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Debiasing: Educational Passage and Langerian Mindfulness on the
Fundamental Attribution Error

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Abstract

Besides the global economic damage as a result of the Coronavirus disease 2019 (COVID-19) pandemic, it also caused a strong psychological impact. The fundamental attribution error (FAE) is found to be one of the cognitive biases most related to the fear of COVID-19 (Rosenfeld et al., 2020). During judgment and decision-making, individuals prone to this bias tend to overestimate dispositional factors and underestimate situational factors. This thesis focusses on debiasing individuals from the FAE by means of a Langerian mindfulness intervention or an educational passage. The purpose is to measure the effect of the interventions and identify which intervention is more effective at reducing the FAE. Using a survey experiment, respondents are randomised into one of four groups (mindfulness: treatment/control, education: treatment/control). In total, 243 complete observations were collected. Prior to conducting the analyses of the hypotheses, a balance check is done to ensure randomisation was successful, and manipulation checks are done to make sure that the intended state is produced. Then, data is analysed by conducting a parametric test, ordinary least squares regression, and a non-parametric test, the Mann-Whitney U test. The results show that the mindfulness treatment had a significant effect on reducing the FAE, while no effect was found for education. The implication of this study is the importance of mindfulness in reducing cognitive bias through our subconscious mind. As mindfulness continues to become an increasingly important aspect of our lives, schools and universities could adopt mindfulness education into their programs.

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Chapter 1: Introduction

Since the unprecedented emergence of the coronavirus disease 2019 (COVID-19) pandemic, the landscape of social interactions has developed into what we now call the “new normal”. Amid the pandemic, cognitive biases were especially present as there was a necessity for urgent decision-making. The rapid and drastic changes to individuals’ lifestyles throughout the pandemic, and the resulting measures, eventually led to an overall decrease in psychological and physical health (Schudy et al., 2020; Mohamed et al., 2021). Due to the high level of uncertainty and complexity, it served as the optimal conditions for cognitive biases to thrive. Remarkably, social psychologists noted a change as a result of the pandemic, which is the increased hostility towards individuals considered “outsiders” (Rosenfeld et al., 2020). Prior research has found that the threat of a disease is a powerful stimulant of prejudice and discrimination against a population that does not abide by the local norms (Schaller & Neuberg, 2012). This was visible in the COVID-19 pandemic in the form of the vaccine divide, i.e., the vaccinated against the unvaccinated. In this case, being “different” refers to being unvaccinated. Bor et al. (2022) found that vaccinated individuals are highly antipathic towards the unvaccinated, by correlating their status to untrustworthiness and unintelligence. Antipathy, therefore, results in prejudice towards the unvaccinated, which negatively affects their everyday interactions (Iyengar et al., 2019; Bor et al., 2022).

The cognitive bias of concern is the fundamental attribution bias (henceforth FAE), which the literature defines as the tendency to underestimate the influences of situational factors, by overestimating the influences of dispositional factors when making inferences about a different individual’s behaviour (Jones & Harris, 1967). Situational factors include influences from the environment or context, whereas dispositional factors are individual characteristics that influence one’s behaviour (Fabi et al., 2019). In the literature, the term FAE is often used interchangeably with correspondence bias or the attribution effect. However, Gawronski (2004) argues that the FAE and correspondence bias are independent phenomena, where the former serves as an explanation for the latter. For consistency in this paper, the bias will be referred to as the FAE.

As an example of the FAE, consider the following situation. Imagine one of your colleagues comes in late to work one day. You may think that the employee is lazy or chaotic, which are dispositional inferences of their behaviour. However, if the day comes that you are late to work, you do not hold yourself accountable and rather blame it on situational factors (e.g., the alarm did not go off).

The importance of this research is because the FAE was especially visible amid the pandemic as the division between responses towards COVID-19 continued to increase. Especially regarding masks and vaccine status, individuals were quick to make personality judgments rather than considering influences from social and environmental forces. Bor et al. (2022) show that this pandemic will leave societies more divided compared to pre-pandemic. Thus, it is important to research the behavioural aspects of individuals post-pandemic. Research by Rosenfeld et al. (2020) emphasises the importance of the shifts in society's perceptions and norms, as a result of COVID-19, on future scientific research.

Fortunately, just like other cognitive biases such as overconfidence and confirmation bias, the impact of the FAE on one's work and personal life can be lessened through different methods. In this thesis, the two methods of focus will be education and mindfulness.

Luong and Butler (2021) investigated the effectiveness of an educational intervention to reduce an individual's FAE using a randomised controlled trial. Respondents in the treatment group read a short educational passage on the FAE, whereas the control group read a passage on biology. Then, an adapted version of the attitude attribution paradigm was used (Jones & Harris, 1967). Although the researchers did not find a significant impact of the educational passage on FAE knowledge, it may be due to the standard single-item attitude attribution paradigm. Schwarz (1994) previously critiqued that it only captures limited information about the FAE, specifically in terms of the reflection of real-world behaviour. Thus, taking the advice of the researchers, a different FAE measure is used in this paper, namely, the Neglect of External Demands (NED) scale. Scopelliti et al. (2017) developed the scale to account for the multiple dimensions of dispositional inferences. Little research has been done on the FAE using the NED scale.

Furthermore, research by Hopthrow et al. (2017) found that respondents after the mindfulness intervention demonstrated a significant reduction in FAE compared to a control group. In addition, the attitude-attribution paradigm was used to measure the FAE. To induce mindfulness, the raisin task was used. Although the raisin task has successfully induced mindfulness in several studies, it requires respondents to listen to a five-minute audio while consuming two raisins (Hopthrow et al., 2017; Weger et al., 2012). Similarly, other methods to induce short-term mindfulness have required subjects to listen to audio of various lengths (Jordan et al., 2014; Ostafin & Kassman, 2012). In this research, mindfulness will be induced using Langerian mindfulness. Langerian mindfulness is simply defined as the act of noticing new things while simultaneously making use of relevant information in specific situations (Langer et al., 1978). The reason for using this method rather than another is because the state

of Langerian mindfulness can be achieved instantaneously, using four simple exercises. Additionally, using the NED scale will add to the literature on the effect of Langerian mindfulness on the FAE.

The FAE is found to be one of the biases most related to the fear of COVID-19, showing that research on how to mitigate it is of importance (Rosenfeld et al., 2020; Zarrabian & Hassani-Abharian, 2020). The constant debate on COVID-19-related issues has prompted individuals to take positions. Through this, people have the innate tendency to fall for the FAE by finding dispositional reasons, leading to making incorrect judgments on other peoples' actions (Liao, 2020).

Thus, in an attempt to find a suitable method to mitigate the FAE, the following research question will be investigated:

RQ: "To what extent can an educational passage and Langerian mindfulness reduce the fundamental attribution error?"

This paper is organised as follows. In Chapter 2, the central concepts concerning the research question is explored. Specifically, existing literature on the FAE, methods to measure the FAE, and prior experiments using education and Langerian methods to reduce cognitive biases. Then, the data and methodology of the experiment are outlined in Chapter 3, followed by the performed analysis in the results section (Chapter 4). Chapter 5 is dedicated to a discussion on the results, accompanied by the limitations and further research. Lastly, Chapter 6 concludes this thesis with a summary and the implications of this study.

Chapter 2: Literature Review

2.1. Judgment and Decision Making Under Uncertainty

In empirical research, a plethora of research exists on the violation of rationality in human judgment and decision-making (Mellers et al., 1998). Rationality is a crucial underlying assumption in normative economics, where decisions made are based on all relevant information and computed calculations to obtain maximum utility (Curseu, 2006). Additionally, all decisions should be made, with the use of sets of axioms, in a consistent and logical manner (Jungermann, 1983). Yet, empirical research findings show systematic errors in our cognitive ability to make rational decisions (Shafir & LeBoeuf, 2002). In fact, Simon (1979) claimed that the rational behaviour assumption is irrelevant as it cannot be tested empirically. Instead, there are many methods to test judgment and decision-making. Tversky and Kahneman (1974) showed that decisions are based on beliefs and estimation of likelihoods, where people rely on heuristics to make subjective judgments. During information processing, our brain receives up to 11 million bits of information per second but can only successfully process around 40 bits per second (Orzan et al., 2012). Due to a large amount of information, our brain attempts to create mental shortcuts to make it easier to arrive at a decision. Although these heuristics are useful to reduce the complexity of a cognitive task, it often results in systematic errors. This reflects the limitation of our cognitive system to act according to normative rational behaviour.

2.1.1. Human Judgment

Kahneman (2011) made a distinction between two human thinking modes, named System 1 and System 2. System 1, or automatic thinking, is when the brain makes use of heuristics (mental shortcuts) and memory to make rapid decisions, whereas System 2, or deliberate thinking, involves more cognitive effort and rationality during decision-making. In 98% of the decision we make, System 1 is used as the downside of System 2 is its required controlled mental processes and self-awareness. System 1 operates by continuously monitoring our environment and initiates several assessments of different parts of an event or situation, under low efforts and without specific intentions (Kahneman, 2011). It is therefore System 1 where intuition is utilised, and the unconscious evaluation of a situation based on availability or representativeness result in the presence of cognitive biases (Tversky & Kahneman, 1974; Kahneman, 2011).

2.1.2. Cognitive Biases

Cognitive biases are defined as a pattern of systematic deviations from rationality in judgments and decision-making (Tversky & Kahneman, 1974). These errors stem from the reliance on heuristics and are a by-product of being in a state of cognitive ease and merely using System 1 (Kahneman, 2011). There are three different types of heuristics used in judgment and decision-making under uncertainty, including representativeness, availability, and anchoring and adjustment. Under each category, different cognitive biases may arise, which lead to predictable errors (Tversky & Kahneman, 1974).

2.2. The Attribution Theory

In the field of social psychology, the attribution theory demonstrates how individuals make decisions on the causes of an event or behavior and the subsequent consequences of the attributions (Heider, 1958; Schmitt, 2015). Heider (1944) originally introduced the idea that almost all changes in the environment are a result of an action of individuals and other external factors. However, the human tendency is to assign the responsibility of the change, in its entirety, to a person. Heider (1958) illustrates that our perception, in an interaction with another individual, draws mainly on the behavior as it becomes dominant against the situational factors. What came out of the author's work were two ideas on dispositional and situational attributions. Researchers define *dispositional attribution* as the process where an observer integrates several inferences regarding the motives and traits of the person being observed (Reeder et al., 2004). *Situational attribution* occurs when an individual infers a target person's actions and behaviour are caused by an external event that is outside of their control. In the Handbook of Social Psychology, Gilbert (1998) discusses that these two are used by individuals to get to know others' temporary and enduring states.

Within the framework of the attribution theory, the process of causal attribution leads to several biases, including the fundamental attribution error and the self-serving bias.

2.2.1. Self-Serving Bias

The self-serving bias can be explained by the following example: imagine you receive a good grade; you may think to yourself: "I am hard-working and studious". If you receive a bad grade, however, you may rather blame it on your teacher for not explaining a topic well enough. Here, it is demonstrated that people have the tendency to attribute successful outcomes to their abilities but fail to acknowledge their failures (Heider, 1958; Miller & Ross, 1975).

2.2.2. The Fundamental Attribution Error

The fundamental attribution error (FAE) is a cognitive bias where individuals exclusively attribute others' behaviour to their personality. After the classic experiment on the correspondence bias, Ross (1977) coined the term 'fundamental attribution error' after the susceptibility of observers to the bias in the experiment by Jones & Harris (1967). In this thesis, the focus is on human behaviour and actions in interpersonal relations. Specifically, the FAE pertaining to dispositional attributions will be investigated. In the literature, this term is also used interchangeably with correspondence bias (Gilbert & Jones, 1986; Fleming & Darley, 1989). Previous studies that conducted experiments using the attitude attribution task have called it either the FAE or correspondence bias (Hopthrow et al., 2017).

It is undeniable that both dispositional and situational inferences are made to come to a judgment or opinion. Reeder et al. (2002) use the assumption that even though observers may perceive certain actions as being situationally induced, they will continue to infer others' personal motives and in turn, judge their personal traits. For instance, imagine a colleague making a generous donation to the favourite charity of your boss, knowing that your boss will become aware of it. In this example, the donation can be seen as being situationally induced, as it could also be the favourite charity of the colleague. Yet, people may still conclude that the action was motivated by selfishness, to impress the boss (Reeder et al., 2004).

Neuroscientists suggest that the FAE is caused by "spontaneous mentalising", where the perceiver processes the target person's mental states to understand their intentions (Moran et al., 2014). The results suggest that the engagement of mentalising underlies the over-attribution of dispositional inferences compared to situational inferences.

Researchers currently have found sufficient evidence to argue that the FAE is learned, as it was not found in young children (Langdridge & Butt, 2004). Contrastingly, children make more situational inferences and only start to make dispositional inferences in the late phases of childhood (Kassin & Pryor, 1985). Thus, if young children can understand the importance of minimising the FAE, perhaps they would be less prone to the bias in the future.

2.2.3. Importance of Understanding the FAE

In social psychology, researchers found evidence of individuals perceiving themselves as being less prone to biases relative to others (Pronin & Kugler, 2007). This is coined the *bias blind spot*. Pronin et al. (2002) conducted several studies to provide evidence for individuals being more aware of cognitive biases in others compared to themselves. From three surveys, the

results showed respondents rated themselves as less susceptible to different biases compared to their classmates in a seminar and compared to airport travellers. This is often called the better-than-average bias. Similarly, one of the studies showed that the subjects reported the presence of self-serving bias concerning their peer's test performance, but their own performance remained bias-free. The FAE is often associated with being part of the bias blind spot (Luong & Butler, 2021).

The importance of attempting to reduce the FAE is due to its detrimental consequences. A review of the explanations and implications of the FAE states that committing the bias could consequentially lead to oppression, victimisation, and peer stress (Berry & Frederickson, 2015). This is an outcome of the perceptions people tend to make in situations where the FAE is present, typically predicting anger and an increased desire to retaliate (Anthony et al., 2003; Sadler et al., 2005). Emotion and mood both have a large influence on judgment. Therefore, understanding the FAE and considering situational factors could lead to fewer conflicts and fewer reoccurrences (Stalder, 2012).

2.3. Measuring the Fundamental Attribution Error

This thesis will measure the FAE in a quantitative manner. In the literature, there has been several methods used to quantify this outcome variable. Here, the attitude attribution task (Jones & Harris, 1967) and the Neglect of External Demands (NED) scale is discussed.

2.3.1. The Attitude Attribution Task

In the scientific literature, the classic experiment by Jones and Harris (1967), the attitude attribution task, is often used to test for the FAE. Subjects are randomly assigned to listen to or read a speech that either opposes or favours an issue, considering that the author either had a choice or no choice on their stance. Then, respondents are asked to estimate the true behaviour of the individual giving the speech. The attitude attribution paradigm is used to measure the degree of the dispositional and situational inferences being made by the observer. In the classic experiment, subjects are prone to the FAE when they align the attitudes of the essay position with the writer even when the position was assigned.

Several criticisms were made on this task. Wright and Wells (1988) found, by using a modified version, that the dispositional bias within the FAE is overestimated by the traditional attitude-attribution paradigm of Jones and Harris (1967). The modification made was that the respondents were made aware by a statement that some of the information given may be

irrelevant to their decision-making. A further critique of the measure is that it fails to reflect sufficient information on the FAE in real-world situations as the task only covers one target of dispositional inferences (Schwarz, 1994). Also, only the attitude attribution paradigm is considered, whereas there are several paradigms resulting in the commitment of the FAE. Thus, the neglect of external demands (NED) scale is often considered instead, which aims to target multiple aspects of dispositional inferences (Scopelliti et al., 2018; Luong & Butler, 2021).

2.3.2. The Neglect of External Demands (NED) Scale

The NED scale is a well-validated FAE measure that encompasses four targets of dispositional attributions, namely, attitudes, ability, emotions, and morality (Scopelliti et al., 2018). These four have been empirically found to be potential causes of the FAE (Gawronski, 2004). Scopelliti et al. (2018) adapted the paradigms to fit a uniform question format, including a scenario followed by a question about how confident the individual is in their dispositional attributions.

For example, item 1 measures the attitude attribution paradigm (see Table B2 in Appendix B.2. for all):

“A famous millionaire commissioned a portrait to a local artist for 2 million dollars. The portrait will be positioned in the hall of a new museum that the millionaire has recently funded, to acknowledge his contribution. The artist portrays him as a triumphant Roman emperor.”

Question: Based on the information provided, how confident are you that the artist admires the millionaire?”

Gawronski (2004) shows that empirically, experiments related to dispositional inferences cover one of the four paradigms, including the attitude attribution, quizmaster, silent interview, and moral attribution paradigm, investigating inferences on attitudes, ability, emotionality, and morality, respectively.

Using the quizmaster paradigm by Ross et al. (1977), ability is measured by assigning three participants to take the role of a quizmaster, contestant, and observer. The individual assigned as the quizmaster is asked to come up with ten general knowledge questions to pose to the contestant. Typically, contestants only get up to four correct answers. Researchers have found an interesting result, where the observer attributes the poor performance level of the

contestant to a higher level of knowledge of the quizmaster (Ross et al., 1977; Block & Funder, 1986; Krull et al., 1999). When evaluating, the observer fails to account for the situationally induced disadvantage of the contestant, as the questions typically reflect the knowledge of the quizmaster only.

The silent interview paradigm, developed by Snyder and Frankel (1976), measures emotions by showing participants a video of an interview. In the video, an individual is shown behaving anxiously during an interview, but the audio is removed. The subjects are either told whether the topic of the interview is anxiety-provoking, or not. Results showed that, regardless of the interview topic, participants were more prone to the FAE when they attribute high levels of dispositional anxiety.

Morality is measured by using the moral attribution paradigm (Bierbrauer, 1979). Participants are presented with several classic social psychology experiments, which examine the impact of situational factors on an individual's moral behavior. For example, subjects learn about the Milgram experiment, where destructive obedience to authority figures led to individuals administering high voltage electric shocks to their fellow participants (Milgram, 1963). After learning about an experiment, participants are asked to list dispositional inferences about an individual whose behavior complies with the majority of the subjects in Milgram's original experiment (Bierbrauer, 1979). A common finding was that observers, despite learning about situational factors (such as pressure and constraints), still attribute immoral dispositions to immorally behaving individuals (Bierbrauer, 1979; Sabini & Silver, 1983).

2.3. De-biasing: Education

There have been several findings that show that learning about cognitive biases can reduce their occurrence (Chen et al., 1997; Beaman et al., 1978; Riggio & Garcia, 2009). In fact, the FAE is a common bias where researchers attempt to reduce its detrimental effects, as it is believed that educating individuals can lead to a community becoming more understanding and more ethical towards one another (Gilovich & Eibach, 2001; Samuels & Casebeer, 2005). Education, in the form of FAE information, has been shown to reduce dispositional inferences (Chen et al., 1997; Riggio & Garcia, 2009). It should be noted that in most of the studies, students are used, specifically, undergraduates and masters (Chen et al., 1997; Riggio & Garcia, 2009; Stalder, 2012). This allowed for longitudinal data but did not allow for randomisation of the interventions.

An experiment using informal education on FAE, targeting Reddit (a forum platform) users, found no significant effect on reducing FAE (Luong & Butler, 2021). This paper, however, utilised the attitude-attribution task, which only encompasses one of several targets of dispositional factors. To improve on this paper, the NED scale will be used instead. Using this scale and a wider audience it is expected that the FAE education will demonstrate lower FAE compared to those in the control group. The control group will be given an educational passage on a biology concept, in line with the experiment of Luong and Butler (2021). Thus, H1 is formulated as follows:

Hypothesis 1: Individuals in the FAE education treatment will demonstrate lower FAE compared to the biology control group

2.4. De-biasing: Langerian Mindfulness

The concept of mindfulness originates from Buddhist traditional philosophy and practices and is often defined as being in the present moment and paying attention non-judgmentally (Kabat-Zinn, 1990). On the contrary, an individual is mindless if they possess a rigid mindset, predominantly adhering to System 1 (automatic thinking), and unaware of different perspectives (Langer E., 2009). Research regarding mindfulness has experienced exponential growth since 2006, predominantly focussing on investigating the effect of mindfulness-based therapies and interventions (Baminiwatta & Solangaarachchi, 2021).

It is important to distinguish the difference between Langer's construct of mindfulness from the traditional Buddhist practice. Langerian mindfulness is defined by Ellen Langer as "the process of consciously making use of information relevant to the situation" (Langer et al., 1978). Similar to the traditional approach, the focus is on being present in the moment and paying attention with purpose. The distinction is mainly the active mindset, including being open to receiving new information and being aware of novelty in different situations (Langer, 1989). As aforementioned, System 2 is involved as it focuses on the deliberate uptake of information from our surroundings and thinking with intention. Thus, mindfulness is shown to reduce cognitive biases by activating more of System 2. The concept of Langerian mindfulness, a non-meditative approach, will be used in this thesis as studies have shown its success at inducing mindfulness in various settings (Alexander et al., 1989; Grant et al., 2004; Langer & Moldoveanu, 2000; Langer, 2009). Furthermore, researchers have shown that the state of Langerian mindfulness can be attained instantaneously through a set of mindful activities, such

as cognitive exercises to induce creativity, cognitive openness, and flexibility (Pagnini et al., 2016; Bosma et al., 2022; Demers et al., 2022). Langerian mindfulness interventions have been successful at increasing mindfulness of the general population, as well as with amyotrophic lateral sclerosis (ALS) patients and stroke survivors and their corresponding caretakers (Langer, 2009; Pagnini et al., 2022; Demers et al., 2022).

It is interesting to note the paradox that arises in the relationship between rationality and mindfulness (Maymin & Langer, 2021). In rationality, as stated by Oppenheimer (2008), there is only one correct answer, which is independent of the context. On the other hand, mindfulness allows for multiple perspectives, and therefore, multiple correct answers, depending on the context.

2.4.1. Langerian Mindfulness and Cognitive Biases

Langerian mindfulness has been explored in various settings but has also been shown to be effective at reducing cognitive biases. In a recent paper by Maymin and Langer (2021), a Langerian mindfulness intervention was used to test whether it could decrease cognitive biases. Twenty-two different cognitive biases were tested based on a set of questions where only one answer was correct, in line with rationality. The results showed that for those who were induced by the Langerian mindfulness, 19 out of 22 cognitive biases were reduced compared to the control group. Also, in my bachelor thesis, students in the mindful group were found to improve their probability judgment accuracy after the Langerian mindfulness intervention (Chen Y., 2021). Accordingly, the second hypothesis is formulated as follows:

Hypothesis 2: Individuals in the mindfulness treatment will demonstrate lower FAE compared to the low-mindfulness (control) group

As the FAE is the result of an automatic cognitive process, it is rather subconscious decision-making. When we consider the two systems of thinking, System 1 is predominantly relied on, but bringing in System 2 to become more aware and slow the cognitive process down could result in fewer errors. Researchers have found that our feelings and beliefs are stored in our subconscious mind, while it takes the form of positive or negative thoughts in our consciousness (Mrnjaus & Krmeta, 2014). These thoughts then turn into emotions that consequently influence our judgment and decision-making. The level of mindfulness is found

to be connected to the feelings and beliefs in our subconscious mind. Thus, the following hypothesis is formed:

Hypothesis 3: The effect of the mindfulness treatment is larger than the education treatment in lowering the FAE

Students are found to be more attentive, as attending lectures and classes has a large influence on their immediate reactions and learning (Kruschke, 2000). Therefore, it is expected that the largest effect can be found in students as attention is vital in survey experiments. As a result, the final hypothesis is formulated as follows:

Hypothesis 4: Students, specifically, will demonstrate lower FAE

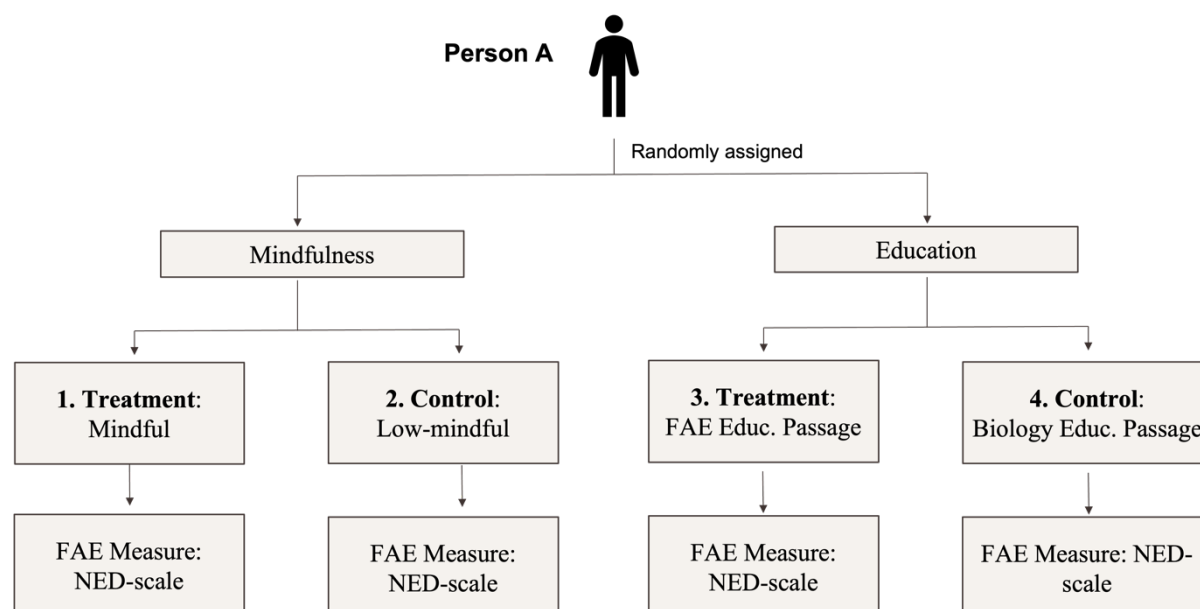
Chapter 3: Data and Methodology

This chapter focusses on the dataset, experimental design and the methodology used to answer the research question “*To what extent can an educational passage and Langerian mindfulness reduce the fundamental attribution error?*”. Furthermore, a description of the statistical analysis is provided. This study adheres to the ethical standards of the Erasmus School of Economics. An ethical check is completed before conducting the experiment.

3.1. Experimental Design

Figure 1.

Graphical Representation of the Experimental Design



Notes: The figure illustrates the between-subject design, which the subjects are exposed to. There are in total four different treatment groups, whereas the outcome variable is constant across the independent variables.

An experimental quantitative survey is conducted to gather primary data, using an online survey platform, Qualtrics (Qualtrics, 2005). To test the hypotheses, a between-subject design randomised controlled trial will be adopted. For the experimental design, a 2 x 2 factorial design is used. Using this design, two interventions are tested, which form the independent variables. The first independent variable, *Mindfulness*, has two levels, namely, *Low-Mindful* and *Mindful*. Similarly, the second independent variable, *Education* also has two levels, the *FAE* and *Biology*. The respondent will be randomly allocated into one of the four treatment groups (see Figure 1).

3.2. Sample

The paper by Pagnini et al. (2022) found an effect size of 0.54 for the Langerian mindfulness intervention. The authors use Hedge's g effect size, but it is a roughly equivalent statistic to Cohen's d . To calculate the optimal sample size for the mindfulness group, this statistic will be used as there is limited available information in the literature on the effect size of Langerian mindfulness. Using a two-sample t-test and an allocation ratio of 1, the optimal sample size per mindfulness group is 55 (using G*Power). For the education group, a smaller effect is expected, thus a medium effect size of Cohen's $d = 0.5$ is assumed. The optimal sample size per education group is 64. The total number of participants required is a minimum of 238 participants. Both are calculated with alpha and power at 0.05 and 0.8, respectively.

The survey link and QR code of the experiment is distributed through multiple channels, namely, friends and family, Facebook survey groups, and survey-exchange platforms SurveySwap and SurveyCircle. As this experiment is solely targeted at respondents residing in the Netherlands, individuals living elsewhere are screened out. Due to ethical concerns regarding minors, only observations from individuals aged 18 and above are taken.

In total, 311 observations were collected. However, after cleaning the data by removing observations that are unfinished, did not consent, and did not fulfil the screening criteria, 243 observations remain. Thus, the remaining observations (form the final dataset, which is made up of 55% women and 45% men (. There are 118 and 125 observations for the *Education* and *Mindfulness* intervention, respectively. The average age of this sample is 26.5 (standard deviation = 9.67, range = 19 – 74), with Dutch respondents being the majority (63%) of the respondents. Furthermore, there were in total 184 (76%) students, 43 (18%) employed, and the rest were either self-employed (5%), or unemployed (1%). The most common highest educational attainment is having a university bachelor's (41%), followed by a university master's (22%), and an HBO bachelor's (20%). Lastly, before completing the survey, 72% of the final sample have never heard of the FAE.

3.3. Materials

3.3.1. Non-Incentivised Experiment

The duration of the survey is estimated to take around 7-10 minutes. Participants were not compensated with a financial incentive, which could potentially result in inattention while completing the survey. The inattention of the respondents can be in the form of satisficing or the lack of motivation to engage in the study. As a result, low-quality data is collected if

respondents answer dishonestly. However, I believe that this is not an issue in this study, even though there is no monetary incentive. The paper by Shatz (2017) explored online survey recruitment and found that participants are willing to complete a survey even without a monetary incentive. In fact, the lack of financial compensation largely mitigates potential incentives for an individual to cheat to participate (Gadiraju et al., 2015; Galais & Anduiza, 2014; Hinderer & Nielsen, 2003). Van Der Zee et al. (2016) conducted a study to test whether the presence and absence of financial rewards were associated with dishonest behaviour in experiments. The authors found that the absence of financial rewards does not lead to higher levels of dishonesty. In line with the theory and studies on the irrationality of dishonesty, dishonest behaviour is not influenced by monetary incentives, because individuals do not utilise a cost-benefit analysis to make such decisions (Ariely, 2012).

The several survey elements that influence response rates are considered in several forms to minimise fatigue of the respondent. To avoid high attrition rates, the survey is kept according to the recommended maximal length for an online survey, which is between 10 to 20 minutes (Marcus et al., 2007). Secondly, a progress bar is added to the survey as it has been shown to encourage survey completion (BETA, 2017). Secondly, the NED scale is reduced to 7 items instead of 10 to shorten the duration of the survey. Moreover, an attention check is used between the NED scale items to ensure respondents are reading the questions with attention and engagement.

Furthermore, on the platforms Survey Swap and Survey Circle, participants are incentivised by earning credits per survey, which can only be retrieved at the end of the survey. Both websites have strict rules on completing other surveys, which may help against inattention.

3.3.2. Variables

This section describes the variables used in this study, including the independent, dependent, and control variables. The descriptive statistics of the main variables are shown in Table 1 at the end of this section.

Independent Variables

For *Mindfulness*, an individual will either be in the *Low-Mindful* (control) or *Mindful* (treatment) group. The variable, therefore, takes the value 1 if the respondent is in the *Mindful* group, and 0 if they are in the *Low-Mindful* group. Specifically, the treatment group will take part in four Langerian mindfulness-inducing warm-up exercises, whereas the

control group will receive a simplified version and the option to skip (see Appendix A) (Maymin & Langer, 2021). After this, the standard Langer Mindfulness Scale (LMS-14) will be utilised for both the *Low-Mindful* and *Mindful* groups (see Table B1, Appendix B.1) (Pirson et al., 2018). Three notions are tested with the LMS-14, namely, novelty-seeking, novelty-producing, and engagement. There are in total six items that are reversely scored, including all four of the engagement items, and two items related to novelty-producing (see Equation 1, and Appendix B.1. for the items). This scale will act as a manipulation check, to identify whether mindfulness was induced successfully post-intervention. Prior studies have shown the reliability and robust validity of the measure (Haigh et al., 2011; Wang et al., 2016). A manipulation check serves to evaluate the effectiveness of the treatment (Hauser et al., 2018). To test for the internal consistency of the LMS-14 items, Cronbach’s alpha score is calculated. For the LMS-14 scale, this is computed to be 0.77, showing an acceptable level of internal consistency.

$$LMS14_i = \sum_{j=1}^5 NS + \sum_{k=1}^3 NP_{i,k} - \sum_{l=1}^4 E_{i,l} - \sum_{m=1}^2 NPN_{i,m} \quad (1)$$

For *Education*, an individual will either read the FAE educational passage (treatment) or a biology passage (control) (see Appendix A). The variable will take the value 1 if the individual is in the *FAE* treatment group, and 0 if they are in the *Biology* control group. These passages are taken from the research paper by Luong and Butler (2021). For the *FAE* group, they will read the passage, followed by a four-item scale to measure self-reported understanding of the general FAE concept (Stalder, 2012). For the *Biology* group, a passage on the process of aerobic cellular respiration is shown, followed by a few general questions on how well they understood the text. The biology passage is used as the control group as it is comparable to the FAE treatment. Then, the individual will be shown A) below, followed by the aforementioned scale on the self-reported understanding of the FAE. The sum of the four items is taken to obtain a general score, which is used as a manipulation check. Cronbach’s alpha is computed to be 0.93, reflecting an excellent level of internal consistency.

- A) “There is a concept known as the fundamental attribution error. Even if you have never heard of it, please answer the questions below.”

Dependent Variable

The dependent variable, a measurement for FAE, will be constant across the treatment groups. As aforementioned, Scopelliti et al. (2018) developed a well-validated FAE measure named the Neglect of Demands (NED) scale (see Table B2, Appendix B.2). The scale consists of 10 items scored on a 7-point Likert scale. To calculate the NED score, the sum of the items is taken. The total computed score will indicate lower correspondence bias if the score is high, and vice versa. Specifically, each item on the scale describes a situation where respondents have to rate their confidence in a character-related attribution for certain behaviours, from “not at all confident (1)” to “very confident (7)”. Due to a large number of questions and the lack of incentives for this experiment, the NED scale is reduced to consist of 7-items instead. The highest level of dispositional inferences is therefore a score of 49. To retain intrinsic motivation for the respondents to complete the survey, three specific items are removed (Table B2 in Appendix B.2. shows the three removed items and their corresponding paradigm). To obtain an individual’s NED score, the seven items are simply added together. A lower NED score corresponds to a lower FAE, and vice versa. Scopelliti et al. (2018) found that the NED scale can predict behaviour in judgment and decision-making. Cronbach’s alpha for the NED score is found to be 0.79, which shows that the internal consistency and reliability of the scale are acceptable.

Control Variables

In case randomisation was unsuccessful and there are imbalances within the demographic variables, these will be controlled for. The variables, age, gender, education, nationality, and previous FAE knowledge are used. Age is controlled for, given the age-related developments and changes in cognition (Murman, 2015).

Gender plays a role in cognition and behaviour differences between men and women, due to the functional and structural organisation differences of the brain (Pogun, 2001; Cosgrove et al., 2007). The variable takes the value 1 if the individual is a male, and 0 if female.

The subject’s highest educational attainment is considered as studies have found it to have a high correlation with cognitive performance and ability (Parisi et al., 2012). This is a categorical variable, which is in ascending order of educational level. For example, the variable takes the value 1 if the individual’s highest educational attainment is primary school, 2 for secondary school, and up to 8 for PhD or higher (see Appendix A, Q10).

In addition, as an individual's cultural background is found to strongly influence the FAE, it is accounted for by asking for the subject's nationality (Chen & Wuqing, 2006; Saleh & Sturm, 2016). Previous research commonly split culture into two, individualistic or collectivistic. Individualistic cultures, typically found in western countries, focus on individualism more than on relationships with others. Prime examples of countries with an individualistic culture include the United States and the United Kingdom. On the other hand, collectivistic cultures focus more on groups and can be found in countries with eastern traditions, including China and Japan. Interestingly, research has shown that the FAE is found to be less common in collectivistic cultures (Triandis, 2001). Thus, a *culture* variable is generated by categorising countries with a collectivistic culture to take the value 1, and 0 for a country with an individualistic culture. Hofstede's cultural dimension score on individualism is used to indicate which side the society of a country generally belongs to, as it measures the interdependency of citizens (Hofstede, 2011).

Lastly, a yes or no question is used to ask whether the respondent has heard of the FAE prior to completing the survey. If so, this may have had an impact on their responses. This binary variable takes the value 1 for yes, and 0 for no.

3.4. Procedure

Subjects are required to read the introduction first, which includes a short and general description of the survey (see Appendix A Q1). To generalise the topic, individuals were told that the study is on the effect of mindfulness and education on decision-making. On the same page, respondents are asked to complete an informed consent form to continue, stating that they agree to participate in the study. By agreeing to the consent form, they understand that their data will remain fully anonymous. Then, subjects are screened by asking for their place of residence. Individuals who do not reside in the Netherlands are brought to the end of the survey. Those who fit the criteria are randomly assigned to one of the four treatment groups. After either an educational passage or the mindfulness intervention, respondents answer a scale to test whether the manipulation was successful. This will be compared between subjects for the respective control and treatment groups. Next, the FAE is measured using the NED scale. The first four items are shown, followed by an attention check, and then the remaining three questions. Lastly, several demographic questions are asked, including age, gender, nationality, occupation, previous FAE knowledge, and highest education level completed. At the end of the survey, the subjects are debriefed on the purpose of my study. Here, it is specified to the

respondents that the study had four treatment groups and investigates de-biasing individuals from the FAE (see Appendix A).

Table 1.
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Education	118	0.508	0.502	0	1
Mindful	125	0.504	0.502	0	1
Age	243	26.539	9.655	19	74
Gender	243	0.449	0.498	0	1
Occupation					
Student	243	.761	.427	0	1
Employed	243	.177	.382	0	1
Unemployed	243	.012	.111	0	1
Self Employed	243	.049	.217	0	1
Highest Education	243	4.642	1.285	2	9
Secondary	243	.119	.325	0	1
MBO	243	.037	.189	0	1
HBO Bachelor	243	.193	.396	0	1
Uni. Bachelor	243	.412	.493	0	1
Master	243	.222	.417	0	1
PhD	243	.008	.091	0	1
Prefer not to say	243	.004	.064	0	1
Other	243	.004	.064	0	1
Culture	243	0.206	0.405	0	1
Attention Check	243	0.835	0.372	0	1
Student	180	0.656	0.477	0	1

Notes: The *Education* variable takes the value 1 if the individual is in the FAE passage treatment group ($n = 60$), and 0 if in the *Biology* control group ($n = 58$). The *Mindful* variable takes the value 1 if the individual is in the mindful treatment group ($n = 63$), and 0 if in the low-mindful control group ($n = 62$). *Age* is a continuous variable, defined in years, whereas *Gender* is a binary variables with the value 1 for males, and 0 for females. Then, *Occupation* is a categorical variable with the options: student (1), employed (2), unemployed (3), and self-employed (4). *Previous FAE* is also a binary variable, where it takes the value 1 if an individual has heard of the FAE prior to completing

the survey of this study, and 0 if they have never. *Highest Education* is another categorical variable, which can take the value 1 to 9, corresponding to the respondent's highest educational attainment. With an ascending order, the options include primary school, secondary school, MBO, HBO bachelor, university bachelor, university master, PhD or higher, prefer not to say, and other. Next, *Culture* is a binary variable that represents either an individualistic (0) or a collectivistic (1) culture of the respondent's country of nationality. Similarly, the *Attention Check* binary variable takes the value 1 if the respondent correctly answered the attention check question, and 0 if they selected a different option. Lastly, the *Student* variable is a dummy variable, which takes the value 1 if the individual is a student, and 0 otherwise. There are in total 180 students who took part in this survey.

3.5. Data Analysis

This section will focus on the empirical approach to answering the research question. The data analysis strategy will include two preliminary analyses and testing the hypotheses using both parametric and non-parametric tests. It should be noted that the significance levels are set at an alpha level of 5% and tests are two-sided.

3.5.1. Preliminary Analyses

A balance test is used to test whether randomisation was successful. Given that the treatment groups are balanced, causal inferences can be made from the results. As there are four treatment groups, six t-tests are required to test the difference in means across the groups.

Then, manipulation checks are performed on both the *Education* and *Mindfulness* groups. For the *Education* group, the Self-Reported Understanding of the FAE (SRU FAE) (Stalder, 2012) is used as the manipulation check, whereas the *Mindfulness* group utilised the Langer Mindfulness Scale (LMS-14). Equations 2 and 3 will be used to test whether there is a significant difference between the corresponding control and treatment groups. Using a t-test, if there is a significant difference between being in the treatment group compared to the control group, it is credible that the manipulation was successful. It is expected that the *Education* treatment group (FAE passage) has a better reported understanding (i.e., higher total score) compared to the control group (Biology passage). Similarly, the *Mindful* group is expected to score higher on the total LMS-14 score, compared to the *Low-Mindful* group. If these expected differences hold during the manipulation check, it can be concluded that the respondent correctly interpreted the intervention (Hoewe, 2017). In turn, the conclusions drawn on the effect of education and mindfulness on the FAE will be more accurate.

$$SRU\ FAE_i = \alpha + \beta Education_i + \varepsilon_{ji} \quad (2)$$

$$LMS14_i = \alpha + \beta Mindful_i + \varepsilon_{ji} \quad (3)$$

3.5.2. Parametric Test: Linear Regression Analysis

As the outcome variable is measured as a continuous variable, we can use the ordinary least squares (OLS) regression to estimate the effects of education and mindfulness. If there are imbalances within the demographic variables, they will be controlled for. In the case of successful randomisation of the treatments in this experiment, meaning that the treatments are independent of the outcome, causal inferences can be made. This would mean that selection bias is cancelled out. The specific equations used are discussed, along with the assumptions of the OLS method.

Hypothesis 1

To test *H1*, which states that an individual in the *FAE* treatment group will demonstrate lower FAE, compared to the *Biology* control group, an OLS regression will be run using Equation 4. If there are baseline characteristics that differ significantly between the control and treatment groups, they will be included in the regression as control variables. In case there are no significant differences, the regression will be run without any control variables. For further analysis, the attention check and previous FAE dummy variables are used to test for confounding effects. Only the observations of respondents who were either in the *Biology* or *FAE Education* group are used ($n = 118$). The variable *Education* takes the value 1 if the respondent read the *FAE passage*, and 0 if they read the *Biology passage*. It is expected that the coefficient of being in the *FAE passage* group is negative, showing a lower mean NED score. *H1* can be accepted if this effect is statistically significant.

$$NEDscore_i = \alpha + \beta Education_i + \sum_{j \in C} \gamma_j Control\ Variable_{i,j} + \varepsilon_i \quad (4)$$

Hypothesis 2

H2 states that the mindful treatment group will demonstrate lower levels of FAE compared to the low-mindful group. Specifically, the *Mindfulness* sample will be used ($n = 125$). To assess this, Equation 5 will be used to run an OLS regression, where *Mindful* takes the value 1 if the individual is in the mindful group, and 0 for the low-mindful group. Based on the results from

the balance test, variables that are significantly different between the groups will be included as controls. Similar to *H1*, the dummy variables of the attention check and previous FAE will be used as an extension to the analysis as well. It is expected that the coefficient of *Mindful* will be negative and statistically significant, to show that the treatment group were less prone to FAE than the control group. This can be deduced as a lower mean score shows that the respondents were less susceptible to making dispositional inferences.

$$NEDscore_i = \alpha + \beta Mindful_i + \sum_{j \in C} \gamma_j Control Variable_{i,j} + \varepsilon_i \quad (5)$$

Hypothesis 3

The test whether the effect of the mindfulness intervention is larger than that of the educational passage (*H3*), the effect size of the two interventions will be calculated using Cohen's *d*. Using the mean of the treatment and control group, Cohen's *d* will determine the magnitude of the experimental effects (i.e., for education and mindfulness). A small, medium, and large effect size is defined as an effect size of 0.2, 0.5, and 0.8, respectively. According to Cohen, if the effect size is smaller than 0.2, the difference is said to be negligible.

Hypothesis 4

H4, states that students, specifically, will demonstrate lower FAE. To test this, a binary variable for *Student* is generated, taking the value 1 if the individual is a student, and 0 otherwise. This will allow for the testing of *H4*, whether students demonstrate lower FAE compared to non-students, by interacting the treatment variables with the *Student* dummy (see Equations 6 and 7 below). If the interaction effect is negative and statistically significant for both treatments, *H4* can be accepted.

$$NEDscore_i = \alpha + \beta Education_i + \delta Student_i + \gamma Education_i * Student_i + \sum_{j \in C} \gamma_j Control Variable_{i,j} + \varepsilon_i \quad (6)$$

$$NEDscore_i = \alpha + \beta Mindful_i + \delta Student_i + \gamma Mindful_i * Student_i + \sum_{j \in C} \gamma_j Control Variable_{i,j} + \varepsilon_i \quad (7)$$

Assumptions

Several assumptions need to be met to attain reliable results from conducting the parametric test. Firstly, all observations should be independent and identically distributed. Secondly, the variance of the error term in the sample should be consistent (i.e., homoskedasticity). Thirdly, the observations should be drawn from a normally distributed population. Lastly, all variables must be on an interval scale. The third assumption is likely to be violated in case the optimal sample size is not obtained. To test for normality of the outcome variable (i.e., the NED score), a histogram is created as it visually illustrates the distribution of the variables. For the formal testing, the Shapiro-Wilk and the skewness and kurtosis test are used. The null hypothesis of both tests state that the data is normally distributed. If the null hypothesis is rejected, meaning that the data is non-normal, using non-parametric tests could lead to more reliable results and conclusions.

3.5.3. Non-Parametric Test: Mann-Whitney U Test

Using a non-parametric test is beneficial in case one of the parametric test assumptions does not hold, because the only assumption is that the observations are independent. As the experiment uses two independent samples and a between-subject design, the Mann-Whitney U test is utilised. By ranking the data in ascending order, followed by summing the ranks, a similar rank should be expected for the two groups if they come from the same population.

Chapter 4: Results

This chapter covers the results of the preliminary tests (i.e., the balance check and manipulation check), the parametric, and non-parametric tests to assess the hypotheses. To test for statistical significance, alpha is set at 0.05.

4.1. Preliminary Tests

Two preliminary tests are conducted before testing the hypotheses. The balance check is used to test for randomisation, and the manipulation checks test whether the intended states are achieved by the respondents.

4.1.1. Balance Check

The balance table, displayed in Table 2 below, shows the differences in means between the two intervention's treatment and control groups. As the treatment group must be compared to its corresponding control group, only those two differences are outlined in Table 2. The balance test across all four groups is presented in Appendix C, Table C1.

For the *Education* group (Columns 1 and 2), all demographic variables are insignificant, except *Highest Education*. The difference in *Highest Education* is significant at a 10 percent significance level. It should be noted here that this paper sets significance levels at 0.05 and tests are two-sided. Thus, this variable does not necessarily need to be included in the regressions. To see its effect on the NED score, a regression will be run with and without the *Highest Education* variable. For the *Mindfulness* group (Columns 3 and 4), randomisation is shown to have worked successfully, as all the differences in means for the demographic variables are insignificant.

None of the variables from the balance test have to be included in the regressions as there should be homogeneity between the groups with regards to the observed characteristics. In turn, we can assume that the unobserved characteristics are also homogeneous between the two groups. Randomisation also led to an elimination of selection bias, which means that causal inferences can be made.

Table 2*The Balance Table*

Variable	(1)	(2)	(3)	(4)	Difference	
	<i>F AE Edu.</i>	<i>Biology Edu.</i>	<i>Low-Mindful</i>	<i>Mindful</i>	(1)-(2)	(3)-(4)
	Mean/SE	Mean/SE	Mean/SE	Mean/SE		
Age	27.241 (1.252)	27.500 (1.456)	26.371 (1.343)	25.143 (0.852)	-0.259	1.228
Gender	0.534 (0.066)	0.483 (0.065)	0.403 (0.063)	0.381 (0.062)	0.051	0.022
Occupation	1.328 (0.096)	1.483 (0.110)	1.371 (0.103)	1.222 (0.066)	-0.156	0.149
Culture	0.190 (0.052)	0.217 (0.054)	0.226 (0.054)	0.190 (0.050)	-0.027	0.035
Previous FAE	0.293 (0.060)	0.367 (0.063)	0.210 (0.052)	0.270 (0.056)	-0.074	-0.060
Highest Education	4.397 (0.170)	4.783 (0.152)	4.581 (0.170)	4.794 (0.165)	-0.387*	-0.213
Observations	58	60	62	63	118	125

Notes: The value displayed for t-tests are the differences in the means across the groups. *Age* is a continuous variable, defined in years, whereas *Gender* is a binary variables with the value 1 for males, and 0 for females. Then, *Occupation* is categorical variables with the options: student (1), employed (2), unemployed (3), and self-employed (4). *Culture* is a binary variable, which represents either an individualistic (0) or a collectivistic (1) culture of the respondent's country of nationality. *Previous FAE* is also a binary variable, where it takes the value 1 if an individual has heard of the FAE prior to completing the survey of this study, and 0 if they have never. *Highest Education* is another categorical variable, which can take the value 1 to 9, corresponding to the respondent's highest educational attainment. With an ascending order, the options include primary school, secondary school, MBO, HBO bachelor, university bachelor, university master, PhD or higher, prefer not to say, and other. Standard errors are robust. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

4.1.2. Manipulation Check

Table 3 and Table 4 exhibits the results of the manipulation check for the *Education* and *Mindfulness* group, respectively.

Being in the *Education* treatment group, relative to the control group, has a positive and statistically significant effect on the self-reported understanding of the FAE. This effect is statistically significant at a one percent level. Specifically, individuals in the treatment group, on average, score 7.47 points higher on the self-reported understanding scale, *ceteris paribus*. Accordingly, the FAE educational passage was more effective at informing individuals about the FAE compared to the *Biology* control group.

Table 3

Manipulation Check Results for the Education Group

	SRU of the FAE
Education	7.47*** (.878)
Constant	13.414*** (.734)
Observations	118
R-squared	.388

Notes: To calculate the self-reported understanding of the FAE (SRU of the FAE), the score on the four items of the scale by Stalder (2012) are summed (see *E-Q4 to E-Q7*, Appendix A). The *Education* variable takes the value 1 if the individual is in the FAE passage group, and 0 if they read the *Biology* passage. Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

For the *Mindful* group, being in the treatment group has a positive and statistically significant effect on the LMS-14 scale. This suggests that the Langerian mindfulness intervention had a larger impact on mindfulness in the treatment group, compared to the control group. Specifically, respondents score on average 3.37 points higher on the LMS-14, *ceteris paribus*. From this, we can conclude that the Langerian mindfulness warm-up exercises were more effective at inducing mindfulness for the treatment group, compared to the low-mindful control group.

Table 4*Manipulation Check Results for the Mindfulness Group*

	LMS-14
Mindful	3.372** (1.614)
Constant	19.581*** (1.227)
Observations	125
R-squared	.034

Notes: The LMS-14 score is computed by summing the items and subtracting the reverse-scored items (see Appendix B.1). The *Mindful* variable takes the value 1 if the respondent is in the mindful treatment group, and 0 if they are in the low-mindful control group. Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

4.2. Parametric Tests

The four hypotheses are tested by conducting OLS regressions. The NED score serves as the outcome variable, as the measure of the FAE for this paper.

4.2.1. Hypothesis 1 Testing

The results of the regressions to test the effect of the educational intervention on FAE are depicted in Table 5 below. As shown in Column 1, being in the treatment group compared to the control group has, on average, no significant effect on the NED-score. From Column 2, it can be seen that the *Highest Education* variable, which showed a significant difference between the two groups at a 10% level, is not correlated to the NED-score. Overall, it is interesting to identify that the coefficients of the FAE treatment group are negative in both columns.

The regression is rerun with the binary variables: attention check ($p = 0.339$) and previous FAE knowledge ($p = 0.541$) (see Table C2, Appendix C). It is interesting to note that the coefficient for previous FAE knowledge is negative, showing that on average individuals who have heard of the bias before, demonstrate a lower level of the FAE. However, neither of the variables are statistically significant, and therefore no conclusions can be drawn.

Table 5*OLS Regression of Education on the NED Score*

	(1)	(2)
	NED Score	NED Score
Education	-1.807 (1.516)	-2.058 (1.546)
Highest Education		.647 (.554)
Constant	28.224*** (1.171)	25.378*** (2.451)
Observations	118	118
R-squared	.012	.022

Notes: The NED score is computed by summing the 7-items based on the 7-point Likert response scale. A low NED score corresponds to less dispositional inferences, and therefore a lower level of the FAE. The *Education* variable takes the value 1 if the individual is in the FAE passage group, and 0 if they read the Biology passage. Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

4.2.2. Hypothesis 2 Testing

Table 6 below exhibits the OLS regression output to test $H2$, which states that the respondents in the *Mindful* group will demonstrate lower FAE compared to the *Low-Mindful* group. The coefficient of *Mindful* shows that the treatment group scored significantly lower on the NED-score, compared to the control group. On average, being in the *Mindful* group compared to the *Low-Mindful* group led to a 2.99 decrease in the NED-score, ceteris paribus. As the effect is statistically significant at a five percent level, there is sufficient evidence to accept $H2$.

The results of controlling for the attention check ($p = 0.368$) and previous FAE knowledge ($p = 0.793$) is shown in Table C2, Appendix C. For the Langerian mindfulness intervention, no statistically significant effects are found for both variables. Hence, having prior knowledge on the FAE does not significantly influence the NED score of the respondent.

Table 6*OLS Regression of Langerian Mindfulness on the NED Score*

	NED Score
Mindful	-2.989** (1.45)
Constant	29.29*** (.964)
Observations	125
R-squared	.033

Notes: The NED score is computed by summing the 7-items based on the 7-point Likert response scale. A low NED score corresponds to less dispositional inferences, and therefore a lower level of the FAE. The *Mindful* variable takes the value 1 if the respondent is in the mindful treatment group, and 0 if they are in the low-mindful control group. Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

4.2.3. Hypothesis 3 Testing

Cohen's d effect size for the *Education* and *Mindfulness* intervention is found to be 0.22 (CI: [-0.14, 0.58]), and 0.37 (CI: [0.01, 0.72]), respectively. Both are considered as small effect sizes. However, as aforementioned, a Cohen's d of less than 0.2 is considered a negligible effect, which the effect size of the *Education* group is marginally close to. On the other hand, for *Mindfulness*, the effect size is small, but it can be considered larger than that of *Education*.

Furthermore, as the 95% confidence interval of the *Education* group contains zero, it could be evidence of statistical non-significance (Lee, 2016). This suggests that the true difference in the level of the FAE for the *FAE* (treatment) and *Biology* (control) passage is possibly zero. For the *Mindfulness* group, the confidence interval remains in the positive. Thus, if repeated sampling is done within the same population and the 95% confidence interval is computed each time, the true effect size of Langerian mindfulness would fall within 95% of all the confidence intervals.

In toto, the effect of the Langerian mindfulness intervention is significantly larger than that of the educational passages, which provides sufficient evidence to accept $H3$.

4.2.4. Hypothesis 4 Testing

Table 7 and 8 below show the results of interacting the *Education* and *Mindfulness* treatment variables with a dummy variable of being a *Student*. By doing so, we are able to analyse the effect of the treatments on students specifically. *H4* states that students, specifically, demonstrate lower levels of FAE. Unfortunately, no significant results are shown for any of the variables, including the interactions. Consequently, there is insufficient evidence to accept the hypothesis. Notably, all the coefficients of student and the interaction terms are positive, showing that there could be a positive effect on the NED score, rather than negative (as stated in *H4*). Even so, no conclusions can be made due to the statistically insignificant results.

Table 7

OLS Regression of Education on the NED Score (Interaction with Student)

	NED Score
Education	-4.174 (3.397)
Student	1.082 (3.117)
Education Treatment × Student	3.61 (3.779)
Constant	27.385*** (2.842)
Observations	118
R-squared	.05

Notes: The NED-score is computed by summing the 7-items based on the 7-point Likert response scale. A low NED-score corresponds to less dispositional inferences, and therefore a lower level of the FAE. The *Education* variable takes the value 1 if the individual is in the FAE passage group, and 0 if they read the Biology passage. Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 8*OLS Regression of Langerian Mindfulness on the NED Score (Interaction with Student)*

	NED Score
Mindful	-3.548 (3.612)
Student	0.744 (2.306)
Student × Mindful	0.658 (3.948)
Constant	28.714*** (2.024)
Observations	125
R-squared	.036

Notes: The NED score is computed by summing the 7-items based on the 7-point Likert response scale. A low NED score corresponds to less dispositional inferences, and therefore a lower level of the FAE. The *Mindful* variable takes the value 1 if the respondent is in the mindful treatment group, and 0 if they are in the low-mindful control group. *Robust standard errors are in parentheses*

*** $p < .01$, ** $p < .05$, * $p < .1$

Assumption Testing

By plotting a histogram with a normal distribution, we can informally conclude that the data is not normal (see Figure 2 in Appendix D). Using the Shapiro-Wilk W test, we can formally test the assumption of normality for the outcome variable (i.e., NED score). As the p -value is statistically significant ($p = 0.000$), there is sufficient evidence to reject the null hypothesis. Similarly, using the skewness and kurtosis test for normality, the null hypothesis can also be rejected ($p = 0.008$). All in all, the data deviates from a normal distribution, which suggests that using a non-parametric test is more reliable.

4.3. Non-Parametric Tests

It is notable that the optimal sample size for the education group ($n = 118$), according to G-Power, was not obtained ($n = 128$). This could be a reason why a normal distribution was not obtained. As the results from the OLS regressions may not be reliable due to the potential assumption violation, the Mann-Whitney U test is performed to find the effects of the *Education* and *Mindfulness* intervention ($H1$ and $H2$).

4.3.1. Hypothesis 1 Testing

Using the Mann-Whitney U test, the results show that the average NED-score is not statistically significantly different between the *Education* treatment and control group at a five percent level ($z = 1.47, p = 0.14$). This suggests that the null hypothesis, which states that the distribution of outcomes is equal, cannot be rejected. In addition, it signifies that there is no difference between the medians of the two groups. Thus, in line with the results of the OLS regression, there is insufficient evidence to accept *H1*.

4.3.2. Hypothesis 2 Testing

In contrast with the parametric test of the effect of mindfulness on the FAE, no significant difference was found using the Mann-Whitney U test at a five percent level ($z = 1.53, p = 0.13$). Similar to *H1*, there is insufficient evidence to accept *H2*.

Chapter 5: Discussion

This thesis explores the efficacy of two different interventions: an educational passage and Langerian mindfulness, on debiasing individuals from the fundamental attribution error. Individuals are randomly allocated into either the control or treatment group of one of the interventions mentioned. After the intervention, the level of FAE per individual is measured using the NED scale. This chapter discusses the results, limitations, and further research implications.

5.1. Results

The purpose of this study is to answer the question “to what extent can an educational passage and Langerian mindfulness reduce the fundamental attribution error?”. To answer the research question, the conclusions drawn from the four formulated hypotheses are discussed.

First, an OLS regression was run to test whether the respondents reported a lower level of FAE after reading the educational passage, compared to the biology passage (*H1*). There was insufficient evidence to accept the hypothesis ($p = 0.236$). No conclusions can be made due to the insignificance. Using the Mann-Whitney U non-parametric test, no differences in the medians were found between the two groups. Hence, there is insufficient evidence to accept *H1* using both the parametric and non-parametric tests. This result is in line with that of Luong and Butler (2021). The authors suggested using the NED scale in order to capture the effect of the educational passage. As this research has not used the full NED scale, it cannot be ruled out that the scale failed to capture the effect of the educational passage.

Secondly, using an OLS regression, sufficient evidence was found to show that the mindful group demonstrated a lower level of the FAE compared to the low-mindful group (*H2*). However, no difference was found between the two groups using the Mann-Whitney U non-parametric test. As the sample size of the mindfulness intervention group ($n = 125$) exceeds the requirement according to the power calculations ($n = 110$), we can assume that it is sufficiently large. Under this assumption, the parametric test results can be used even if the outcome variable is nonnormally distributed. If the sample size is sufficiently large and there truly is an effect, the parametric test has a higher probability of detecting it due to greater statistical power. Furthermore, the average NED score of each group is a better representation of this dataset, rather than the median. Consequently, the results of the parametric test are more reliable than the non-parametric test, leading to the overall conclusion that there is sufficient

evidence to accept *H2*. The paper by Maymin and Langer (2021) supports this result as they found that Langerian mindfulness has a significant effect on reducing several cognitive biases.

Thirdly, it was hypothesised that the effect of Langerian mindfulness is larger than that of the educational passages (*H3*). Using the calculation of Cohen's *d* effect size, the effect of mindfulness had a larger effect size compared to the educational groups. We can identify the null value within the Cohen's *d* 95% confidence interval of the education group (control and treatment), whereas the confidence interval of the mindfulness group does not contain zero. With a null value, the conclusion drawn is that there is no statistically significant difference between the treatment and control group for education, whereas, for mindfulness, the conclusion is that there is a statistically significant difference between the groups. Overall, there is sufficient evidence to accept *H3*, which is in line with the evidence that mindfulness is helpful at influencing the beliefs and feelings in our subconscious mind, and in turn reduces the proneness of individuals to cognitive biases (Mrnjaus & Krneta, 2014).

For the fourth hypothesis, there was insufficient evidence to accept that the effects of the interventions are larger for students. This is not in accordance with previous findings, as Kruschke (2000) found that attending classes has an influence on attention and in turn positively effects parts of learning and immediate response. Therefore, it was expected that the responses of students in the survey would contain fewer measurement errors. But the discrepancy could be due to the lack of physical lectures as part of the COVID-19 pandemic regulations. As a result, attention in students could have been negatively affected, which could influence their responses. For example, Strielkowski (2022) believes that using Microsoft PowerPoint slides to teach students, instead of making handwritten notes from the blackboard, makes them less attentive. When completing the survey, this behaviour could be displayed in the survey responses as well.

5.2. Limitations

This study has from some limitations that could impact the internal and external validity of this study. Suggestions for further research are included.

5.2.1. Internal Validity

First, 16% ($n = 40$) of the respondents did not pass the attention check, which means that these responses could be compromised. By incorrectly completing the instructed response item, the respondents signify inattentiveness, which can affect the cognitive process. Failing to pass the attention check could suggest questionable response behaviour throughout the survey, in the form of nonresponse or shortcuts. The data is likely to contain measurement error as a quarter of the data failed to meet the attention criteria. To account for this, those who failed are excluded, but the conclusions do not change (see Appendix C, Table C3). This result is in line with the findings by Gummer et al. (2018), where removing the individuals who failed the attention check did not significantly change the overall conclusions of the empirical analysis. Additionally, the authors do not recommend omitting the observations when attempting to improve explanatory models as it is not necessarily a measure of the overall quality of the responses.

Secondly, only seven out of the ten NED scale items were used in the survey. The chosen items to be removed were based on inter-item correlations, factor loading, and keeping at least one item for each paradigm. Although this was done to reduce the duration of the experiment, using the incomplete scale could lead to inaccuracies in the measurement of the FAE. For further research, the full scale should be used in combination with an in-person survey to maximise the individual's attentiveness to the questions.

Third, there have been several papers on the differences in the FAE based on culture. Nationality is not a perfect measure of culture. To overcome this, the nationality variable is transformed by classifying countries into either the individualistic or collectivistic culture category. For example, the results of Masuda and Kitayama (2004) found that Asians, compared to Americans, have a higher tendency to defer from making dispositional inferences and include more situational information in their judgment and decision-making. However, controlling for cultural dependence on an individual level, instead of a national level, would improve the internal validity of this study. Further research could focus on measuring cultural values on an individual level, by using, for example, the 40-item personal cultural orientations (PCO) scale (Sharma, 2010).

Lastly, the manipulation check merely serves for correlational analysis, even with random assignment. This means that the intervention may have affected the manipulation check and in turn the NED scale, but the association between the manipulation check and the NED scale remains correlational (Hauser et al., 2018). An additional assessment of the relation between the manipulation check and the NED scale is needed to make causal inferences. Furthermore, as expected, there is a significant effect of having prior knowledge of the FAE on the self-reported understanding, while this knowledge did not have a significant effect on the LMS-14 (see Appendix C, Table C4). However, controlling for this variable does not statistically significantly affect the NED score for both the education group ($p = 0.926$) and the mindful group ($p = 0.608$). This suggests that prior knowledge on the FAE did not translate into a lower NED score (i.e., demonstrating lower FAE). For further research, using a pilot study before running the experiment will help determine if the intended psychological state of the treatments is attained by the participants (Hauser et al., 2018).

5.2.2. External Validity

According to the power calculations, the collected sample size is insufficient, which would directly affect the external validity. However, as there is limited information on the effect size of the educational passages, it may be that a medium effect size is an overestimation. With a smaller effect size, a larger sample is needed.

Secondly, the experimenter-demand effect could also lead to bias in the results, which negatively influences the external validity of this research. Using, for example, the Perceived Awareness of the Research Hypothesis (PARH) scale at the end of the survey could control for whether respondents were aware of the hypotheses being tested (Rubin, 2016).

To improve the application of this research to the real world, long-term studies are required. With only a short intervention, the effect of mindfulness and education is unlikely to remain in the long term. Individuals may forget immediately after the survey, or shortly after. Further research should therefore incorporate all the aforementioned limitations and collect panel data over time with repeated interventions.

Chapter 6: Conclusion

The objective of this research paper is to answer, “to what extent can an educational passage and Langerian mindfulness reduce the fundamental attribution error?”. From the empirical analyses, we can conclude that the effect of debiasing individuals from the FAE using Langerian mindfulness was successful. There was sufficient evidence to accept the hypotheses that the individuals in the mindfulness treatment demonstrated lower FAE compared to the low-mindful group (*H2*), and that the effect of the Langerian mindfulness intervention is larger than the education treatment in lowering the FAE (*H3*). However, no effect was found for the educational passages (*H1*). In addition, students did not reveal a lower level of the FAE (*H4*). These results imply that (Langerian) mindfulness is effective at improving our judgment and decision-making. However, the duration of the aftereffect is undetermined as it requires long-term adaptations of mindfulness interventions. Further research could stem from the limitations of this paper.

Although COVID-19-related restrictions and vaccine mandates have eased, the impact on the beliefs and feelings in our subconscious may still be present. With constant changes in our environment, new values and skills need to be adopted (Mrnjaus & Krneta, 2014). Specifically, students having to switch from the physical environment to fully digital learning could have led to a decrease in their attentiveness. As mindfulness continues to become an increasingly important aspect of our lives, schools and universities could adopt mindfulness education into their programs. Langerian mindfulness is one of several techniques that differ from traditional meditation, but also induces mindfulness. Educating individuals on mindfulness methods can eventually lead to them finding one way that works. Besides the methods, the many benefits of practice should also be outlined, including increased engagement, attentiveness, and cognitive performance, whilst reducing stress and anxiety.

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Appendix A: Survey

Q1 Introduction

Dear participant, welcome!

Thank you for participating in this survey.

This survey will be used for my master thesis at the Erasmus School of Economics, to study the effect of education and mindfulness on decision making.

As my target group is individuals residing in the Netherlands, please continue with the survey if you fit this description.

Your response will be kept fully anonymous. I kindly ask you to answer as truthfully as possible. The survey will take you around 8-10 minutes.

If you have any questions, please contact me: 498101yc@student.eur.nl

Q2 Consent Form

I consent to participating in the research study as described above.

- Yes, I consent to participating in the research study
- No, I don't consent and I will not participate in the research study

Q3 Residence

Please select your country of residence:

- The Netherlands
- Other

Education: Control Group

Please read the biology passage and answer the questions below. You can take as much time as you need.

NOTE: The 'next page' button will show after a while.

Biology Passage

Aerobic cellular respiration is a process that uses oxygen in order to harvest energy from organic compounds. Most eukaryotes are obligate aerobes (i.e., they use aerobic cellular respiration all of, or most of the time). Aerobic cellular respiration can be divided into four distinct stages: glycolysis, pyruvate oxidation, the Krebs cycle (also known as the citric acid cycle or the tricarboxylic acid cycle), and electron transport alongside chemiosmosis. The primary unit of energy is adenosine triphosphate (ATP), which is made through two processes: substrate-level phosphorylation, which involves direct transfer of a phosphate group from a substrate to adenosine diphosphate (ADP); or oxidative phosphorylation, which involves energy transferred indirectly from a series of reduction-oxidation reactions.

To what extent do you agree with the following statements?

*All questions are on a 6-Point Likert Scale (Strongly Disagree (1) – Strongly Agree (6))

E-Q1 It was easy to read the passage

E-Q2 Aerobic cellular respiration is easy to understand

E-Q3 Based on the passage, I understand the tricarboxylic cycle well

Manipulation Check: Self-Reported Understanding of the FAE (Stalder, 2012)

There is a concept known as the fundamental attribution error. Even if you have never heard of it, please answer the questions below.

E-Q4 How well do you feel you know the definition of the fundamental attribution error?

- Not at all
- 2
- 3
- 4
- 5
- 6
- Very Well

E-Q5 How applicable do you think the fundamental attribution error is to everyday events?

- Not at all
- 2
- 3
- 4
- 5
- 6
- Very Applicable

E-Q6 To what degree do you feel you can apply the fundamental attribution error to other people (e.g., your friend) when they explain someone's behaviour (e.g., a rude comment from a boyfriend/girlfriend)?

- Not at all
- 2
- 3
- 4
- 5
- 6
- A great degree

E-Q7 To what degree do you feel you can apply the fundamental attribution error to yourself when you explain someone's behaviour?

- Not at all
- 2
- 3
- 4
- 5
- 6
- A great degree

Education: Treatment Group

Please read the fundamental attribution error passage and answer the questions below. You can take as much time as you need.

NOTE: The 'next page' button will show after a while.

Imagine this: you're walking down a hallway until someone runs and knocks you over. He keeps running without apologising or helping you up. What would your first thoughts be about him? If you're like most people, you aren't very happy: "What a jerk!" But is this always the case? He might be a jerk, but he could also be a normal person rushing for a good reason. Imagine if you were the person who didn't stop running because your relative was dying in the hospital. What would you think about yourself in that situation? You likely wouldn't think of yourself as a jerk, but you might think that of someone else in the same situation.

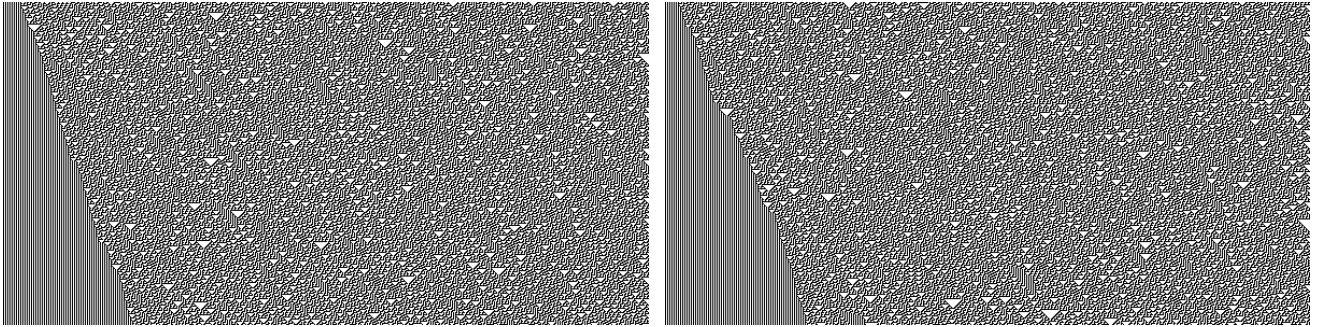
This tendency is known as the fundamental attribution error. With someone else's actions, we tend to think more about the person and less about the person's situation. Before, we thought poorly of the man as a person without thinking about his situation. But we didn't do this when we looked at ourselves in the same situation. The fundamental attribution error shows how easily we can forget the importance of the situation when judging others.

Manipulation Check: Self-Reported Understanding of the FAE (Stalder, 2012)

*See *E-Q4 to E-Q7*

Mindfulness: Control Group

M-Q1 Which image do you prefer?

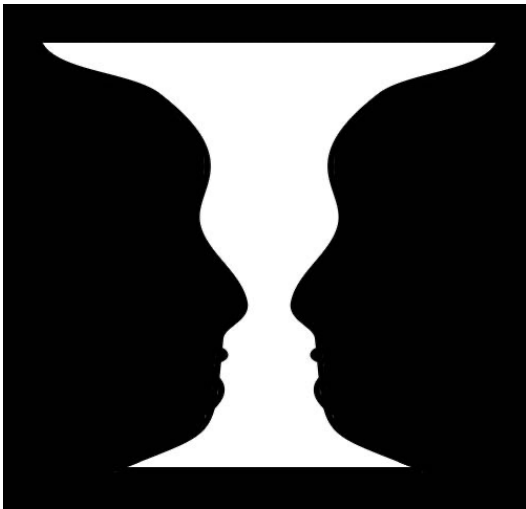


M-Q2 Can you spot the difference? (There is a difference)



- Yes, I see the difference
- No, I do not see a difference
- No, I do not think there is a difference

M-Q3 What can you see here?



- I see a vase
- I see two faces
- I see both a vase and two faces

M-Q4 Look around where you are right now and try to notice three things that you **may or may not** have noticed before.

What are those three things?

- 1 _____
- 2 _____
- 3 _____

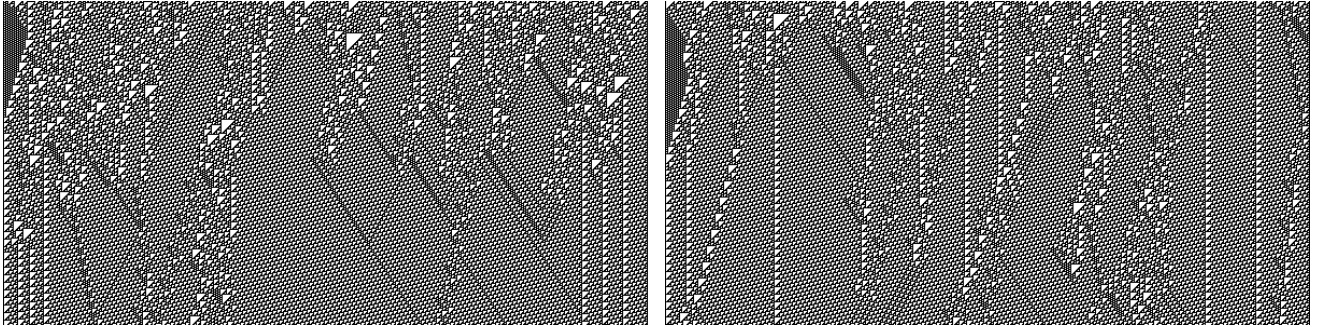
M-Q5: LMS14

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

* See Table B1, Appendix B.1.

Mindfulness: Treatment Group

M-Q6 Which image do you prefer?



M-Q7 Can you spot the difference? (There is a difference)



- Yes, I see the difference
- No, I do not see a difference
- No, I do not think there is a difference

M-Q8 What can you see here?



- I see the vase on the left and the vase on the right, but no faces anywhere.
- I see only the vase on the left, and the vase and faces on the right.
- I see only the vase on the right, and the vase and faces on the left.
- I see the vase and faces on the left and the vase and faces on the right.

M-Q9 Look around where you are right now and try to notice three **new things** that you have never noticed before.

What are those three things?

- 1 _____
- 2 _____
- 3 _____

M-Q10: LMS-14 scale (*see Table B1, Appendix B.1)

Outcome Var: FAE Measure

NED-Scale (*see Table B2, Appendix B.2.)

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

Q4 Attention Check

Please select "Strongly agree".

- Strongly disagree
- 2
- 3
- 4
- 5
- 6
- Strongly agree

Demographics

Q5 Age

Please indicate your age:

Q6 Gender

Please indicate your gender:

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

Q7 Country

Please indicate your nationality:

▼ Afghanistan ... Zimbabwe

Q8 Occupation

Please indicate your current occupation:

- Student (1)
- Employed (2)
- Unemployed (3)
- Self-employed (4)

Q9 Previous FAE

Before completing the survey, have you ever heard of the fundamental attribution error?

- Yes
- No

Q10 Highest Education

What is the highest level of education you have completed? If you are currently a student, please choose the highest level of education you have currently completed.

- Primary school (1)
- Secondary school (2)
- MBO (3)
- HBO bachelor (4)
- University bachelor (5)
- University master (6)
- PhD or higher (7)
- Prefer not to say (8)
- Other, please specify: _____

Debrief:

Thank you for participating in this survey!

The purpose of this study is to find the different effects of education and mindfulness on the fundamental attribution error (FAE). You were randomly placed into one of four treatment groups. For education, you might have read either a paragraph on the FAE or biology. Here, I want to investigate whether the awareness of the bias will mitigate it, by comparing the two groups. Similarly, for mindfulness, you might have completed one of the Langerian mindfulness warm-ups, where I attempt to investigate the difference in the effect of the treatments on FAE between the two groups.

Your answer has been recorded. For further questions or comments, please contact me at 498101yc@student.eur.nl

Sharing this survey would be highly appreciated!

Appendix B: Scales

B.1. Langer Mindfulness Scale (LMS-14)

To the best of your knowledge, to what extent do you agree with the following statements?
7-point Likert scale, ranging from strongly disagree (1) to strongly agree (7)

Table B1

The LMS-14 Scale Items

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

Notes: All the items marked with an asterisk are reverse-scored items.

B.2. NED Scale: the 10-items

Table B2

The NED Scale Items and the Corresponding Paradigms

Item	Description	Paradigm
1	<p>A famous millionaire commissioned a portrait to a local artist for 2 million dollars. The portrait will be positioned in the hall of a new museum that the millionaire has recently funded, to acknowledge his contribution. The artist portrays him as a triumphant Roman emperor.</p> <p>Q: Based on the information provided, how confident are you that the artist admires the millionaire?</p>	Attitude attribution
2	<p>Ben and Zach are presenting introductory information to new employees at a telemarketing company that calls potential customers with information about a home appliance. They flipped a coin to randomly pick what topics each would present. Ben talks about sales strategies that most often do not work. He recounts stories of being hung up on, insulted repeatedly, and led on wild goose chases by people. Zach talks about sales strategies that seem to work well. He relates times that he has connected with people, built good impressions about the product, and arranged large orders with new customers.</p> <p>Q: Based on the available information, how confident are you that Zach sells more than Ben?</p>	Quizmaster
3*	<p>Mary is working on an essay on the negative aspects of capitalism that she was assigned to prepare for her sociology course. The main points she plans to include in her essay are: that capitalism is inherently exploitative, that it leads to imperialism and oppression, and that it creates wasteful practices such as planned obsolescence of products.</p> <p>Q: Based on the information provided, how confident are you that Mary's attitude toward capitalism is negative?</p>	Attitude attribution
4	<p>A struggling freelance writer finally lands her first paid gig. Her employer, a political magazine, assigns her to write a piece advocating for the election of Senator Smith. Her feature story focuses on these three issues: 1) Senator Smith is backing legislation to spur job creation in certain sectors; 2) Senator Smith is committed to reducing America's dependence on foreign oil; and 3) Senator Smith is supporting tax cuts for small businesses.</p>	Attitude attribution

- Q:** Based on the information provided, how confident are you that the writer supports Senator Smith?
- 5* Supermodel Kate Moss has been a celebrity endorser for Rimmel make-up products for over 10 years. She appeared in more than 20 television commercials and in dozens of print advertisements. Attitude attribution
- Q:** Based on the information provided, how confident are you that she really likes Rimmel products?
- 6 Wendy found herself crying while watching a sentimental movie, which critics raved to be one of the most brilliant, powerful, and emotionally stirring films in cinema history. Silent interview
- Q:** Based on this information, how confident are you that Wendy is an emotional person?
- 7 Deborah had invited Peter to watch her class performance of Shakespeare’s play A Midsummer Night’s Dream. After the show, Deborah and Peter were discussing the plot. During this discussion, Deborah had to correct Peter multiple times on important events that occurred during the play Quizmaster
- Q:** Based on the information provided, how confident are you that Deborah is more knowledgeable than Peter?
- 8* In response to citywide budget cuts a principal is instructed to fire six teachers at her school. The principal fires Mary, a young English teacher who is extremely popular with the students. Mary is devastated to be unemployed and nervous about how she will pay her rent next month. Moral attribution
- Q:** Based on the available information, how confident are you that the principal is an inconsiderate person?
- 9 Lily is in the second grade. Her teacher has given all of the second-grade students an assignment to perform an act of charity and tell the class about it. Lily collects \$2.50 in change from her family and neighbours and donates it to the Salvation Army. Moral attribution
- Q:** Based on the information provided, how confident are you that Lily is a generous child?

10 Paula and Jasmine live in different suburbs of Los Angeles. Paula's suburb collects trash and recycling separately every week, so Paula takes the time to separate recyclable paper, plastic, and glass from her trash. Jasmine's suburb does not pick up recycling, so she puts all her trash in one trash bag. Moral attribution

Q: Based on the information provided, how confident are you that Paula cares about the environment more than Jasmine?

Notes: for this thesis experiment, items 3, 5 and 8 are left out to shorten the scale (marked with an asterisk).

Appendix C: Further Analysis

Table C1

The Balance Table

Variable	(1)	(2)	(3)	(4)	Difference					
	<i>F AE Edu.</i> Mean/SE	<i>Biology Edu.</i> Mean/SE	<i>Low-Mindful</i> Mean/SE	<i>Mindful</i> Mean/SE	(1)-(2)	(1)-(3)	(1)-(4)	(2)-(3)	(2)-(4)	(3)-(4)
Age	27.241 [1.252]	27.500 [1.456]	26.371 [1.343]	25.143 [0.852]	-0.259	0.870	2.099	1.129	2.357	1.228
Gender	0.534 [0.066]	0.483 [0.065]	0.403 [0.063]	0.381 [0.062]	0.051	0.131	0.154*	0.080	0.102	0.022
Occupation	1.328 [0.096]	1.483 [0.110]	1.371 [0.103]	1.222 [0.066]	-0.156	-0.043	0.105	0.112	0.261**	0.149
Culture	0.190 [0.052]	0.217 [0.054]	0.226 [0.054]	0.190 [0.050]	-0.027	-0.036	-0.001	-0.009	0.026	0.035
Previous FAE	0.293 [0.060]	0.367 [0.063]	0.210 [0.052]	0.270 [0.056]	0.083	0.023	0.157*	0.097	-0.060	0.083
Highest Education	4.397 [0.170]	4.783 [0.152]	4.581 [0.170]	4.794 [0.165]	-0.387*	-0.184	-0.397*	0.203	-0.010	-0.213
Observations	58	60	62	63	118	120	121	122	123	125

Notes: The value displayed for t-tests are the differences in the means across the groups. Standard errors are robust. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table C2*Regressions for H1 and H2 with Attention Check & Previous FAE as Confounders*

	(1)	(2)
	NED Score	NED Score
Education	-1.488 (1.652)	
Mindfulness		-2.995** (1.478)
Previous FAE	-.561 (1.789)	-.379 (1.444)
Attention Check	1.539 (1.939)	1.556 (1.723)
Constant	26.982*** (2.113)	28.065*** (1.711)
Observations	118	125
R-squared	.018	.039

Notes: The NED score is computed by summing the 7-items based on the 7-point Likert response scale. A low NED score corresponds to less dispositional inferences, and therefore a lower level of the FAE. The *Education* variable takes the value 1 if the individual is in the FAE passage group, and 0 if they read the Biology passage, whereas the *Mindful* variable takes the value 1 if the respondent is in the mindful treatment group, and 0 if they are in the low-mindful control group. Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table C3*Regressions for H1 and H2 with Inattention Observations Removed*

	(1)	(2)
	NED Score	NED Score
Education	-2.312 (1.705)	
Mindful		-3.417**

		(1.619)
Constant	28.698***	29.75***
	(1.198)	(1.079)
Observations	97	106
R-squared	.019	.041

Notes: The NED score is computed by summing the 7-items based on the 7-point Likert response scale. A low NED score corresponds to less dispositional inferences, and therefore a lower level of the FAE. The *Education* variable takes the value 1 if the individual is in the FAE passage group, and 0 if they read the Biology passage, whereas the *Mindful* variable takes the value 1 if the respondent is in the mindful treatment group, and 0 if they are in the low-mindful control group.

*** $p < .01$, ** $p < .05$, * $p < .1$

Table C4

Manipulation Checks with Previous FAE as Control

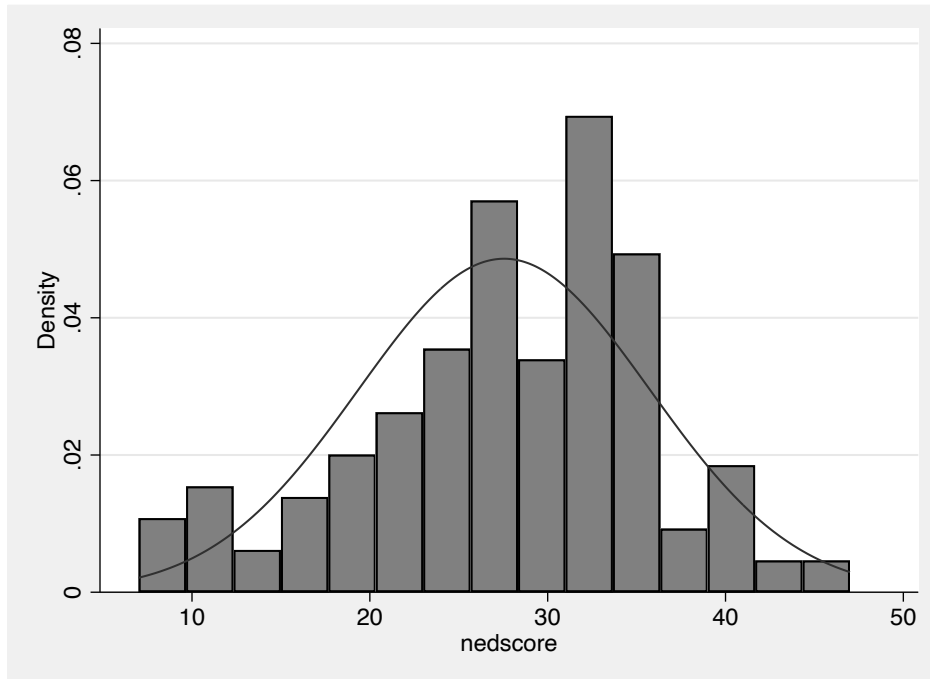
	(1)	(2)
	SRU of the FAE	LMS-14
Education	7.353***	
	(.879)	
Previous FAE	3.297***	1.396
	(.985)	(1.948)
Mindful		2.565
		(1.76)
Constant	12.458***	19.839***
	(.673)	(1.425)
Observations	97	106
R-squared	.484	.025

Notes: The *Education* variable takes the value 1 if the individual is in the FAE passage group, and 0 if they read the Biology passage, whereas the *Mindful* variable takes the value 1 if the respondent is in the mindful treatment group, and 0 if they are in the low-mindful control group. *Previous FAE* holds the value 1 if the respondent has heard of the FAE before completing the survey, and 0 if they have never heard of it. The dependent variable in Column (1) is the self-reported understanding of the FAE, which acts as the manipulation check for the education group. For Column (2), the Langer Mindful Scale (LMS-14) is the manipulation check for the mindfulness group. For both manipulation checks, the score is computed by summing their corresponding items. *Robust standard errors are in parentheses.* *** $p < .01$, ** $p < .05$, * $p < .1$

Appendix D: Normality Check

Figure 2.

Histogram of the NED Score



Notes: The graph above illustrates the distribution of the outcome variable of this study. As a reminder, the NED score is computed by summing the 7-items used based on the 7-point Likert scale.