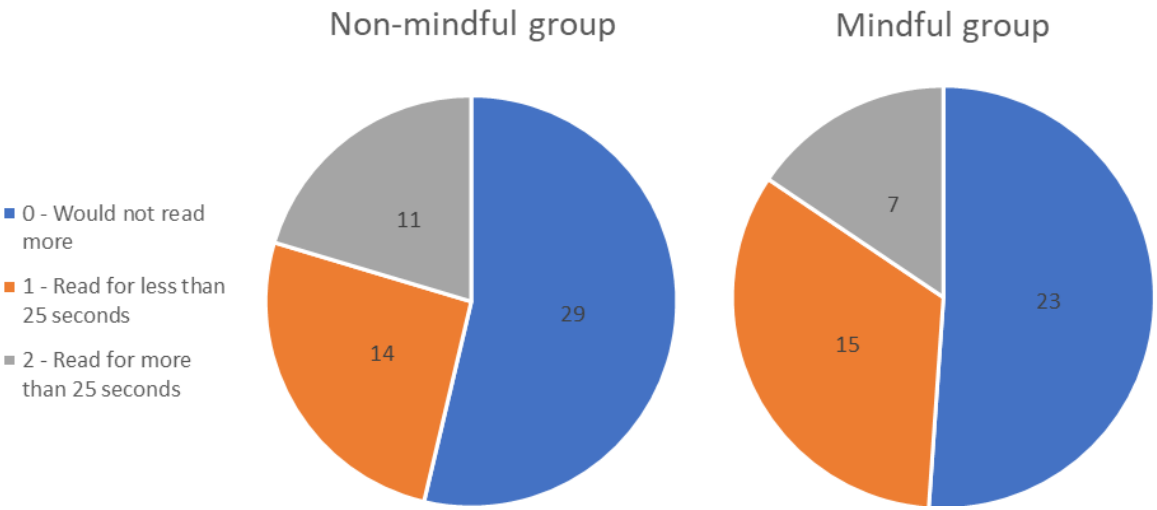
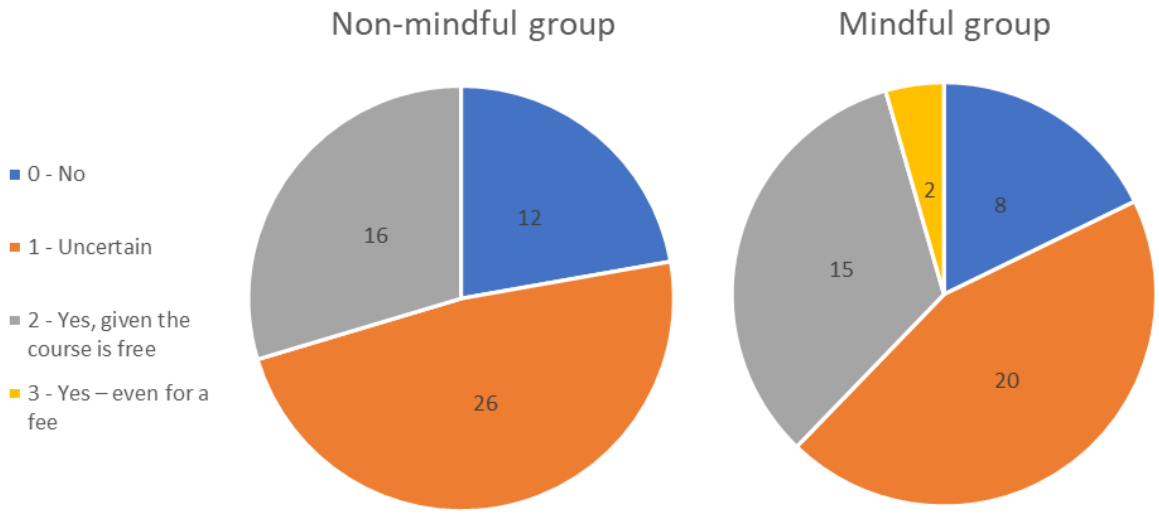


Figure 4

Pie charts of students having different levels of willingness to sign-up in the two treatment groups.



As mentioned, since the outcome variables of interest, *information-seeking level* and *willingness to sign up (for the given MBSR course)*, are measured as ranked options, two ordered probit models were estimated with *mindful treatment* as the explanatory variable, while the *frequency of practicing mindfulness before participating* in the survey is controlled for. Here, it is noteworthy that the estimated coefficients from the ordered probit model can only be interpreted in terms of significance and sign. The magnitude of the coefficients cannot be interpreted straightforwardly, but as demonstrated in section 3.3 of the thesis, can be plugged back in the cumulative normal distribution function to calculate the probability of an observation being in an outcome category given certain values of the independent variables.

The results, as shown in column (1) and (2) of Table 4, suggest no significant relationship between the received treatment and the level of information-seeking and willingness to sign up for the course in this data sample. In both models, the intercept coefficients are significantly different from each other. This indicates that the three categories for *information-seeking* and the four categories for *willingness to sign up* should not be combined to lower numbers of categories. On average, students in the mindful treatment group have a slightly lower z-score for *information-seeking* (-0.089), implying a lower probability of being on a higher information-seeking level while holding other variables in the model constant. The mindful treatment group also on average exhibits a slightly higher z-score for *willingness to sign up* (0.106), which implies a slightly higher probability of being on a higher willingness to sign-up category. However, as these are not statistically significant, no causal statements can be inferred here. Subsequentially, this experiment does not find enough evidence to support hypotheses 2 and 3.

One interesting remark from the results is that, as shown in Table 4, column (2), students who already rarely – occasionally practiced mindfulness exhibit higher willingness to sign up for the presented MBSR course. At 1% significance level, having rarely to occasionally practiced mindfulness increased the z-score for *willingness to sign up* (and hence, the probability of being on a higher willingness to sign up category) by 0.684, compared with students who never practiced mindfulness. To see if the treatment worked the most effectively with students who already rarely-occasionally practiced mindfulness, an interaction term between the mindful treatment dummy and the frequency categorical variable was added. Result from the additional

model is shown in column (3) of table 4, which, however, suggests no evidence of such interaction effects.

Table 4

Ordered probit results of the relationship between being in the mindful treatment and information-seeking level & willingness to sign up for the given MBSR course

	(1) Information-seeking	(2) Willingness to sign up	(3) Willingness to sign up
Mindful treatment	-0.089	0.106	0.373
	(0.243)	(0.228)	(0.490)
Frequency			
Rarely – Occasionally	0.401	0.684***	0.677**
	(0.254)	(0.257)	(0.308)
A few times a week – Daily	0.504	0.293	0.183
	(0.423)	(0.336)	(0.437)
Interaction terms: Mindful treatment x Frequency being:			
Never			-0.327
			(0.664)
Rarely – Occasionally			-0.287
			(0.573)
Intercept cut1	0.283	-0.450**	-0.470**
	(0.207)	(0.214)	(0.232)
Intercept cut2	1.148***	0.885***	0.867***
	(0.216)	(0.222)	(0.240)
Intercept cut3		2.591***	2.571***
		(0.318)	(0.347)
Observations	99	99	99
Pseudo R^2	0.015	0.040	0.041

Note. Each column is an ordered probit model with outcome dependent variables as indicated in the column titles. Intercepts cut1, cut2, and cut3 are the coefficients of the model, denoting the thresholds on the normal distribution of z-score where the area for *z-values < cut1 coefficient* indicates the probability of the outcome variable being 0, the area for *cut1 coefficient < z-values < cut2 coefficient* indicates the probability of the outcome variable being 1, and so on, depending on whether the outcome variable of the concerned model has two or three ranks. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1

Additionally, two ordered probit models were also estimated with *LMS14 total score* as the main independent variable, while the *frequency of practicing mindfulness before participating* in the survey is controlled for, each model with either *information-seeking level* or

willingness to sign up (for the given MBSR course) as the outcome variable. Results, as shown in Table 5, show that in this data sample, LMS14 total score has significant positive correlational relationships with both information seeking behavior and willingness to sign up. At 10% significance level, an additional mindfulness score on the LMS14 scale correlates with a 0.034-unit higher z-score for *information-seeking*, corresponding with a higher probability of being on a higher information-seeking level, and a 0.022-unit higher z-score for *willingness to sign up*, implying also a higher probability of being on a higher willingness to sign up category.

Table 5

Ordered probit results of the relationship between the LMS14 mindfulness score and information-seeking level & willingness to sign up for the given MBSR course

	(1) Information-seeking	(2) Willingness to sign up
LMS14 total score	0.034**	0.022**
	(0.013)	(0.01)
Frequency		
Rarely – Occasionally	0.424*	0.752***
	(0.247)	(0.254)
A few times a week – Daily	0.339	0.198
	(0.434)	(0.332)
Intercept cut1	1.056***	-0.013
	(0.339)	(0.3)
Intercept cut2	1.967***	1.345***
	(0.358)	(0.318)
Intercept cut3		3.125***
		(0.38)
Observations	99	99
Pseudo R^2	0.052	0.056

Note. Each column is an ordered probit model with outcome dependent variables as indicated in the column titles. Intercepts cut1, cut2, and cut3 are the coefficients of the model, denoting the thresholds on the normal distribution of z-score where the area for *z-values < cut1 coefficient* indicates the probability of the outcome variable being 0, the area for *cut1 coefficient < z-values < cut2 coefficient* indicates the probability of the outcome variable being 1, and so on, depending on whether the outcome variable of the concerned model has two or three ranks. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1

5. Conclusion and discussion

This study aims to investigate if a brief mindfulness meditation session could induce students' likeliness to sign up for a mindfulness-based stress reduction (MBSR) course, and to shed light on how that could be possible. In a survey, the data sample, which consists of 99 students pursuing higher education in the Netherlands, were randomly split into a mindful and a non-mindful treatment group. Randomization seemed to work during the experiment, where most demographic and baseline characteristics are similar in both treatment groups. However, there were significant differences in proportions of students among categories of frequency at which they practiced mindfulness before taking part in this survey. Therefore, this variable is later included in the analysis models as a control.

The mindful treatment group was asked to do a five-minute Buddhist mindfulness guided meditation, while the other was shown a series of short entertaining videos from the TikTok platform. These treatments are meant to manipulate the survey respondents' mindfulness level in two opposite directions, which was checked afterward via the means of the LMS14 questionnaire (hypothesis 1). It's worth mentioning here that in this data sample, computed Cronbach's alpha for the whole 14-item scale demonstrated an acceptable level of internal consistency, whereas for the three separate notions (NS, NP and E), this alpha is either approaching or surpassing the acceptable internally consistent benchmark. The survey introduced the MBSR course (which is a MBI by-student, for-student at the university where this study is based) and recorded how they behaved and responded, expecting that a higher mindfulness level thanks to the mindful treatment would make the students seek for more information (hypothesis 2) and act upon it (to be more willing to sign up – hypothesis 3). While analysis result support the first hypothesis, there were insufficient evidence supporting the latter two.

Testing the first hypothesis, an OLS regression was done, where results, as shown in Table 3, shows that students who did the brief mindfulness meditation would have a total LMS14 score that is, on average, 5.196 points higher than those who were in the non-mindful treatment group, significant at the 1% level. This means that the first hypothesis cannot be rejected, and that the

Buddhist mindful treatment worked even when tested on a Langerian scale. In other words, compared to after watching a series of videos from TikTok, students doing the brief Buddhist mindfulness meditation actually reported a higher Langerian mindfulness level right after. This is in line with past findings that brief mindfulness interventions have instant effects on levels of mindfulness (e.g., Adams et al., 2013; Vinci et al., 2014). However, to measure mindfulness level, these studies simply made used of scales that are developed on a Buddhist mindfulness nature, such as the Mindful Attention Awareness Scale (Brown & Ryan, 2003) and the Five-Factor Mindfulness Questionnaire (Baer et al., 2006). By employing the Langerian mindfulness scale LMS14 to measure the respondents' mindfulness level, this thesis provides the first quantitative proof of the akin relationship between the Buddhist and the Langerian socio-cognitive concepts of mindfulness. This result is hence also in line with the existing literature's qualitative conclusion of overlapping in mindfulness conceptualization in the two major school of thoughts (McIntosh, 1997; Khoury et al., 2017).

Meanwhile, there is no significant causal relationship found between being in the mindful treatment group and the students' likeliness to seek more information and to sign up for the presented course. The results from the two ordered probit models regressing respectively information-seeking level and willingness to sign up level on the mindful treatment, controlled for the frequency at which students already practiced mindfulness beforehand, can be found in table 4. It is observed that students in the mindful treatment group have a slightly lower average z-score of *information seeking* (which implies being on a lower information-seeking level) and a slightly higher z-score of *willingness to sign up* (suggesting being on a higher level of willingness to sign up). However, as these are not statistically significant, it is not possible to reject the null hypotheses that there is no effect of the mindful meditation treatment on the said two outcome measures. Besides the main results of the two hypotheses' testing, it is also found that students who already rarely – occasionally practiced mindfulness exhibit higher willingness to sign up for the presented MBSR course, and that mindfulness score (as measured with the LMS14 scale) has significant positive correlations with both information seeking behavior and willingness to sign up among students in both treatment groups.

The mentioned results being insufficient evidence to support hypotheses 2 and 3 might stem from several foreseeable, yet unavoidable limitations of this study. Firstly, the data sample is of relatively small size, and was gather by means of convenience sampling. Survey respondents were students that said yes to the invitation to do the survey experiment, and they were studying in the main library and other buildings on campus. This is not close to random sampling, making the possibility of the data sample being representative low. To improve the external validity of of the research as well as precision of coefficient estimating, future studies with similar research design should be performed on a larger and more representative sample.

Another limitation worth highlighting regards the treatments included in this experiment. The treatments in this study were both 5-minute long and were delivered in a video format. In past studies, to ensure the mindful treatment is well received and can have effects, participants were usually instructed to do the brief meditation on a regular basis and followed up for a relatively long period before outcome variables of concern were measured (e.g., Chen et al., 2013; Shearer et al., 2016; Calma-Birling & Gurung, 2017). Studies that also integrated a brief mindfulness meditation as a treatment into a survey, such as Vinci et al. (2014), usually have a longer treatment time (10 minutes or longer). However, when facing several constraints and the risk of respondents not completing the survey due to longer treatment, this study chose the mentioned duration. Future research could therefore improve this aspect of the experimental design to aim for stronger, more sizable treatment effect.

This study has proven even a very brief mindful meditation can significantly improve students' mindfulness level, and as the bridge between the concepts of mindfulness in Buddhism and socio-cognitive psychology emerges thanks to quantitative proof here, that also means students would not only benefit from stress reduction and improve mental wellbeing, but also improve their instantaneous cognitive abilities, namely regarding novelty-seeking, novelty-producing, and engagement notions. This further motivates the initial goal of the study, which is finding ways to engage more students in mindfulness-based initiatives (MBIs) offered within the university. However, this study found no significant evidence supporting the idea that integrating a brief mindfulness meditation into promoting activities would lead to information-seeking behavior or willingness to sign up for the given MBI. Further research should consider addressing

the forementioned limitations, namely gathering a bigger data sample in a more appropriate sampling method and designing a stronger mindfulness intervention when targeting participants' change of behavior or intentions, since these may have deeper internal root than we can expect, such as from personal experience, beliefs, and/or misconceptions about the mindfulness practices themselves.

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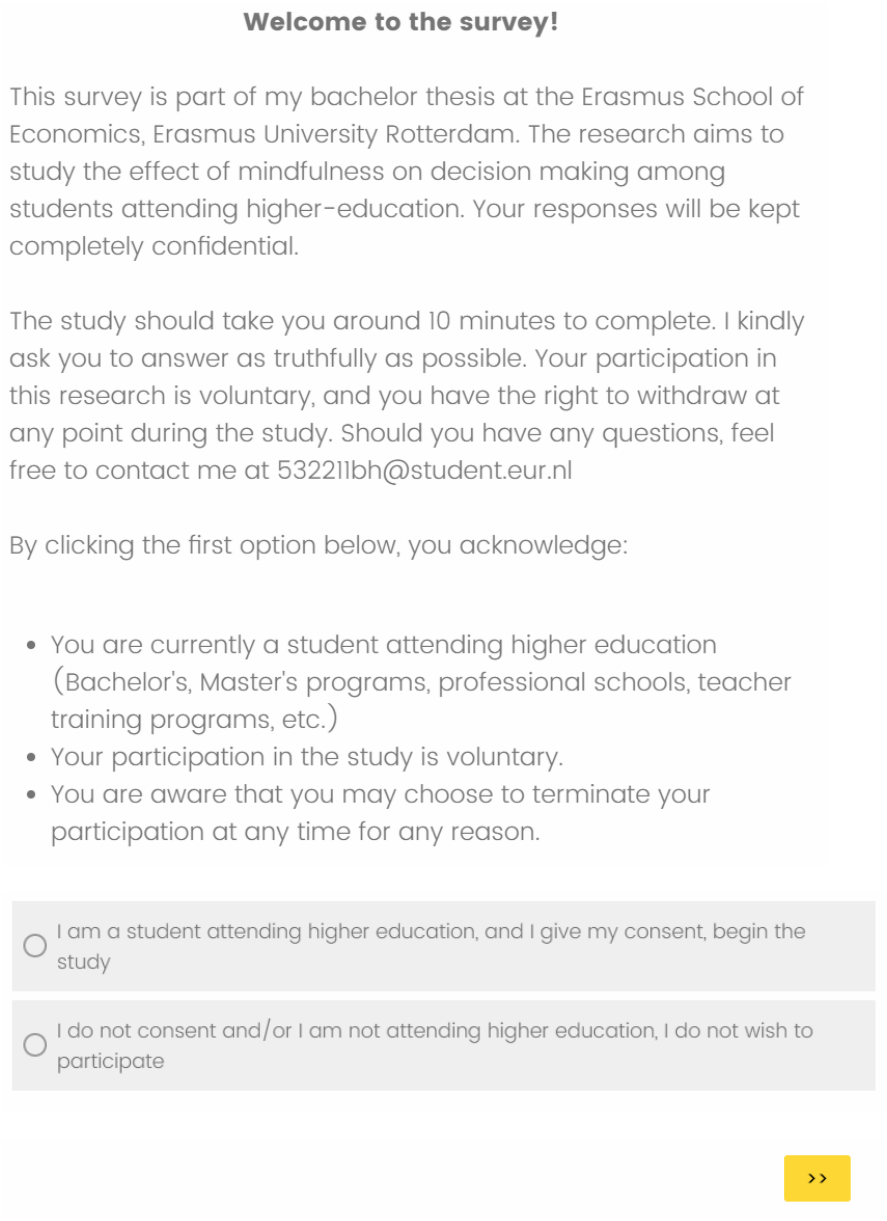
Appendices

Appendix A: The survey

Section 1: General information and consent.



Welcome to the survey!

This survey is part of my bachelor thesis at the Erasmus School of Economics, Erasmus University Rotterdam. The research aims to study the effect of mindfulness on decision making among students attending higher-education. Your responses will be kept completely confidential.

The study should take you around 10 minutes to complete. I kindly ask you to answer as truthfully as possible. Your participation in this research is voluntary, and you have the right to withdraw at any point during the study. Should you have any questions, feel free to contact me at 532211bh@student.eur.nl

By clicking the first option below, you acknowledge:

- You are currently a student attending higher education (Bachelor's, Master's programs, professional schools, teacher training programs, etc.)
- Your participation in the study is voluntary.
- You are aware that you may choose to terminate your participation at any time for any reason.

○ I am a student attending higher education, and I give my consent, begin the study

○ I do not consent and/or I am not attending higher education, I do not wish to participate

>>

If survey participant chooses “I do not consent and/or I am not attending higher education, I do not wish to participate”, they will be directed to the end page of the survey.

Section 2: Baseline questions on mindfulness

How often do you meditate or do any other types of mindfulness practices?

- ○ Never
- ○ Rarely - occasionally
- ○ A few times a week
- ○ Daily

Do you know about mindfulness-based initiatives provided for students at your university?

- ○ No, I have never heard of such initiatives
- ○ I (vaguely) recall hearing/seeing information about such initiatives
- ○ Yes, I know (a few of) such initiatives at my university

Have you participated/signed up to participate in such MBIs?

- ○ Yes, I have
- ○ No, I have never and I'm not interested in signing up and participating
- ○ No, but I would sign up if I had time/if it was more convenient for me to participate
- ○ No, but I would sign up if I had known about such initiatives

<< >>

Section 3a: Mindful treatment group

Please watch and follow the instructions from the following video. The survey will auto-advance shortly after the video is complete.

Video by Goodful, retrieved April 22, 2022, from https://www.youtube.com/watch?v=inpok4MKVLM

The forward button only shows up after 240 seconds. ››

The survey auto-advance after 320 seconds.

Section 3b: Low mindful treatment group

Please play the video below and watch for 4 - 5 minutes. Feel free to forwards 5/10 seconds anytime to see the next TikTok clip during watching the video, as long as in total you spend around 4 to 5 minutes watching.

The survey will auto-advance after 5 minutes. You will be able to see a button and skip to the next part of the survey yourself after 4 minutes.

Video by TikTok Chart (a Youtube channel), retrieved April 22, 2022, from https://www.youtube.com/watch?v=O55Vs54s-mo

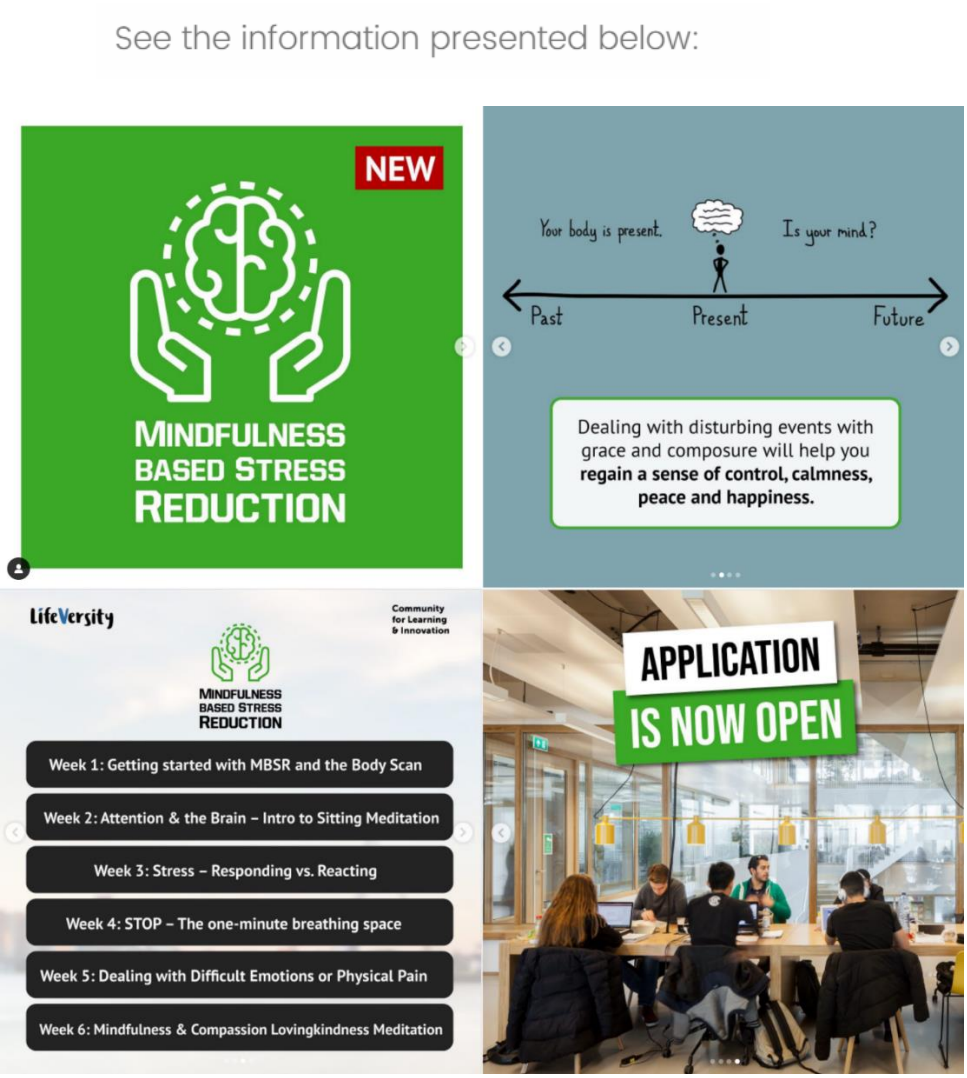
Section 4: Mindfulness-manipulation check

To the best of your knowledge, to what extend do you agree or disagree with the following statements?

	strongly disagree - 1	2	3	neither agree nor disagree - 4	5	6	strongly agree - 7
I like to investigate things	○	○	○	○	○	○	○
I generate few novel ideas	○	○	○	○	○	○	○
I make many novel contributions	○	○	○	○	○	○	○
I seldomly notice what other people are up to	○	○	○	○	○	○	○
I avoid thought-provoking conversations	○	○	○	○	○	○	○
I am very creative	○	○	○	○	○	○	○
I am very curious	○	○	○	○	○	○	○
I try to think of new ways of doing things	○	○	○	○	○	○	○
I am rarely aware of changes	○	○	○	○	○	○	○
I like to be challenged intellectually	○	○	○	○	○	○	○
I find it easy to create new and effective ideas	○	○	○	○	○	○	○
I am rarely alert to new developments	○	○	○	○	○	○	○
I like to figure out how things work	○	○	○	◉	○	○	○
I am not an original thinker	○	○	○	○	○	○	○

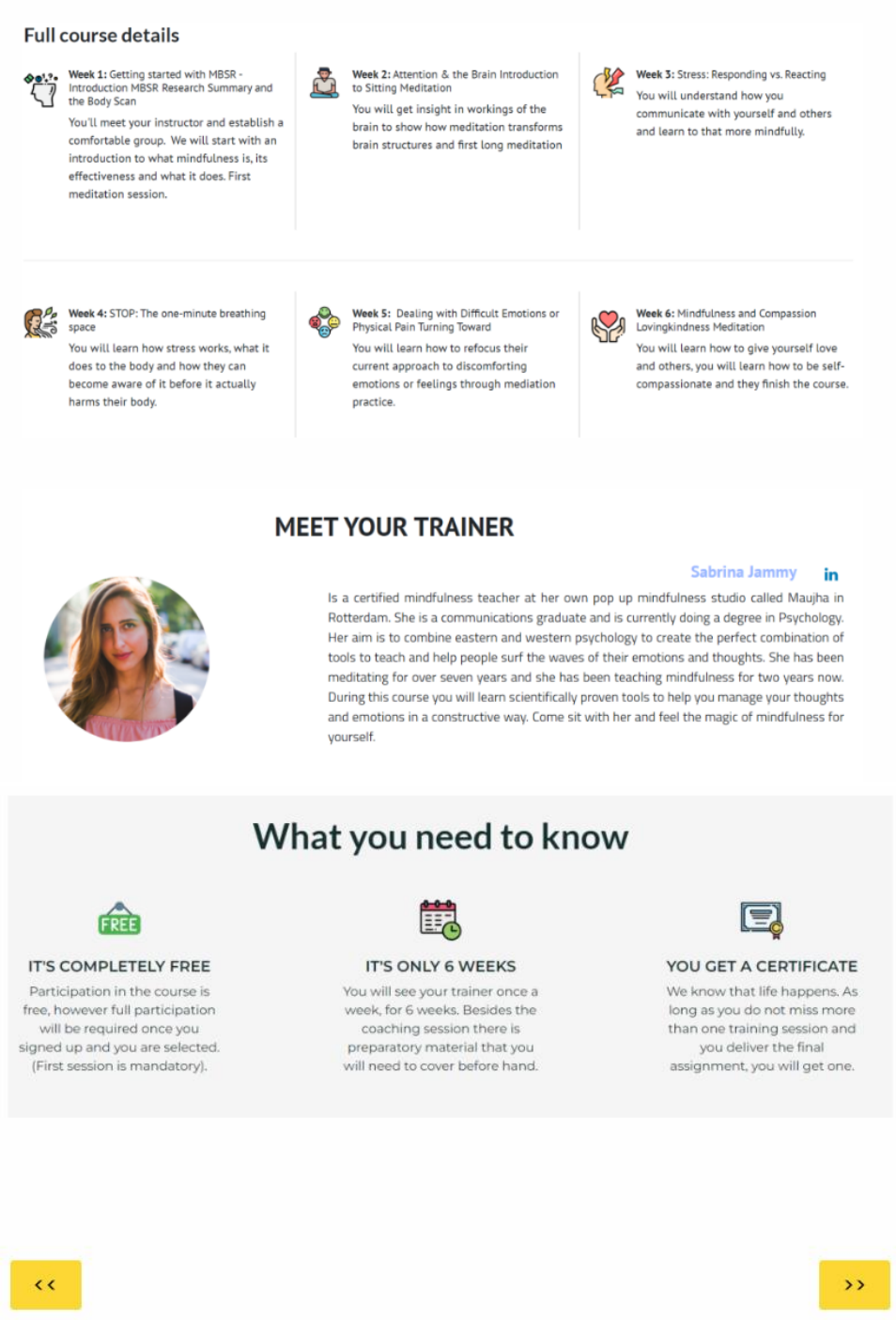
<< >>

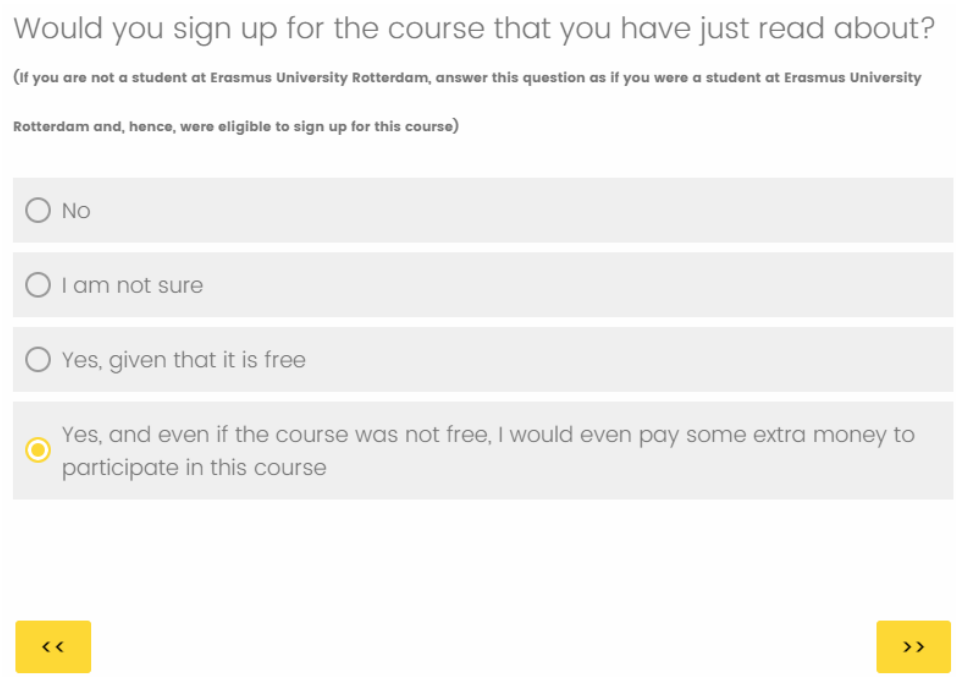
Section 5: Information about the MBI



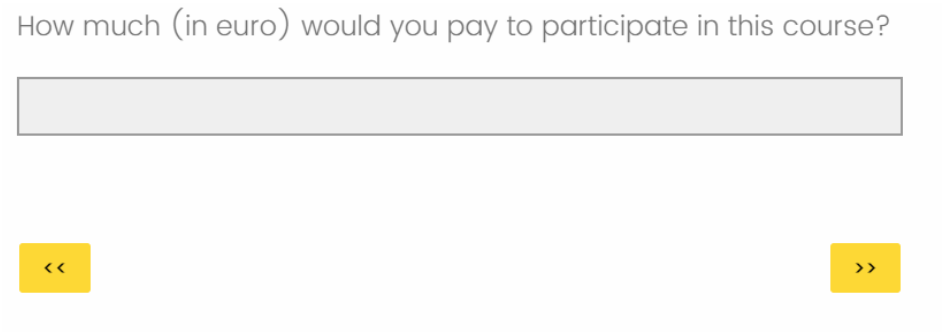
If survey participant chooses “Not really”, they will be directed to the next question (*Would you sign up for the course that you have just read about?*). The information presented on the next

page is only displayed for when “Yes, I would like to read more about the course details and trainer information, etc.” is chosen.

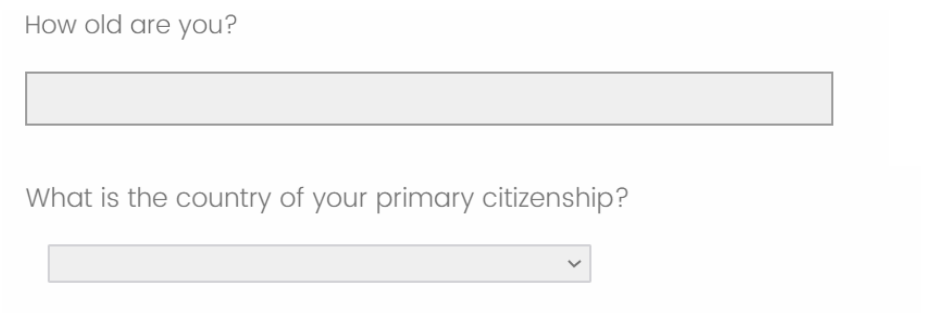




If survey participant chooses "Yes, and even if the course was not free, I would even pay some extra money to participate in this course", they will be asked the following last question.



Section 6: Demographics



How do you describe yourself?

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

How many years of formal education have you had?

(For most people, formal education starts with primary school at age of six)

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Appendix B: Langer Mindfulness Scale LMS14 (Pirson et al., 2012)

LMS14 survey items:

1.	I like to investigate things	(NS)
2.	I generate few novel ideas	(NP)*
3.	I make many novel contributions	(NP)
4.	I seldomly notice what other people are up to	(E)*
5.	I avoid thought-provoking conversations	(E)*
6.	I am very creative	(NP)
7.	I am very curious	(NS)
8.	I try to think of new ways of doing things	(NS)
9.	I am rarely aware of changes	(E)*
10.	I like to be challenged intellectually	(NS)
11.	I find it easy to create new and effective ideas	(NP)
12.	I am rarely alert to new developments	(E)*
13.	I like to figure out how things work	(NS)
14.	I am not an original thinker	(NP)*

All items being marked with an asterisk (*) are reverse-scored item.

Mindfulness-score computation:

$$Mindfulness_i = \sum_{j=1}^{5} NS + \sum_{k=1}^{3} NP_{i,k} - \sum_{l=1}^{4} E_{i,l} - \sum_{m=1}^{2} NPN_{i,m}$$

where *i* identifies observations; *j, k, l, m* identifies different LMS14 items