Mindfulness and Trading Decisions

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January 15, 2025

Abstract

The growing population of retail and professional traders is vulnerable to cognitive and emotional biases that impact financial decision-making and performance. Mindfulness practices have been proposed as a method to mitigate these biases, yet existing research has predominantly focused on short-term "state mindfulness" interventions or self-reported "trait mindfulness," leaving the effects of sustained mindfulness training underexplored. This study examines the impact of "trained mindfulness" on trading decisions using a randomized controlled experiment. We analyse traders' relative and absolute returns across scenarios with varying uncertainty levels. Results indicate that mindful traders underperform in low-uncertainty scenarios characterized by high information load, with underperformance most pronounced following negative news (-35.4%). The findings suggest that mindfulness attenuates negative emotional responses, potentially slowing reactions to adverse news and impairing market timing under high information flow. This nuanced understanding contributes to the literature on mindfulness and trading, highlighting the contextual nature of its effects.

Keywords: Mindfulness Training, Cognitive Biases, Financial Decision-Making, Trading Performance, Randomized Controlled Experiment.

JEL: G11, G41, D91, C93

1. Introduction

The growing population of retail traders as well as established professional portfolio managers and traders are susceptible to various cognitive and emotional biases. These can significantly influence their trading decisions and ultimately affect personal savings and the financial performance of professional asset managers.

Mindfulness practices offer a promising approach to mitigating these behavioural biases (e.g., Maymin and Langer, 2021). Few papers have investigated the impact of mindfulness practice on financial decision making (e.g., Hafenbrack et al., 2014; Bazley et al., 2021; Charoensukmongkol, 2016; Charoensukmongkol and Aumeboonsuke, 2018). None of these focus on the lasting effects of mindfulness following a period of training, or "trained mindfulness" in a controlled environment. Instead, some focus on "state mindfulness" (Hafenbrack et al., 2014; Bazley et al., 2021) which is induced with a one-off (3-10 minute) mindfulness treatment which is immediately followed by an experiment aimed at measuring the effect of such intervention. These studies cannot shed light on whether the effects of mindfulness are persistent and can produce a lasting effect on the trader's behaviour, which is of more practical relevance. In fact, there is evidence that mindfulness induced behavioural changes achieved through trained mindfulness cannot be produced through state mindfulness alone (Gentina et al., 2021). Other studies are based on self-reported mindfulness meditation practices and trading performance, which are subject to reporting biases and allow only for limited control of the heterogeneity in mindfulness practices (Charoensukmongkol, 2016; Charoensukmongkol and Aumeboonsuke, 2018). Still another approach relies on self-reported prevalent attitudes and behaviours of an individual, normally evaluated via a questionnaire, which are termed "trait mindfulness". These also may have limited practical relevance as they cannot determine whether such traits can be acquired and what would be their effect on traders' behaviours when they are acquired rather than inherent in the personality.

Our main contribution to the literature is the first investigation of the effects of trained

mindfulness on trading decisions in a randomized controlled setting. This design is commonly used in clinical trials and experimental studies to minimize bias and ensure that the results are more likely to reflect a true cause-and-effect relationship. We analyse the market timing performance of traders by looking at relative and absolute returns. The former captures "pure" market timing as they reflect stock price fluctuations regardless of the size of the participant's position. The latter in based on stock returns as well as the size of a trader's holdings. Absolute returns not only account for market timing but also how aggressively a trader buys or sells. Our difference in the difference analysis of relative (absolute) returns shows that mindful traders underperform other traders, but only in the low uncertainty scenario. Their performance is indistinguishable from other traders in the medium and high uncertainty scenarios. The result for the low uncertainty scenario is both statistically and economically significant with a baseline underperformance of 15.7% (9.9%). Such scenario is characterised by high inflow of news which increases the information load that the trader needs to process in order to inform their trading decisions. Within our scenarios we included directional news which could be positive, indicating stock price appreciations, or negative, indicating stock price depreciations. We also included neutral news which did not have any clear implication for stock price movements.

When conditioning the analysis to the type of news we find that the underperformance of mindful traders is more pronounced following bad news, - 35.4%, while it becomes much less economically significant following positive news, -4.3%. Instead, no statistically significant difference between mindful and other traders is found following neutral news.

An explanation for these results is that mindfulness can "attenuate thoughts that emphasize negativity but not those that emphasize positivity" (Kiken and Shook, 2014). This can slow down their reaction following bad news which negatively impacts their trading performance as they remain exposed to price depreciations for longer. This response qualifies previous findings that mindfulness practitioners tend to develop stronger emotional regulation skills, allowing them to observe their thoughts and emotions without reacting impulsively. For instance, Schomburgk and Hoffmann (2023) observe that (trait) mindfulness leads to lower engagement in buy-now-pay-later (BNPL) actions through decreased impulse buying tendency. Indeed, mindfulness can be defined as "paying attention to present-moment experience without conceptual elaboration or emotional reactivity" (Jha, 2021). This means that mindfulness-trained individuals may have a reduced tendency to catastrophise and overreact to negative information. This ability allows mindful traders to recognise emotional responses to market events without being overwhelmed by them and create a mental "pause" between receiving information and acting on it. This may lead to a slower response rather than an impulsive one particularly when confronted with negative news. The implication is that market timing may suffer, even though the extent of such underperformance is restricted to contexts of high information load.

2. Experiment design

To evaluate the influence of mindfulness practice on trading behaviour, we conducted an experiment involving undergraduate and postgraduate students from the University of Reading, UK. In September 2022, we advertised our study and received 338 applications from a diverse pool of nationalities, genders, and socio-cultural backgrounds. Each applicant also completed an entry survey that included questions about their demographic data, background and risk preferences.

The experiment spanned from September 29 to October 18, 2022, comprising a trading session at the start of the period and another at the end. 241 participants attended the first session. Following the session, participants were randomly divided into two demographically matched sub-groups. Participants of the "treatment" sub-group were asked to attend individually two 12-minute pre-recorded mindfulness training videos per day for 10 consecutive days which were made available through Blackboard, a virtual learning environment platform. The two videos available on a specific day were selected from a pool of 6 videos and could be accessed at any time during the day. All the videos, created by a co-author who is an experienced mindfulness practitioner, encompassed standard mindfulness techniques based on Jha (2021). Overall, participants in the treatment group were asked to engage with 20 x 12 minute videos for a total of 4 hours. This is in line with the minimum length of mindfulness training observed by Jha (2021) to obtain measurable behavioural changes.¹ In contrast, the control group viewed daily 25 minutes of "Life Tools" videos, produced by the University's student Wellbeing Services, covering various topics including "living on a student budget and preventing debt", "motivation and productivity", "confidence: I can and I will", "how to write a cover letter" and "beyond university - looking ahead".²

We encouraged video engagement through daily reminder emails and monitored it using the back-end analytics of Yuja Enterprise Video Platform, a software application designed to manage video content. The experiment concluded with a second trading simulation, attended by 205 of the 241 participants. The final sample comprised 106 participants in the control group and 99 in the treatment (mindfulness) group. The number of participants in the two sub-groups in each stage of the experiment is reported in Table 1.

2.1. Randomisation

To ensure demographic matching between the treatment and control groups, we conducted 10,000 random allocations to both groups drawing from the students who applied to participate in this study. We then selected the allocation that demonstrated the greatest similarity in terms of age, nationality, and gender. For statistical analysis, nationalities that were thinly populated were grouped into regions. The final countries/regions considered in the analysis are Europe, Africa, UK, China, India, Malaysia, Thailand, and Others. Table 2 compares the characteristics of the treatment and control groups across several dimensions,

¹Jha (2021) arrives at "... a practical prescription, the minimum required dosage for training your attention: Four weeks, five days a week, 12 minutes a day" (p.273) which amounts to 4 hours of mindfulness training. We compressed the same number of training hours over ten days by increasing the amount of mindfulness training administered each day.

²We would like to express our gratitude to Dr. Alicia Peña Bizama who produced the "Life Tools" videos and kindly agreed to their use in our study.

revealing no statistically significant difference.

2.2. Trading rules and Incentives

During our trading simulations, no wealth constraints were imposed on participants. Rather, we enforced constraints on the size of trades (both buying and selling). As a result, the maximum exposure was capped by the maximum trade size per transaction, which was set at 100 shares, multiplied by the number of price updates or "ticks" in each simulation, 300, divided by the number of ticks required to execute a transaction, 2 on average (or, 4 seconds as prices were updated every 2 seconds). In addition to the maximum number of shares that could be purchased in a single order, the following rules were also applied to all trading simulations:

- Participants must execute a minimum of three buy transactions in each simulation, with no upper limit on the number of transactions.
- Sell orders are capped at the total number of shares held by the participant at any point in time during the simulation.
- Short-selling is not allowed.

In the absence of wealth constraints, participants in this study can trade unencumbered, responding freely to price fluctuations and market news. Furthermore, the established trading rules ensure comparability among the participants' positions. Essentially, trade size limits serve as a de facto endowment cap, considering that trade execution is time-bound within each simulation. Short-selling is excluded to level the playing field as first time traders in the study could be disadvantaged by the lack of familiarity with the concept.

To align the trading objectives of the participants we introduced monetary incentives. Participants could earn up to $\pounds 60$ for completing all the activities associated with this study. Those attending both trading sessions and watching a minimum of five days' worth of videos received a guaranteed $\pounds 20$. An additional sum of up to $\pounds 40$ was available, contingent on trading performance measured as trading profit (absolute return). Performance was evaluated by dividing the participants into two sub-groups. One group included participants with no prior finance experience (educational or professional) as reported in their responses to the entry survey. The other included participants with prior finance experience. Adherence to trading rules was a prerequisite for inclusion in the performance calculations. In each sub-group, participants in the top, middle, and bottom terciles of performance received £5, £2, and £0 per simulation, respectively. Therefore, consistently ranking in the top tercile across all the eight scenarios employed across the pre- and post-treatment sessions resulted in a maximum performance bonus of £40.³

2.3. Scenarios description

In this study, participants were required to engage with two stock trading simulation sessions, each lasting two hours. The first session occurred at the beginning of the study (from September 29 to October 3) and the second session followed the treatment intervention (from October 14 to 18). These sessions utilized ICTrader software, a proprietary trading simulation app, and involved small groups of no more than 30 participants per session. Each session comprised an introductory segment, a warm-up period, and four formal trading simulations based on different scenarios. The tick-by-tick trading actions taken by each participant during the simulations were recorded. The introduction covered the general rules of the trading session, where participants were advised to buy or sell stocks based on their expectations about stock price movements and the information they could obtain from "news" that would be shared via the trading platform. Before the introduction and warm-up, a succinct trading guide was distributed to participants to acquaint them with the ICTrader platform. The one-page guide detailed the simple procedures for buying and selling. It also provided information on how to monitor upcoming news, which were flagged

³In addition to monetary incentives, all 205 participants who attended both trading sessions were awarded trading certificates at the conclusion of the experiment. They also received a certificate indicating the hours credited towards the Reading Experience and Development (RED) Awards of the University of Reading that help students develop their employability skills.

with a sound alert and a notification on screen. Additionally, the guide explains how to track stock performance using a graph within ICTrader, which illustrates the evolution of stock prices from the start of the trading simulation.

Each of the four formal trading simulations spanned 10 minutes, including 300 price ticks at a two-second interval per tick. The scenarios were based on price movements following a Geometric Brownian motion. The drift parameter of the Brownian motion would change over the scenario to introduce positive and/or negative trends in the price series. Trend reversals may or may not be associated with directional news. When directional news were introduced they would correctly indicate a change in the slope of the trend (e.g. from positive to negative) but without indicating the exact timing of the reversal and duration of the new trend. Participants were made aware of the accuracy and limitations of the informational content of directional news. The uncertainty in each scenario is inversely related to the amount of directional news, with more directional news leading to lower uncertainty. A trading scenario may also include neutral news which has no informational value to determine future price trends. Examples of news content used in our scenarios are provided below:

- Bad *directional* news example: "War in Ukraine worsens. Stock prices to DECREASE."
- Good *directional* news example: "WXY Inc. has won a major government contract. Stock price to INCREASE."
- Neutral news example: "New species of ant found in the Sahara Desert."

2.3.1. Low uncertainty scenario

In our low uncertainty scenario, we introduced 14 news for both the pre-treatment trading session and the post-treatment trading session. Among the 14 news, 10 news were directional news in the pre-treatment session and 9 news were directional news in the post-treatment session. The remaining news were neutral. Participants could trade only one stock in this scenario.

2.3.2. Medium uncertainty scenario

For the medium uncertainty scenario, we introduced fewer directional news items. During the pre-treatment session, 6 out of 6 news items were directional, whereas in the posttreatment session, 5 out of 6 were directional. Participants could trade only one stock in this scenario.

2.3.3. High uncertainty scenario

In the high uncertainty scenario, we further reduced the number of directional news items seen in the medium uncertainty scenario and went from 6 to 5 in the pre-treatment session and from 5 to 3 in the post-treatment session. Relative to the medium uncertainty scenario, we increased the return volatility of the simulated stock prices to increase uncertainty levels. Participants could trade only one stock in this scenario. We present the stock price for high uncertainty and low uncertainty scenario in Figure 1. Panel A represents the low uncertainty scenario, while Panel B depicts the high uncertainty scenario. Green triangles indicate positive news, which is expected to be followed by a price increase. Red squares represent negative news, likely leading to a price decrease. Yellow circles signify neutral news. It is evident that in the low uncertainty scenario, participants have access to more directional news, providing better indications of stock price movements.

2.3.4. Stock picking scenario

The final scenario in each trading session is the stock picking scenario, distinct from the three previous scenarios. This scenario was specifically designed to assess whether mindfulness practice influences participants' inclination towards ethical investing. Unlike the previous scenarios, which featured only one stock, the stock picking scenario presents participants with two possible, non-exclusive, investment options: "Better World," representing a green stock, and "Tobacco Inc," symbolizing a brown stock. Participants had the choice to invest in either or both stocks. Participants were informed that if they invested exclusively in "Better World," £1 would be donated to the Save the Children charity.⁴ Notably, the design of this scenario did not allow for maximization of trading profits through investment in the green/ethical stock alone. Directional news items included in this scenario clearly highlighted that profit maximisation (and hence the chances of receiving a higher performance-based monetary compensation as discussed in Section 2.2) would be achieved by investing in the brown stock. The resulting trade-off between personal gain and ethical behaviour, confronted participants with a choice between personal monetary incentives (up to £5) and charitable benefit. At the project's conclusion, a total of £127 was donated to the Save the Children charity ⁵ through participants' trading choices.

Figure 2 illustrates the price movements of these stocks before and after treatment. In the pre-treatment scenario, both stocks initially exhibit similar upward trends until negative news about "Better World" is released. Rational investors would favour "Better World" until this juncture due to its perceived green-ness and charitable contribution. Subsequently, the price trends diverge: "Better World" stabilizes while "Tobacco Inc" continues to rise, prompting participants to weigh profit maximization against ethical considerations.

In the post-treatment scenario, "Tobacco Inc" initially underperforms, suggesting participants should favour "Better World" despite its stagnant performance. However, following positive news, "Tobacco Inc" begins to grow, testing whether its improved performance tempts participants away from ethical investing.

2.3.5. Summary statistics for trading scenarios

Table 3 presents summary statistics for stock returns in each scenario, both before and after treatment. We also report adjusted return volatilities which account for participants' temporary partial foresight following directional news. We do so by setting stock returns to zero when computing adjusted volatility, to proxy for the reduced uncertainty, for several

⁴The aim of Save the Children UK is to ensure that every child, in the UK and around the world, stays safe, healthy, and keeps learning, thereby changing their future for good. See https://www.savethechildren.org.uk for more details.

⁵See https://www.savethechildren.org.uk/donate.

ticks after each directional news. We show volatilities when returns are set to zero for 30 and 40 ticks, that is 1 minute and 1 minute and 20 seconds in the simulation, respectively, as examples of plausible periods perceived by participants in which to trade with a high degree of confidence about the trend (positive, negative or stable) that will be followed by the stock price. The adjusted volatilities mirror the ranking of scenario uncertainty based on the number of directional news in each scenario. The only exception is the post treatment low risk scenario that exhibits slightly higher adjusted volatility (.33%) than the medium uncertainty scenario's volatility (.26%) when the number of zero return ticks is set to 30.

3. Data

In this project, we gathered comprehensive data on each participant. These include tickby-tick trading behaviour data from the ICMA Centre's ICTrader, a platform developed in collaboration with Fitch Learning; video engagement data via Yuja analytics; and entry survey data covering demographics, financial literacy, meditation experience, and a range of risk measures.

3.1. ICTrader

ICTrader, designed for teaching in ICMA Centre's undergraduate and postgraduate programmes, simulates a real-world trading desk environment. We created a research version of the software, **ICTrader Research**, hosted on Amazon Web Services and deployable as an online web application. The trading scenarios discussed earlier were implemented on this platform. We collected the following trading data for each participant: participant ID, scenario ID, tick-by-tick stock price, tick-by-tick trade quantity, trading date, time and dealing room number. This information enabled the calculation of each participant's tick-by-tick relative and absolute returns for every scenario. In our analysis, we do not differentiate between realized and unrealized return, opting to calculate the cumulative return for each participant in each scenario.

3.2. Entry Survey

The entry survey, comprising 41 questions, gathered a comprehensive set of data on each participant, including demographic details (age, gender, nationality), financial literacy background (academic and professional), prior mindfulness/meditation experience, risk aversion, major loss, gender, age and financial background among others (Tan et al., 2019). The list of the survey questions used in this study is provided in the Appendix. Based on the survey, we included the following variables in our regression analysis:

- Female: A binary variable, set to 1 if the participant's birth gender is female.
- Age: The participant's age in years at the time of the first trading session.
- Financial Background: A binary variable, set to 1 if the participant has academic or professional experience in business or finance (questions 7 and 8 in the entry survey).
- Meditation Experience: A binary variable, set to 1 if the participant practices meditation at least once a week.
- **Ring Finger**: A binary variable set to 1 if the ring finger of the left hand is longer than the index finger (Tan et al., 2019). This indicator is associated with the 2D:4D ratio which refers to the ratio of the lengths of the second digit (index finger) and the fourth digit (ring finger). The ratio is often used as a marker for prenatal hormone exposure, particularly the balance of testosterone and estrogen during fetal development. This is as a non-invasive marker employed in studies investigating the effects of prenatal hormones on various traits, such as aggression, risk-taking, and athletic performance.
- **Major Loss**: The number of major loss types experienced by the participant, including financial, familial death, or natural disaster.
- Eldest: A binary variable, set to 1 if the participant is the eldest child in their family.
- Risk Behaviour: A score from 1 to 5, calculated by averaging the responses to four questions (from 16 to 19 in the entry survey) about willingness to engage in risky

behaviour.

• Risk Assessment: A score from 1 to 5, derived by averaging the responses to four questions (from 20 to 23 in the entry survey) about the perceived riskiness of specific behaviours.

Table 2 Panel C presents the summary statistics for these control variables and p-values for differences between the treated and control samples. The average age of participants was 22.8, with 39% identifying as female. Approximately 37% were the eldest child in their family, and the average major loss score was 0.46. A comparison of these pre-determined control variables between treatment and control groups reveals no statistically significant differences, supporting the robustness of our random allocation process.

3.3. Mindfulness and Life Tools videos

We utilized Yuja Analytics to track participants' engagement with the mindfulness (treatment) and Life Tools (control) videos. For each participant, we gathered the following video engagement statistics:

- Total number of videos viewed.
- Timestamps for the beginning and end of each video viewing.
- Percentage of each video watched.
- Cumulative duration of video viewing.

The key metric used to assess video engagement quality is the percentage of each video watched by the participants. For the purposes of our incentive structure, a valid intervention day required participants to watch at least 80% of the assigned video(s). A minimum of five valid intervention days was necessary for a participant to receive compensation.

In our regression analysis, we introduce the "Mindfulness Index" for participants in the treatment group. This index is a continuous variable ranging from 0 to 1, representing the extent of video engagement. A participant with no video engagement (0% viewership over all

10 days) would have a Mindfulness Index of 0, while a participant who watched 100% of the videos each day would have a Mindfulness Index of 1. To calculate this index, we summed the percentages of videos watched over the ten days and divided this figure by 20 (since treatment group participants were assigned two videos per day). This approach enables us to include all treatment group participants in the regression analysis while controlling for treatment intervention intensity.

4. Methodology

Our primary objective is to examine the impact of mindfulness practice on trading performance and portfolio selection. The baseline regression model focuses on tick-by-tick relative and absolute return as metrics of trading performance. An analysis of relative returns implicitly assumes a constant initial investment which makes returns comparable over different trade ticks for the same participant/scenario and across participants/scenarios. However, each participant's stock holdings vary substantially over each scenario. To capture this variability and its effect on traders' performance, we also use absolute returns. Our performance measures are defined as follows:

Absolute Return_{*i*,*n*,*s*,*t*} = (
$$P_{n,s,t,(i)} - P_{n-1,s,t,(i)}$$
) × Position_{*i*,*n*-1,*s*,*t*},
Relative Return_{*i*,*n*,*s*,*t*} = $\frac{P_{n,s,t,(i)} - P_{n-1,s,t,(i)}}{P_{n-1,s,t,(i)}}$.

where i, s, n and t are the indices for participant i, scenario s, price tick n, and trading session t which captures whether the session takes place before or after treatment. Both returns at tick n are computed for participants i only if the participant's stock positions at both tick n and n-1 are strictly positive.

To analyse the correlation between mindfulness practice and performance, we employ Difference in Differences (DID) regressions. To difference in differences term is the interaction between the Mindfulness Index and the Post-treatment dummy variable which is equal to 1 for all the post-treatment trading simulations. We control for participant fixed effects to account for any unobserved heterogeneity among participants and reduce any omitted variable bias. In robustness tests, we replace participant fixed effects to control for demographic information (Female, Age, Eldest), nationality/region fixed effects to account for cultural backgrounds, financial literacy information (Finance Background), risk behaviour information (Risk Behaviour, Risk Assessment, Major Loss, Ring Finger), and past meditation experience (Meditation experience) in line with Tan et al. (2019). Moreover, given that the experiments involved groups of approximately 30 participants who attended their trading sessions on different dates, time slots, and dealing rooms, we incorporated "slot" fixed-effects to control for any variability in "trading environment" that might arise from these differences. Since our study is based on a randomized controlled trial (RCT) design, the inclusion of participant fixed effects or alternative participant-specific control variables in the regression models should not significantly alter our results. This is because the random assignment of participants to treatment or control groups inherently balances both observable and unobserved factors. Even though RCTs are designed to account for potential confounders, including these controls provides an additional layer of rigor, ensuring that any observed effects are not driven by these variables (Angrist and Pischke, 2009). The baseline model is as follows:

$$Performance_{i,n,s,t} = \beta_0 + \beta_1 Post_t + \beta_2 Post_t \times Mindfulness_i + \theta_i + \theta_c + \theta_j + \epsilon_{i,n,s,t}$$
(1)

Equation 1 is our primary regression, where j and c are the indices for time slot j and country c (all other indices are as defined earlier). The dependent variable is trading performance measured either with relative or absolute return. The explanatory variables include two DID components Post_t, Mindfulness_i and Post_t × Mindfulness_i; participant-fixed effects θ_i , country-fixed effects θ_c , and time slot-fixed effects θ_j . Mindfulness_i is not included alone as it is subsumed by the participant fixed effects. We introduce this variable in robustness tests when the participant-specific variables based on the entry survey are used instead of fixed effects. Standard errors are clustered at the participant level to address serial correlation within a participant's error term. Additionally, the Peformance_{*i*,*n*,*s*,*t*} variable is winsorized at the 1% and 99% levels to mitigate outlier effects.

5. Results

5.1. Mindfulness and Market Timing

Table 4 shows summary statistics of trading undertaken by participants under the onestock high, medium and low uncertainty scenarios, in which both pre- and post-treatment simulations are combined for each scenario. The mean relative return per tick varies from 9 (medium uncertainty) to 26 basis points (low uncertainty) while the absolute return per tick varies from \$11.4 to \$20.2 respectively. The maximum position is 4,600 shares, which is well below the maximum position of 15,000 shares that a participant could have taken by executing buy transactions continuously throughout the scenario.⁶

Table 5 displays the baseline results from Equation 1. The first three models of the table focus on the high, medium, and low uncertainty scenarios, separately. In the columns 4, we combine the three scenarios. Scenario dummies are also incorporated when pooling the scenarios. The coefficient of the DID interaction term is the focal point of our analysis, as it represents the potential effect of mindfulness practice. Our findings reveal no significant treatment effect in the high and medium uncertainty scenarios (columns 1 and 2). These are characterised by a relatively low number of directional (good or bad) news, as shown in Table 3. By contrast, the DID term in the low uncertainty scenario in which participants receive frequent information about the direction of future price movements, shows a marked

⁶The maximum position is obtained by multiplying the maximum buy order of 100 by the total number of ticks in each simulation, 300, and dividing by the average execution time of 2 ticks or 4 seconds.

difference in the performance of mindful traders. They underperform other traders by 4 basis points (significant at the 1% level), when looking at tick-by-tick relative returns and by \$2 (significant at the 5% level) when looking at absolute returns, which are also economically significant changes of -15.7% and -9.9%, respectively, relative to average returns in that scenario.⁷

The finding suggests that mindful participants may be less reactive to the information they receive through news and the evolution of the stock price visible on their screen. This is particularly the case when the amount of news items increases as is the case in the low uncertainty scenarios. The finding that mindfulness-trained traders underperform when faced with high information loads is intriguing and counterintuitive. Mindfulness is often associated with improved focus, decision-making, and stress resilience (Van Vugt, 2015; The Trading Pit, 2024; Carina Sciences, 2020), all of which seem beneficial in high-pressure trading environments. Some research indicates that mindfulness can reduce overreaction to news and panic selling.⁸ However, in a fast-paced trading environment, this cautious approach might sometimes lead to missed opportunities or slower decision-making. Another possibility is that mindfulness trained traders may have developed a different risk tolerance profile. They might be more cautious, leading to missed opportunities in fast-paced markets.

The findings of a similar negative performance for mindfulness practitioners are echoed in Bazley et al. (2021). The study observed that individuals who underwent a single session of state mindfulness meditation tended to invest less and were more inclined to realize their stock gains early. This behaviour reflects a preference for immediate rewards over potential future gains. Consequently, these mindfulness-trained investors were 10-15% more likely to sell their winning stocks, resulting in approximately 4% less wealth accumulation from the trading session.

⁷A notable insight from the absolute return regression analysis is the significant increase in return during the post-trading session. The coefficient for the Post dummy variable consistently shows positive significance at the 1% level. This indicates a marked improvement in participants' trading performance during the second session compared to their initial session, suggestive of a learning or adaptation effect.

⁸Mindfulness for Traders – CarinaSciences: https://carinasciences.com/2020/10/19/mindfulness-fortraders/

Our result suggests that news frequency and, possibly news type, could influence the trading behaviour of mindful traders differently from other traders. To investigate this hypothesis, we investigate whether the negative performance of mindful traders can be explained by their behaviour right after the time when news is communicated to participants. We also differentiate between good, bad and neutral news. We have considered alternative time horizons from 5 to 30 ticks (i.e. from 10 to 60 seconds) to measure post-news performance in the low uncertainty scenario. However, as directional news typically anticipates changes in price trends (from positive to negative or from negative to positive) by a few ticks, we find that 5-15 ticks post news are not sufficient to crystallise the difference in performance between mindful and other traders as returns after the news but before the trend reversal may pollute results. Furthermore, the average distance between adjacent news is about 20 ticks in the low uncertainty scenario. So, considering a post-news performance of more than 20 ticks may confound the effects of consecutive news that may be present within the same period. For these reasons, we consider a post-news period of 20 ticks. We find that results hold with similar significance and economic also for post-news periods of 15 and 25 ticks. For consistency, we keep the same 20-tick post-news period across all scenarios. Results are presented in Table 6. This Table shows estimates of panel regressions based on equation 1 in which Down, Up and Neutral news dummies are introduced alone and interacted with the Mindfulness Index and the Post dummy. The news dummies take value 1 from the time bad, good or neutral news, respectively, is released until 20 ticks after. Directional news gives partial and temporal foresight to the participants indicating a trend reversal, or the persistence of a current trend, that take place shortly after the news. Participants do not know how quickly prices will react to the directional news or for how long.

Table 6 Panel A shows that indeed negative news, as captured by the Down dummy variable in the triple interaction Post \times Down \times Mindfulness is negative and statistically significant at the 5% level when considering relative returns (model 7 in the Table). At -6.6 basis points, this is much larger than the coefficient of the Post x Mindfulness interaction,

which is now only -2.8 basis points, down, in absolute value, from the -4 basis points in Table 5. This indicates that post-negative news behaviour is more important in explaining the underperformance of mindful traders than their behaviour following other news. Moreover, the triple interaction coefficient indicates a strongly economically significant underperformance of -25.5% for mindful traders following bad news relative to their post-news performance following other news.

Indeed, when investigating mindful traders' performance following good news (model 8 in Table 6) we find a positive and statistically significant effect rather than a negative one. Additionally, such effect of 5.11 basis points almost entirely offsets the negative coefficient of the Post x Mindfulness interaction (-6.24 basis points). The sum of these two coefficients is not statistically significant. This suggests that following positive news mindful traders perform similarly to other traders and that the underperformance of the former may be almost entirely attributed to their post-negative news trading. This is contrary to the conclusions in Bazley et al. (2021) who find that the underperformance of mindful traders is associated with upward trends (i.e. mindful traders closing positions in upward price trends prematurity and sooner than control traders) rather that in the downward trends.

Finally, model 9 shows that neutral news do not seem to introduce any significant differential impact in the performance of mindful traders relative to other news. From Table 6 we can also conclude that mindful and other traders have similar post-news performance in the high and medium uncertainty scenarios. Therefore, the underperformance of mindful traders only materialises when there is information overload that is when directional news occurs with high frequency.

Our results echo findings in psychology that suggest that mindfulness may attenuate thoughts that emphasize negativity while such attenuation may not be present with positive thoughts (Kiken and Shook, 2014). This means that mindfulness may slow the reactivity of traders to bad news, and this could ultimately impair their performance when market conditions deteriorate. These conclusions obtained when investigating pure market timing, that is when measuring performance with relative returns that capture traders' reactivity to price fluctuations only, broadly apply, even though more weakly, also to absolute returns. These combine pure market timing with the size of the position taken by the trader at each point in time, which reflect how aggressively the trader reacts to directional news. Table 6 panel B shows results based on absolute returns. Directional news (good or bad) interacted with Post × Mindfulness are no longer significant, unlike with relative returns in Panel A. The Post × Mindfulness interaction is not significant when considering the reaction of mindful traders to negative news in model 7. However, when we control for positive or neutral news in models 8 and 9, respectively, Post × Mindfulness remains negative and significant as in Table 5 panel B. In other words, this indicates that only when the Post × Mindfulness interaction incorporates the effect of negative news (i.e. when negative news is not controlled for while good and neutral news are) it is statistically significant. The implication is that the underperformance of mindful traders appears to be driven by post-negative news behaviour even when dollar returns are considered.

We also run the market timing analysis by replacing participant fixed effects with participant characteristics collected to the entry survey which are summarised in Table 2 Panel C and the Appendix. Results, reported in Table 7 and 8 are marginally weaker as unobserved participant heterogeneity cannot be fully captured by the survey questions, while they are captured more comprehensively by the participant fixed effects used in Table 5 and 6. Nonetheless, the present regressions with survey controls as they provide further insights into the behaviour of mindful traders. In Table 7 and 8 we explicitly report only those controls that are statistically significant across model specifications. All the others are still included under "Participant controls" alongside session and nation/region fixed effects at the bottom of the tables.

Table 7 confirms the findings of Table 5 in that mindful traders underperform other traders, post treatment, only under the low uncertainty scenario. This effect is now statisti-

cally significant only at the 10% level, even though economic significance is still substantial at -12.4% and -8.7% for relative (panel A) and absolute (panel B) returns, respectively. While, unsurprisingly, participant with a finance background outperform other participants, female traders underperform under all scenarios. This is consistent with some evidence in the literature. Charness and Gneezy (2012) highlight that women are generally more risk-averse than men, which might lead to more conservative trading strategies. While this can sometimes result in lower returns in high-volatility or opportunity-rich environments, it can also protect against significant losses. Eckel and Füllbrunn (2015) suggest that gender differences in financial decisions may depend on the type of task or scenario. In environments like low uncertainty, women may underperform if their risk-averse strategies limit opportunities for gains. Interestingly, our findings hold even after controlling for risk aversion.

When looking at absolute returns, the coefficient of "Risk Assessment" which captures a participant's risk aversion is positive and statistically significant. This suggests that more risk averse traders outperform other traders likely because they tend to adhere more strictly to the information associated with directional news and limit trading in periods not covered by the news. An alternative explanation is that risk averse traders may wait until a trend reversal announced by directional news materialises rather than buying and selling right after directional news are announced as other, more aggressive traders, may do. Alternative explanations are that (1) risk-averse traders might only engage in trades where the perceived risk-reward balance is highly favourable, resulting in fewer but more profitable trades; (2) risk-averse participants might avoid trading in reaction to non-directional or ambiguous news, reducing losses from noise-driven trades.

In Table 8 we extend the analysis in Table 7 by including reaction to news. Results are broadly in line with our previous findings based on participants fixed effects (Table 6) in that, for relative returns shown in Panel A, Post \times Down \times Mindfulness is still negative and significant (model 7) and Post \times Up Mindfulness is still positive and significant (model 8) confirming the opposite effect of these types on news on the performance of mindful traders post treatment. However, the mindfulness effects for absolute returns in Panel B are not statistically significant with the exception of model 8 in which Post \times Mindfulness is still significant at the 10% level.

5.2. Mindfulness and Stock Picking

The participant in this study were asked to engage with an additional trading scenario in which they had the option to invest in either or both of two stocks, a brown stock and a green stock. As discussed in Section 2.3, the purpose of the stock picking scenario is to test whether mindfulness participants are more likely to invest in the green stock. Gentina et al. (2021) study the relationship between mindfulness and ethical behaviour. They find that "mindfulness reduces avaricious monetary attitudes and enhances ethical consumer beliefs". Particularly, the authors find that long-term trained mindfulness excites consumer ethical beliefs, while the state mindfulness alone does not have a significant impact. As described in the scenario description, the stock picking scenario is designed in a such a way as to generate less profit if participants only invest in the green stock "Better World", which in turn will affect their performance-related compensation. However, if a participant only invests in the green stock, a monetary donation of $\pounds 1$ on behalf of the participant would be made to the charity Save the Children. This donation serves as a means of reinforcing the ethical dimension of participants' decisions in this trading scenario. We estimate the propensity of participants to choose the green stock with a linear probability model and a logit model. The dependent variable takes value 1 if, for the whole duration of the scenario, a participant only invests in "Better World", that is, the green stock, and zero otherwise.

Table 9 reports the results. We do not find significant difference between the treatment and control groups. As Gentina et al. (2021) points out, only long-term mindfulness training can enhance ethical consumer behaviour. Typically, they trained 30 hours for the treatment individuals over 2 months. By contrast, our participants trained for 4 hours over 10 days, which could be the reason of the discrepancy in our findings. However, we find that female participants are 27.8% more likely (OLS) and 28.3% more likely (where the margin effects difference between women and men in logit regression equals to 0.489 - 0.206) to invest in the green asset alone. This result is strongly statistically significant in both regressions. For comparison purposes, we have also run regressions to check if mindful traders' return and profit were different from those of the control group in the stock picking scenarios. We find they are not statistically significantly difference when participants' characteristics are included (Table 10) or fixed effects are used (Table 11).

6. Conclusion

Our results indicate the need for a balanced approach when advocating for mindfulness in financial training programs. While mindfulness can promote emotional stability and reduce risk-taking behaviour, its effects on market performance warrant careful evaluation to ensure that such interventions align with the intended goals of financial stability and trader effectiveness. These findings underscore the importance of understanding the situational impacts of mindfulness, ensuring its integration into trading practices is both effective and targeted.

References

- Angrist, J.D., Pischke, J.S., 2009. Mostly harmless econometrics: An empiricist's companion. Princeton university press.
- Bazley, W., Cuculiza, C., Pisciotta, K., 2021. Being present: The influence of mindfulness on financial decisions. Available at SSRN 3921871.
- Carina Sciences, 2020. Mindfulness for traders. URL: https://carinasciences.com/2020/ 10/19/mindfulness-for-traders/.accessed: 2024-08-26.
- Charness, G., Gneezy, U., 2012. Strong evidence for gender differences in risk taking. Journal of economic behavior & organization 83, 50–58.
- Charoensukmongkol, P., 2016. Mindful facebooking: The moderating role of mindfulness on the relationship between social media use intensity at work and burnout. Journal of health psychology 21, 1966–1980.
- Charoensukmongkol, P., Aumeboonsuke, V., 2018. The role of mindfulness meditation on stock trading performance. Thammasat Review 21, 111–130.
- Eckel, C.C., Füllbrunn, S.C., 2015. That she blows? gender, competition, and bubbles in experimental asset markets. American Economic Review 105, 906–920.
- Gentina, E., Daniel, C., Tang, T.L.P., 2021. Mindfulness reduces avaricious monetary attitudes and enhances ethical consumer beliefs: Mindfulness training, timing, and practicing matter. Journal of Business Ethics 173, 301–323.
- Hafenbrack, A.C., Kinias, Z., Barsade, S.G., 2014. Debiasing the mind through meditation: Mindfulness and the sunk-cost bias. Psychological science 25, 369–376.
- Jha, A., 2021. Peak mind: find your focus, own your attention, invest 12 minutes a day. Hachette UK.

- Kiken, L.G., Shook, N.J., 2014. Does mindfulness attenuate thoughts emphasizing negativity, but not positivity? Journal of research in personality 53, 22–30.
- Maymin, P.Z., Langer, E.J., 2021. Cognitive biases and mindfulness. Humanities and Social Sciences Communications 8, 1–11.
- Schomburgk, L., Hoffmann, A., 2023. How mindfulness reduces bnpl usage and how that relates to overall well-being. European Journal of Marketing 57, 325–359.
- Tan, G., Cheong, C.S., Zurbruegg, R., 2019. National culture and individual trading behavior. Journal of Banking & Finance 106, 357–370.
- The Trading Pit, 2024. Mindful trading: The key to enhanced performance. URL: https://www.thetradingpit.com/blog/ mindful-trading-the-key-to-enhanced-performance. accessed: 2024-08-26.
- Van Vugt, M.K., 2015. Cognitive benefits of mindfulness meditation. Handbook of mindfulness: Theory, research, and practice, 190–207.

Fig. 1. Pre-treatment low uncertainty and high uncertainty scenarios

This figure shows the stock price movements under low uncertainty and high uncertainty scenario, before treatment. Panel A is for the low uncertainty scenario, while the Panel B is for the high uncertainty scenario. The green triangles denote good directional news which will be followed by a price increase. The red squares denote bad directional news which will be followed by a price decrease. The yellow circles denote neutral news.



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Fig. 2. Stock picking scenarios

This figure shows the prices of the two stocks used in the stock picking scenario, before and after treatment. The stocks are Tobacco Inc and Better World. The red square indicates "bad" directional news that suggests the price will decline, the green triangles denote good directional news which will be followed by a price increase, the yellow circle denotes directional news indicating that the stock price will remain stable.





Table 1: Attrition

This table illustrates the attrition rate in our sample of participants. Undergraduate and postgraduate students from the University of Reading, UK, were invited to participate in the study.

	Attrition	
Total applicants No shows	64	305
 Participants in first trading session Session Mindfulness group Control group Attended both trading sessions: Mindfulness group Control group 	121 120 99 106	241 205
Attrition rate		33%

Table 2: Treatment and control samples: comparison

Panel A presents mean and median similarity tests for age, nationality code, and gender code between 121 participants in the treatment group and 120 participants in the control group. Panel B shows tests on the difference between the country/region distributions for the two groups. Those countries that are represented by one or very few participants are grouped into regions. The countries/regions considered are Africa, China, Europe, India, Malaysia, Thailand, UK, and "Others". The numeric gender codes are 1 for female and 0 for male. Panel C provides summary statistics for information provided by participants when enrolling for the study. "T-C Diff" is the difference between Treated mean value and Control mean value. P-value is the p value of the mean difference. Female is a dummy equal to 1 for participants that declare their gender at birth to be female. Age is the participant's age in years when the first trading sessions took place. Financial background is a dummy that is equal to 1 if the participant has either past academic experience in business or finance, or past working experience in the financial sector. Meditation experience is a dummy if participants have practiced meditation at least once a week. Ring Finger is a dummy that is equal to 1 if the participant reported their ring finger to be longer than their index finger. Major Loss is the number of different types of major loss a participant has suffered. Major loss types include major financial loss, death in family, or a natural disaster. Eldest is a dummy that is equal to 1 if the participant is the eldest child in his/her family. Risk Behaviour is a score between 1 to 5 with 5 indicating the riskiest behaviour as captures by questions from 16 to 19 in the entry survey reported in the Appendix. We sum the numerical values associated with each answer and divide by 4. Risk Assessment is a score between 1 to 5 with 5 indicating the strongest risk aversion as captures by questions from 20 to 23 in the entry survey reported in the Appendix. We sum the numerical values associated with each answer and divide by 4.

Panel A

Variables	Treatment median	Control median	Mann–Whitney U test	Treatment mean	Control mean	T test
Age (years)	21	21	0.947	22.727	22.492	0.724
Country/Region code	4	4	0.993	3.959	3.992	0.921
Gender code	1	1	0.936	0.388	0.383	0.936
Panel B						

Country/Region	Code	Treatment group	Control group	Difference	
Africa	0	7	11	-4	
China	1	24	19	5	
Europe	2	13	16	-3	
India	3	14	12	2	
Malaysia	4	3	9	-6	
Thailand	6	15	8	7	
UK	7	8	6	2	
Others	5	36	40	-4	
Chi-square test	Pearson $chi2(7) = 7$	7.5571 Pr = 0.373			
Fisher's Exact Test	Fisher's exact $Pr =$	0.385			

Kolmogorov-Smirnov test Control Pr=0.893, Treated Pr=0.780, Combined K-S Pr=1.000

Panel C

	То	tal	Control (C)	Treated (T)	T- C Diff	Pvalue
Variable	Mean	Sd	Mean (C)	Mean (T)		
Age	22.79	5.1	22.44	23.15	0.71	0.33
Female	0.39	0.49	0.39	0.38	0	0.97
Meditation experience	0.13	0.34	0.12	0.14	0.02	0.69
Financial background	0.79	1.09	0.83	0.74	-0.09	0.54
Eldest	0.37	0.48	0.4	0.33	-0.06	0.35
Major Loss	0.46	0.61	0.46	0.45	-0.01	0.93
Ring finger	0.65	0.48	0.63	0.68	0.04	0.5
Risk Behaviour	1.81	0.79	1.82	1.81	-0.01	0.94
Risk Assessment	3.91	0.82	3.9	3.92	0.03	0.81

Table 3: Scenario description

This table reports summary statistics for the one-stock trading scenarios used in the experiment. Directional news indicates the number of news that are released before a trend reversal in the stock price. Participants are informed that all news items correctly predict price trends giving participants partial foresight for an unspecified period of time. Not all trend reversals are associated with directional news. Mean return is the tick-by-tick average return for a given scenario. Return volatility is the tick-by-tick return volatility for a given scenario. The adjusted return volatility is the return volatility computed by assuming that returns are zero for a specified number of ticks (30 or 40) following a directional news.

	High Uncertainty	Scenarios Medium Uncertainty	Low Uncertainty
		Pre-treatment	
Directional news	5	6	10
Mean return	0.00%	0.01%	0.05%
Return volatility	0.69%	0.41%	0.82%
Adj. ret. Vol.(30)	0.39%	0.20%	0.17%
Adj. ret. Vol.(40)	0.34%	0.15%	0.04%
		Dest treatment	
		Post-treatment	
Directional news	3	5	9
Mean return	0.09%	0.03%	0.07%
Return volatility	0.73%	0.35%	0.92%
Adj. ret. Vol.(30)	0.64%	0.26%	0.33%
Adj. ret. Vol.(40)	0.61%	0.23%	0.16%

Table 4: Summary statistics of performance measures by scenario

This table describes summary statistics of traders' performance measures for different trading scenarios. Each scenario includes trading observations in both the pre-treatment and post-treatment sessions of that scenario. Relative Return is the tick-by-tick relative change in stock price. Absolute Return is the tick-by-tick difference in total return. Position is the total exposure of a participant at a specific time. High uncertainty is the trading scenario with least directional news (pre 5, post 3); Medium uncertainty is the trading scenario with moderate directional news (pre 6, post 5); Low uncertainty is the trading scenario with the most directional news (pre 10, post 9).

Scenarios	Variable	Obs	Mean	Min	Max
High upcontainty	Rel.Return	63,153	0.0015	-0.0163	0.0165
High uncertainty	Abs. Return Position	63,153 63,153	12.540 666.229	-213.453 3	279.040 3800
Medium uncertainty	Rel.Return Abs. Return Position	64,699 64,699 64,699	$\begin{array}{c} 0.0009 \\ 11.352 \\ 797.714 \end{array}$	-0.0073 -96.661 1	$\begin{array}{c} 0.0083 \\ 181.019 \\ 4600 \end{array}$
Low uncertainty	Rel.Return Abs. Return Position	71,003 71,003 71,003	$\begin{array}{c} 0.0026 \\ 20.219 \\ 517.216 \end{array}$	-0.0205 -151.531 2	$0.0205 \\ 191.663 \\ 3000$

Table 5: Mindfulness and Market Timing

This table shows panel difference in difference regressions in which the dependent variable is the tick n return of participant i in simulation s and trading session t which captures whether the session takes place before or after treatment. The high (medium/low) uncertainty scenario has the lowest (intermediate/highest) number of directional news. Short selling positions are not allowed. Post is a dummy which is 0 before treatment and 1 after treatment. Mindfulness is an index that varies between 0 and 1. It is 0 for participants in the control group, or participants in the treatment group who did not attend any meditation sessions. It is 1 for treatment group participants who attended all the meditation sessions attended by a participant, weighed by the length of time spent by the participants in each session. Attendance for the entire duration of a session would have a weight of 1, with shorter attendance attracting proportionally lower weights. Panel A shows result for relative returns and Panel B for absolute returns. Standard errors are clustered at the participant level and the corresponding t statistics are reported underneath the coefficients. Variables are winsorised at the 1% and 99% levels. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

	1	2	3	4
Variables	High uncertainty	Medium uncertainty	Low uncertainty	All
Post	-0.000269	0.000746^{***}	0.000797^{***}	0.000396^{***}
	[-1.135]	[4.896]	[2.997]	[2.869]
Post x Mindfulness	-0.000118	-9.76e-05	-0.000407^{***}	-0.000255^{***}
	[-0.881]	[-1.470]	[-2.625]	[-3.063]
Low uncertainty				0.00106^{***}
				[19.92]
Medium uncertainty				-0.000631***
				[-20.79]
Constant	0.00164^{***}	0.000515^{***}	0.00200***	0.00128^{***}
	[9.902]	[4.183]	[9.975]	[12.94]
Session FE	Yes	Yes	Yes	Yes
Participant FE	Yes	Yes	Yes	Yes
Observations	$63,\!153$	64,699	71,003	198,855
R-squared	0.009	0.029	0.021	0.026

Panel A: Relative Returns

Panel B: Absolute Returns

	1	2	3	4
Variables	High uncertainty	Medium uncertainty	Low uncertainty	All
Post	7.936***	21.83***	13.40***	13.67***
	[4.102]	[7.132]	[8.385]	[7.543]
Post x Mindfulness	-0.662	1.274	-2.003**	-0.732
	[-0.747]	[0.859]	[-2.042]	[-0.889]
Low uncertainty				7.019^{***}
				[25.18]
Medium uncertainty				-1.768^{***}
				[-8.119]
Constant	9.220***	-0.00281	14.42^{***}	6.455^{***}
	[6.430]	[-0.00130]	[14.32]	[4.853]
Constant EF	V	V	V	V
Session FE	Yes	Yes	Yes	Yes
Participant FE	Yes	Yes	Yes	Yes
Observations	63,153	$64,\!699$	71,003	198,855
R-squared	0.012	0.079	0.037	0.034

Table 6: Mindfulness and Reaction to News

This table reports the estimated coefficients for the OLS regression of equation 1, with the temperature variables interacted with different firm owner dummies. The dependent variable 90th" and "Days above 30°C". In each specification, we control for precipitation, firm fixed effects, industry-year fixed effects, and country linear trend. In columns 2, 3, and 4, we also is Operating income over total assets. "Industrial" is a dummy that equals 1 if a firm's ultimate owner is a non-financial company. "Family" is a dummy that equals 1 if a firm's ultimate owner is an individual or a family. "Financial" is a dummy that equals 1 if a firm's ultimate owner is a financial company. "Government" is a dummy that equals 1 if a firm's ultimate owner is a government authority. "Mean temp" is the average daily mean temperature in a year. "Days above 30" is the total number of days in a year that saw temperatures above 30° C. "Days above 90^{th} " is the total number of days in a year when the daily maximum temperature was above the 90^{th} percentile of the maximum daily temperature distribution "Days above 90th and 30" are the total number of days in a year when the daily maximum temperature met the conditions of both "Days above control for cold days effects. Robust standard errors, clustered at the firm level and country-year level, are shown in parentheses. The sample period is 2005–2014. The observations are annual. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. of the same month in 1974-2003.

$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Panel A: Relative Returns												
		1	2	n	4	ю	9	4	ø	6	10	11	12
		High uncert'y	High uncert'y	High uncert'y	Med. Uncert'y	Med. Uncert'y	Med. Uncert'y	Low uncert'y	Low uncert'y 1	Low uncert'y	All	All	All
	Variables	Down	$U_{\mathbf{p}}$	Neutral	Down	$U_{\mathbf{p}}$	Neutral	Down	Up	Neutral	Down	Up	Neutral
	Post	-0.000156	-0.000390	3.76e-05	0.000749^{***}	***076000.0	0.000831^{***}	0.000943***	-0.000766***	0.00168^{***}	0.000466***	-6.18e-05	0.000775***
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Doet v Mindfulness	[-0.652] -7 840-05	[-1.590] -0.000124	[0.155] -0.000156	[5.857] 0.740-05	[7.020] -0.425-05	[5.381]	[3.810] -0.000257*	[-3.098] _0.000634***	[6.176] _0 000407**	[3.569] _0.000187**	[-0.442] 0.000378***	[5.486] -0.000366***
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	COMMITMENTAL V 100 I	[-0.643]	-0.0055]	-0.000100	[-1.598]	[-1.257]	-3.135-00 [-1.299]	-0.00200-	-0.00024 [-2.733]	-0.000401 [-2.244]	-0.000101	-2.602]	-0.000200
Part Norm 0.0031 (0.013) 0.00313 (0.013) 0.00313 (0.013) 0.00313 (0.013) 0.00313 (0.013) Part Norm 0.0031 (0.053) 0.00314 (0.053) 0.00314 (0.053) 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) Part Norm 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) Part Norm 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) 0.00314^{-1} (0.013) Part Norm 0.00314^{-1} (0.013) 0.000314^{-1} (0.013) 0.00044^{-1} (0.013) 0.00044^{-1} (0.013) Part Norm 0.00031^{-1} (0.013) 0.00031^{-1} (0.013) 0.00044^{-1} (0.013) 0.00044^{-1} (0.0011) Part Norm 0.00031^{-1} (0.011) 0.00031^{-1} (0.011) 0.00041^{-1} (0.0011) 0.00044^{-1} (0.0011) Part Norm 0.00010^{-1} (0.0011) 0.00011^{-1} (0.0011) 0.00011^{-1} (0.0011) Part Norm 0.00010^{-1} (0.0011) 0.00011^{-1} (0.0011) 0.00011^{-1} (0.0011) Part Norm 0.00011^{-1} (0.0011) 0.00011^{-1} (0.0011) 0.00011^{-1} (0.0011) $0.00011^{$	Down	0.000143			-0.00125***			-0.00133***			-0.00104***		
Den x Muchhaes 0.00149 57-0.01 6.77-01 6.70-010 6.77-01 6.70-010 6.77-01 6.70-010 6.77-01 6.70-010 6.77-01 6.70-010 6.77-01 6.27-01 6.27-01 6.27-01 6.27-01 6.27-01 6.27-01 6.27-01 6.27-01 6.27-01 6.27-01 <td>Post x Down</td> <td>[0.0394]-0.00195***</td> <td></td> <td></td> <td>-2.000695*** -0.000695***</td> <td></td> <td></td> <td>[-9.00187*** -0.00187***</td> <td></td> <td></td> <td>-0.00142*** -0.00142***</td> <td></td> <td></td>	Post x Down	[0.0394]-0.00195***			-2.000695*** -0.000695***			[-9.00187*** -0.00187***			-0.00142*** -0.00142***		
Part x Muththus 000033 000033 000033 000033 000034	Down x Mindfulness	[-9.708] 0.000194 [0.678]			[- (.0.10] -6.79e-05 [_0 771]			0.000490* [1 819]			[-12.80] 0.000318* [1 979]		
Up -0.00013^{++-} 0.00043^{++-} 0.00043^{++-} 0.00043^{++-} 0.00043^{++} 0.00043^{++} 0.00043^{++} 0.00043^{++} 0.00043^{++} 0.00043^{++} 0.00043^{++} 0.0044^{++	Post x Down x Mindfulness	-0.000482 -0.000482 [_1 341]			0.000134 0.000134 0.862			-0.000664**			-0.000448^{**}		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Up		-0.000624***			0.000996***		1	0.000772^{***}			0.000448^{***}	
Peak Clp 000046** 00004** 00016** 00016** 00016** 00016** 00004** 00016** 00016** 00016** 00016** 00016** 00016** 00016** 00016** 00016** 00016** 00016** 00016** 000016** 000016** 000016** <td></td> <td></td> <td>[-6.791]</td> <td></td> <td></td> <td>[25.22]</td> <td></td> <td></td> <td>[5.435]</td> <td></td> <td></td> <td>[5.505]</td> <td></td>			[-6.791]			[25.22]			[5.435]			[5.505]	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Post x Up		0.000464^{***} [4.837]			-0.000419^{***} [-10.57]			0.00289^{***} $[19.39]$			0.00148^{***} [21.02]	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$Up \ge Mindfulness$		-6.71e-05			-0.000122*			-0.000241			-0.000162	
Peat x Dx Mindfilines $3.34-05$ $6.52-05$ 0.00077^{***} 0.00013^{**} 0.00013			[-0.441]			[-1.679]			[-0.936]			[-1.261]	
Neutral Nontral 0.00082*** 0.00082*** 0.000139** 0.000139*** 0.00139**** 0.00139*** 0.00139***	Post x Up x Mindfulness		3.34e-05 [0.229]			6.82e-05 [0.914]			0.000511^{**} $[2.296]$			0.000147 [1.313]	
	Neutral			0.000682^{***}			-0.000767***			-0.000153**			-0.000143**
				[6.537]			[-17.91]			[-2.184]			[-2.237]
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Neutral x Mindfulness			-0.000159 [0.005]			-3.51e-05			-0.000105			1.84e-06
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Post x Neutral			-0.00184^{***}			[01₽.0-]			-0.00283***			-0.00176***
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				[-18.77]						[-25.43]			[-23.68]
Low uncertainty $1.0.41$ $1.0.41$ $1.0.41$ $1.0.41$ $1.0.41$ $1.0.41$ $1.0.41$ $1.0.41$ $1.0.683$ $1.0.6682***$ 0.001 Medium uncertainty $0.00160***$ $0.00159***$ $0.000580***$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.000630****$ $0.00023****$ $0.00023****$ $0.000128****$ $0.000128****$ $0.000128****$ $0.000128*****$ $0.000128******$ $0.000128******$ $0.000128****$	Post x Neutral x Mindfulness			0.000174			¢			2.29e-05			-1.21e-05
	Low uncertainty			[+=0++]						[#***:0]	0.00117^{***}	0.000682^{***}	0.00118^{***}
Mediation 0.00160*** 0.00159*** 0.000568*** 0.000191* 0.000513*** 0.000214*** 0.00135*** 0.00013 1.12601 1.12601 1.12601<	Madime montointe										[25.43] 0.000580***	[10.63] 0.000620***	[20.81] 0.000795***
Constant 0.00160^{***} 0.00159^{***} 0.00058^{***} 0.000513^{***} 0.00170^{***} 0.00137^{***} 0.00138^{***} 0.00137^{***} 0.00138^{***} 0.00137^{***} 0.00138^{***} 0.001137^{***} 0.00138^{****} 0.00138^{****} 0.00138^{****} 0.00128^{****} 0.00128^{****} 0.00118^{****} 0.00204^{****} 0.00318^{****} 0.0318^{****} 0.0318^{****} 0.0318^{****} 0.0318^{*****} 0.0318^{*****} 0.0318^{*****} $0.0318^{*******}$ 0.0318^{******} <t< td=""><td>Meanum uncertainty</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-0.000380 [-18.38]</td><td>-0.000000 [-22.37]</td><td>-0.000/23</td></t<>	Meanum uncertainty										-0.000380 [-18.38]	-0.000000 [-22.37]	-0.000/23
	Constant	0.00160^{***}	0.00179^{***}	0.00159^{***}	0.000668^{***}	0.000191^{*}	0.000513^{***}	0.00221^{***}	0.00170^{***}	0.00204^{***}	0.00135^{***}	0.00128^{***}	0.00131^{***}
Session FE Yes Yes <thyes< th=""> Yes <thyes< th=""> <thyes< td=""><td></td><td>[9.592]</td><td>[10.53]</td><td>[9.444]</td><td>[6.618]</td><td>[1.728]</td><td>[4.137]</td><td>[11.60]</td><td>[10.35]</td><td>[10.34]</td><td>[14.24]</td><td>[14.00]</td><td>[12.92]</td></thyes<></thyes<></thyes<>		[9.592]	[10.53]	[9.444]	[6.618]	[1.728]	[4.137]	[11.60]	[10.35]	[10.34]	[14.24]	[14.00]	[12.92]
Participant FE Yes	Session FE	Yes	$\mathbf{Y}_{\mathbf{es}}$	Yes	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\gamma_{\rm es}$	Yes	$\mathbf{Y}_{\mathbf{es}}$	Yes	Yes	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$
$ \begin{array}{ccccccc} Observations & 63,153 & 63,153 & 63,153 & 64,699 & 64,699 & 64,699 & 71,003 & 71,003 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 198,855 & 1003 & 0.011 & 0.010 & 0.012 & 0.054 & 0.041 & 0.032 & 0.031 & 0.051 & 0.037 & 0.036 & 0.056 & $	Participant FE	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	Yes	Yes	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$
R-squared 0.011 0.010 0.012 0.054 0.041 0.032 0.031 0.051 0.037 0.036 0.05	Observations	63,153	63,153	63,153	64,699	64,699	64,699	71,003	71,003	71,003	198,855	198,855	198, 855
	R-squared	0.011	0.010	0.012	0.054	0.041	0.032	0.031	0.051	0.037	0.034	0.036	0.034

"Note that for the medium uncertainty scenario, there is only one neutral news, post treatment, which makes the estimation of of the Post x Neutral, Post x Neutral x Mindfulness interaction terms unfeasible.

Panel B: Absolute Returns												
	1	2	ŝ	4	5	9	7	8	6	10	11	12
	High uncert'y	High uncert'y	High uncert'y 1	Med. Uncert'y	Med. Uncert'y	Med. Uncert'y	Low uncert'y	Low uncert'y	Low uncert'y	All	All	All
Variables	Down	Up	Neutral	Down	$\mathrm{U}_{\mathbf{p}}$	Neutral	Down	Up	Neutral	Down	Up	Neutral
Post	9.937***	7.101***	10.50^{***}	22.19^{***}	22.41^{***}	23.18^{***}	14.84^{***}	3.436**	17.57^{***}	14.82^{***}	10.49^{***}	16.37^{***}
	[5.286]	[3.618]	[5.419]	[7.438]	[7.213]	[7.435]	[9.267]	[2.032]	[10.81]	[8.519]	[5.898]	[8.959]
Post x Mindfulness	0.222	-0.962 [-0.935]	-0.961 [-0.966]	1.199 $[0.833]$	1.271 $[0.829]$	[0.921]	-1.148 [-1.172]	-3.090^{**}	-2.234** [-1.981]	-0.127 [-0.149]	-0.954 [-1.033]	-0.733 [-0.786]
Down	9.334^{***}			-4.153***			0.141			0.778		
Post x Down	[4.993]-28.81***			[-9.049]-6.873***			[0.129]-13.29***			[0.948]-13.69***		
Down x Mindfulness	[-10.07] 4.435			[-6.790] -0.224			[-7.165] 4.063*			[-13.07] 3.516^{**}		
Post x Down x Mindfulness	[1.281] -11.07*			[-0.293] 1.127			[1.842] -3.964			[2.110] -4.976**		
	[-1.942]	0 1 /0***		[0.608]	***806 0		[-1.056]	1 776**		[-2.377]	***099 6	
40		-3.143 [-11.75]			[7.875]			-1.1.10			-2.000 [-4.962]	
Post x Up		2.442^{***}			-1.325**			18.45^{***}			9.255^{***}	
		[3.971]			[-2.506]			[13.76]			[12.69]	
Up x Mindfulness		-1.870 [-1.377]			-0.689 [-1 455]			-1.813			-1.734* [-1 809]	
Post x Up x Mindfulness		1.637 1.637			-0.0320			2.518 [1.057]			0.820	
Nontral		[0/0'T]	1 1 9 2		[eeen.u-]	-10 01***		[/ 60.1]	***90 C		[200.0]	***OUC c-
rennan			1.125 [1.335]			-12.21			-3.030			-2.209 [-5.429]
Neutral x Mindfulness			-1.864			-1.889			-1.511			-0.883
Post x Neutral			[-1.383] -14.33***			[-1.136] ^			[-1.576] -13.10^{***}			[-1.323] -12.16^{***}
			[-15.36]						[-19.80]			[-19.55]
Post x Neutral x Mindfulness			1.232 $[0.894]$			¢			0.971 $[0.801]$			-0.165 [-0.176]
Low uncertainty										7.363*** [25.85]	6.400^{***}	8.080*** [28.73]
Medium uncertainty										-1.557*** -1.6.924	-1.573*** -1.573*** [-7.414]	-2.573*** -2.573***
Constant	7.953***	11.44^{***}	9.534^{***}	0.515	-0.704	-0.0457	14.32^{***}	16.02^{***}	15.34^{***}	6.067***	7.858***	6.820***
	[5.668]	[7.798]	[6.830]	[0.243]	[-0.324]	[-0.0211]	[13.81]	[14.38]	[15.10]	[4.679]	[6.072]	[5.153]
Session FE	Yes	$\mathbf{Y}_{\mathbf{es}}$	Yes	Yes	Yes	Yes	$\mathbf{Y}_{\mathbf{es}}$	γ_{es}	Yes	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$
Participant FE	$\mathbf{Y}^{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	Yes	\mathbf{Yes}	$\mathbf{Y}_{\mathbf{es}}$	\mathbf{Yes}	\mathbf{Yes}	\mathbf{Yes}	\mathbf{Yes}	$\mathbf{Y}_{\mathbf{es}}$	\mathbf{Yes}	Yes
Observations	63,153	63,153	63,153	64,699	64,699	64,699	71,003	71,003	71,003	198,855	198,855	198,855
K-squared	0.016	0.015	0.015	0.083	0.080	0.085	0.040	0.050	0.048	0.036	0.035	0.040
					-		۲ د د	:	;		:	

Table 7: Market Timing with Survey-based Controls

This table shows panel difference in difference regressions in which the dependent variable is the tick n return of participant i in simulation s and trading session t which captures whether the session takes place before or after treatment. The high (medium/low) uncertainty scenario has the lowest (intermediate/highest) number of directional news. Short selling positions are not allowed. Post is a dummy which is 0 before treatment and 1 after treatment. Mindfulness is an index that varies between 0 and 1. It is 0 for participants in the control group, or participants in the treatment group who did not attend any meditation sessions. It is 1 for treatment group participants who attended all the meditation sessions in their entirety. A value of the mindfulness index between 0 and 1 represents that proportion of meditation sessions attended by a participant, weighed by the length of time spent by the participants in each session. Attendance for the entire duration of a session would have a weight of 1, with shorter attendance attracting proportionally lower weights. Panel A shows result for relative returns and Panel B for absolute returns. Controls include demographic information (female, age, eldest), financial literacy information, risk behaviour information (risk behaviour, risk assessment, major loss, ring finger), and past meditation experience. Only controls that are statistically significant across all scenarios are explicitly reported. Standard errors are clustered at the participant level and the corresponding t statistics are reported underneath the coefficients. Variables are winsorised at the 1% and 99% levels. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Relative Returns				
	1	2	3	4
Variables	High uncertainty	Medium uncertainty	Low uncertainty	All
_				
Post	-0.000360	0.000684***	0.000470*	0.000251
Mindfulness	[-1.426]	[5.139] 0.000132*	[1.725] 0.000278*	[1.449]
Mindrumess	0.000115	[1.874]	[1.656]	[1 017]
Post x Mindfulness	-0.000130	-0.000111	-0.000323*	-0.000236**
	[-0.911]	[-1.626]	[-1.812]	[-2.503]
Female	-0.000251***	-0.000126**	-0.000565***	-0.000325***
	[-2.660]	[-2.360]	[-3.659]	[-3.787]
Finance background	0.000251^{***}	0.000192^{***}	0.000511^{***}	0.000326^{***}
_	[2.707]	[3.766]	[3.496]	[3.718]
Low uncertainty				0.00109***
Madiana and a inter				[19.29]
Medium uncertainty				-0.000623
Constant	0.000875*	0.000122	0.00113*	0 000522
Competition	[1.908]	[0.471]	[1.878]	[1.358]
	[]	[· ·]	[]	[]
Participant controls	Yes	Yes	Yes	Yes
Session FE	Yes	Yes	Yes	Yes
Nation/Region FE	Yes	Yes	Yes	Yes
Observations	63,153	64,699	71,003	198,855
R-squared	0.003	0.020	0.010	0.019
Panel B: Absolute Returns				
	1	2	3	4
Variables	High uncertainty	Medium uncertainty	Low uncertainty	All
Post	4.549**	19.13***	10.95***	11.24***
	[2.172]	[8.010]	[5.353]	[5.958]
Mindrumess	2.102	[2.050]	1.(1)	[2 210]
Post x Mindfulness	-0.699	[2.030]	-1 762*	-0.786
1 OSU X WINGHUMESS	[-0.759]	[0.684]	[-1.657]	[-0.907]
Risk assessment	1.315**	1.466***	1.773***	1.535***
	[2.037]	[2.675]	[2.993]	[2.826]
Female	-4.619***	-3.822***	-5.915***	-4.790^{***}
	[-4.843]	[-4.385]	[-5.640]	[-5.523]
Finance background	2.965***	2.524***	3.169***	2.965***
T , 1 ,	[3.197]	[3.052]	[3.261]	[3.508]
Low uncertainty				[22,10]
Modium uncortainty				[22.10] 1 710***
Medium uncertainty				[-6 296]
Constant	3.630	-7.861**	10.89**	0.523
	[0.872]	[-2.168]	[2.589]	[0.146]
Participant controls	Yes	Yes	Yes	Yes
Session FE	Yes	Yes	Yes	Yes
Nation/Region FE	Yes	Yes	Yes	Yes
Observations	03,133	04,099	71,003	198,855

Table 8: Reaction to News with Survey-based Controls

the participants in each session. Attendance for the entire duration of a session would have a weight of 1, with shorter attendance attracting proportionally lower weights. Down is a dummy variable that equals one from the time a negative news is announced and for the following 20 ticks. Up is a dummy variable that equals one from the time a positive news is This table shows panel difference in difference regressions in which the dependent variable is the tick n return of participant i in simulation s and trading session t which captures whether the session takes place before or after treatment. The high (medium/low) uncertainty scenario has the lowest (intermediate/highest) number of directional news. Short selling positions are not allowed. Post is a dummy which is 0 before treatment and 1 after treatment. Mindfulness is an index that varies between 0 and 1. It is 0 for participants in the control group, or participants in the treatment group who did not attend any meditation sessions. It is 1 for treatment group participants who attended all the meditation sessions in their entirety. A value of the mindfulness index between 0 and 1 represents that proportion of meditation sessions attended by a participant, weighed by the length of time spent by amounced and for the following 20 ticks. Neutral is a dummy variable that equals one from the time a neutral news is amounced and for the following 20 ticks. Panel A shows result for relative returns and Panel B for absolute returns. Controls include demographic information (female, age, eldest), financial literacy information, risk behaviour information (risk behaviour, risk assessment, major loss, ring finger), and past meditation experience. Only controls that are statistically significant across all scenarios are explicitly reported. Standard errors are clustered at the participant level and the corresponding t statistics are reported underneath the coefficients. Variables are winsorised at the 1% and 99% levels. *, **, denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Relative Returns	1	2	3	4	5	6 6	7	8	6	10	11	12
Variables	ыgn uncert y Down	Up Up	nign uncert y Neutral	Med. Uncerty Down	Mea. Uncerty Up	Med. Uncerty Neutral	Low uncert y Down	Low uncerty Up	Low uncerty Neutral	АП Down	Up Up	All Neutral
Post	-0.000282	-0.000476*	-9.40e-06	0.000702^{***}	0.000913^{***}	0.000763***	0.000640^{***}	-0.00101^{***}	0.00132^{***}	0.000321^{**}	-0.000177	0.000639***
	[-1.134]	[-1.801]	[-0.0372]	[6.421]	[7.608]	[5.644]	[2.620]	[-3.798]	[4.632]	[2.030]	[-1.017]	[3.637]
Mindfulness	9.29e-05 [0.712]	0.000130 [0.740]	0.000134 [0.820]	0.000117* [1.747]	0.000129* $[1.722]$	0.000133^{*}	0.000184 [1.440]	0.000370	0.000302^{*}	0.000159* [1.761]	0.000251^{*}	0.000218^{**}
Post x Mindfulness	-8.97e-05 [-0.700]	-0.000136 -0.829	-0.000170 -0.000170 [-1.093]	-0.000109* [-1.733]	-9.88e-05 [-1.299]	-0.000106 [-1.450]	-0.000185 [-1.224]	-0.000533**	-0.000317 [-1.564]	-0.000171** [-2.047]	-0.000253** -0.1961	-0.000244** -0.2556]
Down	[. 0.199] 3.26e-06 [0.0199]			-0.00133*** -0.00133***						-0.00116*** [_14_15]		
Post x Down	-0.00183*** -0.00183***						-0.00190***			-0.00143*** -0.00143***		
Down x Mindfulness	0.000189 0.000189			-9.33e-05			0.000407			0.000276* [-10:40]		
Post x Down x Mindfulness	[0.044] -0.000483 [1, 242]			[351.035] 0.000158 11.030			[1.542] -0.000615** [1.5.061]			[1.087] -0.000406** [3355]		
Up	[77:07-]	-0.000545***		[nen:t]	0.00107^{***}		[100.2-]	0.000907***		[007.7-]	0.000537***	
Post x Up		[-5.597] 0.000464***			[28.76]-0.000466***			[6.380] 0.00287***			[6.518] 0.00146***	
Up x Mindfulness		[4.823]-7.32e-05			[-12.28] -0.000105			[19.60] -0.000199			[21.11]- 0.000154	
Post x Up x Mindfulness		[-0.453] 3.34e-05			[-1.473] 5.11e-05			[-0.759] 0.000490**			[-1.159] 0.000128	
		[0.229]			[0.700]	***************************************		[2.193]	****0		[1.143]	*0010000
Neutral			0.000783*** [7.058]			-0.000744*** [-16.98]			-0.000194*** [-2.821]			-0.000126* [-1.940]
Neutral x Mindfulness			-0.000185			-3.15e-05			-7.69e-05			-1.65e-05
Post x Neutral			-0.00198***			[=0=-0-]			-0.00275***			-0.00177***
Post x Neutral x Mindfulness			[-19.06] 0.000215 f1.0041			¢			[-24.01] 8.26e-06 fo.04001			-4.86e-06
Female	-0.000245** [0.600]	-0.000261*** [a zaal	[1.234]-0.000242***	-9.44e-05** [6 140]	-9.94e-05**	-0.000127** [0.000127**	-0.000482***	-0.000482***	[0.0400] -0.000565*** [2.205]	-0.000283*** . [2 2 40]	-0.000296*** [3 736]	-0.000324*** -0.000324***
Finance Background	[-2:000] 0.000245***	[-2.122] 0.000253*** [5.224]	0.000245*** 0.000245***	0.000149*** 0.000149***	0.000169^{***}	0.000193*** 0.000193***	0.000439*** [6.461]	0.000431*** 0.000431	0.000509*** 0.000509***	0.000286*** 0.000286***	0.000300*** [0.000300	0.000323*** [0.00123***
Low uncertainty	[2.661]	[2.684]	[617.2]	[826.5]	[3.777]	[3.754]	[3.401]	[3.406]	[3.439]	$[3.591] 0.00121^{***}$	[3.703]0.000686***	[3.674] 0.00121***
Medium uncertainty										[24.61]-0.000567***	[10.28]-0.000626***	[20.36]-0.000717***
										[-17.05]	[-20.63]	[-21.54]
Constant	0.000901 **	0.000986^{**}	0.000777* [1.716]	0.000400* [1.879]	-0.000178 [-0.788]	0.000116 $[0.446]$	0.00153^{***} [2.940]	0.000780 [1.493]	0.00118^{*} [1.936]	0.000728^{**} [2.093]	0.000540 [1.495]	0.000510 [1.328]
Darticinant controls	, Voc	, Nos	, ,	, Nos	, , ,	, , ,	, , ,	, ,	, , , ,	, Voc	, , ,	, , ,
Session FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nation/Region FE	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	Yes	$\mathbf{Y}_{\mathbf{es}}$	Yes	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	Yes	Yes
Observations	63, 153	63, 153	63, 153	64,699	64, 699	64,699	71,003	71,003	71,003	198, 855	198,855	198,855
R-squared	0.005	0.004	0.006	0.047	0.034	0.023	0.022	0.042	0.025	0.028	0.031	0.027
[•] Note that for the medium unc	ertainty scenari	o there is only a	one neutral nev	vs. nost treatme	nt. which make	s the estimation	of of the Pos	t v Neutral. Po	st x Neutral x	Mindfulness in	nteraction terr	anteasible.

Panel B: Absolute Returns	1	2	3	4	5	6	7	8	9	10	11	12
Variables	High uncert'y Down	High uncert'y Up	High uncert'y Neutral	Med. Uncert'y Down	Med. Uncert'y Up	Med. Uncert'y Neutral	Low uncert'y] Down	Low uncert'y I Up	Jow uncert'y Neutral	All Down	$_{\rm Up}^{\rm All}$	All Neutral
Doot	***C0F 2	9 600	*** *200 11	**************************************	***00 01	***00 00	ст ***п	202 I	***00 7 1	**************************************	*** 01 0	***00 7 5
F OSC	[2.919]	3.330 [1.630]	[3.615]	19.00 [8.424]	[8.273]	20.39 [8.348]	12.40 [6.228]	1.020	14.99 [7.075]	12.33 [6.665]	[4.331]	14.00 [7.326]
Mindfulness	1.685^{*}	2.487*	2.329*	1.329^{**}	1.488^{**}	1.387**	0.989	2.479	2.157*	1.477^{**}	2.491^{**}	2.110^{**}
	[1.821]	[1.801]	[1.914]	[2.031] 0.055	[2.103]	[2.053]	[1.140]	[1.516]	[1.880]	[2.012]	[2.341]	[2.468] 0.748
FOSU X MUNDIULINESS	[0.185]	[996.0-]	-0.963]	[0.651]	[0.699]	1.264 [0.765]	-0.920 [-0.884]	-2.014	[-1.596]	-0.203	-0.965 [-1.041]	-0.776]
Down	8.672***		s 4	-4.972***	, ,	, ,	-1.010			-0.159		
Post x Down	[4.532]-28.04***			[-12.93] -6.764^{***}			[-0.978]-12.93 $***$			[-0.200] -13.42***		
Down x Mindfulness	[-9.696] 4.016			[-7.186] -0.421			[-7.040] 3.588*			[-12.95] 3.033^{*}		
	[1.152]			[-0.587]			[1.693]			[1.863]		
FOSU X DOWIL X INHIGUININESS	-11.11			[0.830]			-3.507 [-1.032]			[-2.231]		
Up		-8.748*** [-11.02]			3.120^{***} [13.86]			-1.039 [-1.251]			-1.935*** [-3.716]	
Post x Up		2.693^{***}			-1.885***			18.00^{***}			8.998***	
Up x Mindfulness		[4.057] -1.766			[-3.792]-0.691*			[13.59] -1.610			[12.43]-1.724*	
Post x Up x Mindfulness		[-1.280] 1.744			[-1.709] -0.126			[-1.018] 2.579			[-1.818] 0.785	
Neutral		[1.595]	1 513 *		[-0.133]	-11 xx***		[1.092]	-3 204***		[0.630]	-0 108***
			[1.771]			[-11.92]			[-6.829]			[-5.282]
Neutral x Mindfulness			-1.810 [-1.315]			-2.074 [-1.225]			-1.490 [-1.596]			-1.163^{*} [-1.800]
Post x Neutral			-15.11***			- - -			-12.76***			-12.20^{***}
Post x Neutral x Mindfulness			[-16.17] 1.260			¢			0.786			[-19.92] -0.152
Risk Assessment	1.328^{**}	1.343^{**}	[0.934] 1.302**	1.472^{***}	1.472^{***}	1.471^{***}	1.741^{***}	1.735^{***}	[0.654] 1.751***	1.513^{***}	1.520^{***}	[-0.164] 1.532^{***}
	[2.040]	[2.021]	[2.063] 4 F80***	[2.782] 2.665***	[2.720] 3.750***	[2.668]	[3.024] 5 750***	[3.058]	[2.956]	[2.823] 4 705***	[2.814]	[2.837]
Leunare	-4.419 [-4.862]	-4.946]	-4.002 [-4.881]	-3.003 [-4.343]	-3.132 [-4.335]	-3.049 [-4.379]	-3.138	-5.697]	[-5.635]	-4.703 [-5.519]	[-5.593]	[-5.541]
Finance Background	3.005*** [3.207]	3.038^{***}	2.910^{***}	2.318*** [2.871]	2.464^{***}	2.537*** [3.057]	3.037*** [3.103]	2.927^{***}	3.159*** [3.265]	2.858*** [3 437]	2.935*** [3.406]	2.936*** [3.486]
Low uncertainty	[107:0]	EOT O	[101.0]	[+ i 0 · 7]	[++0.0]	[100.0]	607.0	07.140	007.0	7.671***	6.464^{***}	8.314***
Medium uncertainty										[23.25] -1.476***	[18.09] -1.554***	[25.28] -2.533 $***$
C										[-5.349]	[-5.774]	[-9.239]
Constant	2.824	5.367	3.364	-6.615*	-8.761**	-7.964**	11.37^{***}	11.65^{***}	11.85^{***}	0.760	1.542	0.597
	0.663	[1.238]	[0.817]	[-1.896]	[-2.449]	[-2.179]	[2.767]	[2.812]	[2.816]	[0.215]	[0.428]	[0.167]
Participant controls	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	Yes	Yes	$\mathbf{Y}_{\mathbf{es}}$	Yes	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$	$\mathbf{Y}_{\mathbf{es}}$
Session FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nation/Region FE Observations	Yes 63 153	Yes 63 153	Yes 63.153	Yes 64.699	Yes 64 699	Yes 64 699	Yes 71.003	Yes 71,003	Yes 71.003	Yes 198.855	Yes 198 855	Yes 198 855
R-squared	0.010	0.008	0.009	0.068	0.064	0.068	0.029	0.040	0.037	0.027	0.026	0.031
Note that for the medium unce	rtainty scenario	, there is only	one neutral nev	vs, post treatme	nt, which make	s the estimation	of of the Post	x Neutral, Pos	st x Neutral x	Mindfulness ir	iteraction tern	is unfeasible.

Table 9: Stock Picking and Gender

This table shows panel difference in difference OLS and logit regressions in which the "Green Investor" dependent variable is equal to 1 for participants who only invest the Better World stock in the stock picking scenario and 0 otherwise. Post is a dummy which is 0 before treatment and 1 after treatment. Mindfulness is an index that varies between 0 and 1. It is 0 for participants in the control group, or participants in the treatment group who did not attend any meditation sessions. It is 1 for treatment group participants who attended all the meditation sessions in their entirety. A value of the mindfulness index between 0 and 1 represents that proportion of meditation sessions attended by a participant, weighed by the length of time spent by the participants in each session. Attendance for the entire duration of a session would have a weight of 1, with shorter attendance attracting proportionally lower weights. Controls include demographic information (female, age, eldest), financial literacy information, risk behaviour information (risk behaviour, risk assessment, major loss, ring finger), and past meditation experience. Standard errors are clustered at the participant level and the corresponding t statistics are reported underneath the coefficients. Variables are winsorised at the 1% and 99% levels. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

	OLS	Logit		
Variables	Dep. Var	iable: Green investor		
Post	-0.00589	-0.145		
	[-0.0740]	[-0.348]		
Mindfulness	-0.150	-0.955		
	[-1.020]	[-1.211]		
Post x Mindfulness	-0.0349	-0.141		
	[-0.330]	[-0.234]		
Female	0.278^{***}	1.590^{***}		
	[4.750]	[4.466]		
Observations	374	374		
R-squared	0.191			
PseudoR2		0.176		
Controls	Yes	Yes		
Slot FE	Yes	Yes		
Country FE	Yes	Yes		
Logit model marginal effects				
	Margin	Std. err.	Ζ	p > Z
Female 0	0.206	0.025	8.150	0.000
Female 1	0.489	0.048	10.230	0.000
$[Green_investor]0b.female - [Cchi2 (1) = 19.95Prob > chi2 = 0.0000$	Freen_invest	tor]1b.femal $= 0$		

Table 10: Mindfulness and Stock Picking with Survey-based Controls

This table shows panel difference in difference regressions in which the dependent variable is the tick n return of participant i in stocking picking scenario and trading session t which captures whether the session takes place before or after treatment. Short selling positions are not allowed. Post is a dummy which is 0 before treatment and 1 after treatment. Mindfulness is an index that varies between 0 and 1. It is 0 for participants in the control group, or participants in the treatment group who did not attend any meditation sessions. It is 1 for treatment group participants who attended all the meditation sessions in their entirety. A value of the mindfulness index between 0 and 1 represents that proportion of meditation sessions attended by a participant, weighed by the length of time spent by the participants in each session. Attendance for the entire duration of a session would have a weight of 1, with shorter attendance attracting proportionally lower weights. Model 1 shows result for relative returns and Model 2 for absolute returns. Controls include demographic information (female, age, eldest), financial literacy information, risk behaviour information (risk behaviour, risk assessment, major loss, ring finger), and past meditation experience. Standard errors are clustered at the participant level and the corresponding t statistics are reported underneath the coefficients. Variables are winsorised at the 1% and 99% levels. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

	1	2
Variables	Rel.Return	Abs.Return
Post	-0.000179*	6.685**
	[-1.947]	[2.541]
Mindfulness	$7.55e-05^{**}$	2.190^{**}
	[2.117]	[2.000]
Post x Mindfulness	-7.28e-05	-1.698
	[-1.245]	[-1.163]
Observations	99.219	99,219
R-squared	0.003	0.008
Controls	Yes	Yes
Slot FE	Yes	Yes
Country FE	Yes	Yes

Table 11: Mindfulness and Stock Picking

This table shows panel difference in difference regressions in which the dependent variable is the tick n return of participant i in stock picking scenario and trading session t which captures whether the session takes place before or after treatment. Short selling positions are not allowed. Post is a dummy which is 0 before treatment and 1 after treatment. Mindfulness is an index that varies between 0 and 1. It is 0 for participants in the control group, or participants in the treatment group who did not attend any meditation sessions. It is 1 for treatment group participants who attended all the meditation sessions in their entirety. A value of the mindfulness index between 0 and 1 represents that proportion of meditation sessions attended by a participant, weighed by the length of time spent by the participants in each session. Attendance for the entire duration of a session would have a weight of 1, with shorter attendance attracting proportionally lower weights. Model 1 shows result for relative returns and Model 2 for absolute returns. Standard errors are clustered at the participant level and the corresponding t statistics are reported underneath the coefficients. Variables are winsorised at the 1% and 99% levels. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

	1	2
Variables	Rel.Return	Abs.Return
Post	-0.000193	5.788
	[-1.456]	[1.587]
Post x Mindfulness	-6.15e-05	-1.587
	[-1.020]	[-1.101]
Observations	99,219	99,219
R-squared	0.009	0.023
Slot FE	Yes	Yes
Participant FE	Yes	Yes

Appendix: Participants' Entry Questionnaire

The survey completed by the participants in this study included 41 questions of which we report here the 23 questions used in the analysis.

- 1. Your date of birth
- 2. Your sex at birth
- 3. Your student ID number
- 4. Your year of study
 - Undergraduate Year 1
 - Undergraduate Year 2
 - Undergraduate Year 3
 - Undergraduate Year 4
 - Master's
 - Other
- 5. Title of your degree
- 6. Your University of Reading email address
- 7. Have you studied any of the following subjects before joining this study? (Choose as many as needed)
 - Business, High school
 - Economics, High school
 - Business, Undergraduate
 - Finance, Undergraduate
 - Economics, Undergraduate
 - Business, Postgraduate
 - Finance, Postgraduate
 - Economics, Postgraduate
- 8. Do you have any work experience in the finance industry?
 - No

- Up to 3 months
- 3-6 months
- 6-12 months
- More than 12 months
- 9. Do you regularly practice meditation techniques?
 - Never
 - Once a month
 - Once a week
 - Once a day
- 10. Your experience in trading/investing
 - None
 - Up to 6 months
 - $\bullet~6$ months 1 year
 - More than 1 year, up to 2 years
 - More than 2 years, up to 3 years
 - More than 3 years
- 11. Name the country where you spent most of your childhood (up to age 16)
- 12. In your family, you are the
 - Only child
 - Youngest child
 - Middle child
 - Eldest child
- 13. During your childhood, you experienced major loss situations in your family from (please choose as many as appropriate)
 - Death in family
 - Natural disaster
 - Major financial loss

- Not applicable
- 14. Your exposure to major loss/disasters
 - None
 - Once
 - Twice
 - Three times
 - More than 3 times
- 15. Which hand is closest to your own?



- First image (left)
- Second image (middle)
- Third image (right)
- 16. Would you bet a day's income at the horse races?
 - Extremely unlikely
 - Unlikely
 - Not sure
 - Likely
 - Extremely likely
- 17. Would you bet a day's income at a poker game involving a large amount of money?
 - Extremely unlikely
 - Unlikely

- Not sure
- Likely
- Extremely likely
- 18. Would you bet a day's income on the outcome of a sporting event (e.g., baseball, soccer, or football)?
 - Extremely unlikely
 - Unlikely
 - Not sure
 - Likely
 - Extremely likely
- 19. Would you gamble a week's income at a casino?
 - Extremely unlikely
 - Unlikely
 - Not sure
 - Likely
 - Extremely likely
- 20. In your view, how risky is it to bet a day's income at the horse races?
 - Not at all risky
 - Somewhat risky
 - Moderately risky
 - Risky
 - Very risky
- 21. In your view, how risky is it to bet a day's income at a poker game involving a large amount of money?
 - Not at all risky
 - Somewhat risky
 - Moderately risky

- Risky
- Very risky
- 22. In your view, how risky is it to bet a day's income on the outcome of a sporting event (e.g., baseball, soccer, or football)?
 - Not at all risky
 - Somewhat risky
 - Moderately risky
 - Risky
 - Very risky
- 23. In your view, how risky is it to gamble a week's income at a casino?
 - Not at all risky
 - Somewhat risky
 - Moderately risky
 - Risky
 - Very risky