Mindfulness reduces information avoidance☆

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A B S T R A C T

Mindfulness meditation has been found to influence various important outcomes such as health, stress, depression, productivity, and altruism. We report evidence from a randomised-controlled trial on a previously untested effect of mindfulness: information avoidance. We find that a relatively short mindfulness treatment (two weeks, 15 min a day) is able to induce a reduction in information avoidance — that is, avoiding information that may cause worry or regret. Supplementary evidence supports mindfulness's effects on emotion regulation as a possible mechanism for the effect.

1. Introduction

A well-known bias in individual decision-making is the tendency to avoid information about potentially negative outcomes, even if it is freely available. Information avoidance can be costly: an individual's ability to make good decisions hinges critically on their knowledge of the state of the world. To the extent that anticipatory emotions (such as worry or regret) play an important role in information avoidance (Golman et al., 2017), mental training that targets the regulation of such emotions might help to diminish their influence in decision making.

One such form of mental training is "mindfulness" meditation, increasingly popular in the West due to a variety of benefits, e.g. for health, stress, depression, and productivity (Brown et al., 2007). Meditation encourages a particular state of mind (non-judgmental attention to the present moment), and various evidence from psychology and neuroscience has demonstrated that its practice can increase levels of attention and emotion regulation (and, indeed, structurally change regions of the brain associated with such tasks (Hölzel et al., 2011). This paper reporting evidence from a Randomised-Controlled Trial (RCT) on whether mindfulness can influence information avoidance.

In our experiment, participants ($n = 261$) were randomly allocated to either a treatment intervention (14 days of 15-minute guided mindfulness meditations), or an active control intervention (14 days of 15-minute guided relaxing-music listening. Our main finding is that mindfulness reduced information avoidance — that is, the tendency for a participant to avoid receiving information that might cause worry or regret. Relative to the active control, the mindfulness treatment reduced the information avoidance scale (Ho et al., 2020) by approximately 0.25 standard deviations. We provide supporting evidence for emotion regulation as a plausible mechanism, as the treatment had a positive effect on a self-report measure of non-reactivity to inner experience.

These results add to the literature on the causes of information avoidance. We expect mindfulness to act on the hedonic form of information avoidance — where individuals avoid information

about their beliefs because of psychological costs such as worry, regret, disappointment, pessimism or cognitive dissonance (Golman et al., 2017). In support of this idea, Saunders et al. (2013) find that mindfulness increases recall of self-threatening information. More indirectly, mindfulness has been shown to reduce symptoms of belief-based utility, such as anxiety (Roemer et al., 2009) and habitual worrying (Verplanken and Fisher, 2014). In general, mindfulness has been found to increase abilities to regulate emotions (Goleman and Schwartz, 1976; Ortner et al., 2007; Kumar et al., 2008; Garland et al., 2011).

Our paper also relates to a literature that investigates the influence of mindfulness on decision-making. A number of prominent papers have found null effects of mindfulness on a range of decision outcomes (Alem et al., 2016; Noone and Hogan, 2018), but there were issues with the active controls used. Other work has found that mindfulness can make decisions more adaptive (in a gambling context) (Lakey et al., 2007); reduce negativity bias (Kiken and Shook, 2011); reduce correspondence bias (Hopthrow et al., 2017); decrease the sunk cost effect (Hafenbrack et al., 2014); alleviate addiction and self-control problems (Zgierska et al., 2009); and increase levels of altruism (Iwamoto et al., 2020). Our paper adds information avoidance to these documented effects.

2. Experimental design

The following design was pre-registered in the AEA RCT Registry (Ash et al., 2020).

2.1. Sample

We recruited subjects using Prolific, an online crowd-sourcing platform (based in the UK) which connects researchers to participants for academic studies (Peer et al., 2017; Marreiros et al., 2017; Callan et al., 2017). We recruited 261 subjects in one wave.[1] Besides restricting to the UK, we required that participants have already completed at least 10 previous Prolific studies, with a good participation track record (at least 95% of Prolific studies approved). We also pre-screened on meditation experience, recruiting only participants who had answered "No" to Prolific's own pre-screening question, "Do you meditate?". In the invitation to potential participants, the study was described as investigating the effects of mood on decision-making. The task would involve doing a simple and enjoyable activity for 15 min a day on 14 consecutive days.

Each day, the instructions for the activity were given by a professional instructor via an audio recording. On the day before and day after the course, the subjects took a survey (which measured our outcomes). The software o-Tree was used to host the surveys, while Qualtrics was used to deliver the interventions.

The subjects were paid for doing the activity (£2 per session in the first week; £2.50 per session in the second week) and taking the surveys (£2 for the pre-course survey; £3 for the post-course survey). To minimise attrition, subjects were told on sign-up that their submissions would only be "accepted" (i.e. they would only be paid) if they completed all parts of the study (unless there were exceptional circumstances). Various compliance measures are discussed below.

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[1] Calculations suggested a sample of 220–260 subjects would be adequate to detect effects with 80% power and 5% significance (Ash et al., 2020).

2.2. Interventions

After the pre-course survey, subjects were randomly allocated to one of two groups: a *mindfulness* intervention (the treatment), and a *music* intervention (an active control).

Mindfulness intervention. Here the instructor led the participants in a guided mindfulness meditation each day. Each session started with a short introduction (welcoming the participants). The instructor then led the participants through three stages of meditation: (1) bringing awareness to now (noticing what is happening outside and how you are); (2) mindful breathing (being aware of the breath and cultivating an attitude of non-judgment as thoughts arise); and (3) a body scan (expanding this awareness from the breath to the entire body). This was then followed by a period where the participants were asked to just sit with whatever awareness they had accumulated, before the instructor came back to end the session.

Music intervention. Here the same instructor led the participants in a period of relaxing music listening each day. The idea of the intervention was to try to control for as many of the structural elements of the treatment as possible (15 min a day of doing an activity instructed by an audio recording, with the same instructor leading the activity), and in addition control for the relaxing effects of the meditations (de Witte et al., 2020). To try to make the instructor's presence felt as much as in the treatment, the instructor spent time on a short introduction before the music began (welcoming the participants, mentioning the details of the artist/album etc., and also reciting a famous quote about music for the participants to contemplate). After the music finished, he would come back to end the session.

In order to boost feelings of instructor-participant interaction for both groups (and help minimise attrition), the instructor prepared three short videos of himself to be played at the start, middle and end of the interventions (simple check-ins). In addition, participants were sent daily reminders on Prolific about the activity sessions. Compliance was encouraged before the recordings began with a request to close all sources of distraction and to stay on the browser tab (and not multitask). Compliance was then monitored using two different measures: (1) how often they left their browser tab during the recording; (2) whether they clicked to the "next page" when the instructor asked them to at the end of the recording. We also included an optional feedback question about their experience of the session at the end.

2.3. Procedure

The study was launched on August 27th, 2020. From August 28th through September 11th, each day the subjects were invited to complete a session of the daily activity (study available from 6am; reminder sent at 3pm), and were asked to submit by 3am that night. Participants who missed a session were asked to take the session on the following day instead. Participants who attempted a session but had difficulties finishing it for some reason (e.g. because of internet trouble) were allowed to miss the session. Any participant who missed more than one session without giving a reason was excluded. On September 12th, participants were asked to take the post-course survey.

2.4. Outcomes

Information avoidance. We used the *Information Preference Scale* (IPS) (Ho et al., 2020): a 13-item scale (validated by an incentivised experiment) that measures an individual's willingness to receive information that might cause worry or regret in a series

Table 1
Effect of the treatment on information preferences.

Marginal effects	Information preference scale	
	(1)	(2)
Treatment	0.251[+]	0.230[+]
	(1.892)	(1.735)
Demographics	No	Yes
Observations	226	224

[+]$p < 0.10$, [*]$p < 0.05$. Marginal effects from OLS regressions with t-statistics in parentheses. IPS is standardised. Demographics include sex, age, race, education, household income and conservatism.

Table 2
Effect of the treatment on non-reacting.

Marginal effects	Non-react scale	
	(1)	(2)
Treatment	0.272[*]	0.269[*]
	(2.057)	(1.984)
Demographics	No	Yes
Observations	226	224

[+]$p < 0.10$, [*]$p < 0.05$. Marginal effects from OLS regressions with t-statistics in parentheses. Non-React Scale is standardised. Demographics include sex, age, race, education, household income and conservatism.

of thirteen hypothetical scenarios.[2] Replies to the scenarios use a 4-point scale coded $\{0, \ldots, 3\}$, giving scores $\{0, \ldots, 39\}$.

Mindfulness. We used the 15-item version of the *Five Facet Mindfulness Questionnaire* (FFMQ) (Baer et al., 2012), a frequently-used measure of mindfulness and its underlying dimensions (Sauer et al., 2013). Responses are made on a 5-point scale coded $\{0, \ldots, 4\}$, giving a mindfulness score of $\{0, \ldots, 60\}$, but the scale can also be disaggregated into subscales that measure five attributes of mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience (3 items in each, scores $\{0, \ldots, 12\}$).

Stress. We used the 10-item version of the *Perceived Stress Scale* (PSS) (Cohen and Williamson, 1988), a widely-used instrument to assess subjective perceptions of stress (Liu et al., 2020). Responses are made on a 5-point scale coded $\{0, \ldots, 4\}$, giving scores $\{0, \ldots, 40\}$.

2.5. Regression specification

To estimate the statistical effect of the treatment on outcomes in the post-course survey, we use the following linear regression model:

$$Y_i = \alpha + \beta \text{Treat}_i + \gamma X_i + \epsilon_i \tag{1}$$

where Y_i is the outcome, Treat_i is a dummy variable equal to 1 for individuals in the mindfulness treatment, and X_i is a vector of individual characteristics measured at baseline.

3. Results

Balance and placebo checks. There were no significant differences in means of baseline measures across the treatment and control groups (see Appendix D). Levels of attrition were 13% in the treatment and 18% in the control, which mostly occurred after the pre-course survey (see Appendix E); the remaining samples of non-attritors were still comparable on the baseline measures (see Appendix F). Average feedback of the sessions was positive and similar for the treatment and control (see Appendix G), and there were strong and similar levels of compliance in both groups according to our different compliance measures (see Appendix H).

The active control intervention served an effective placebo check. As shown in Appendix C, both interventions reduced perceived stress the same amount.

Mindfulness and information avoidance. We now evaluate the effect of the treatment on information avoidance. As seen in Table 1, being assigned to the treatment had a positive estimated effect on preferences to receive potentially negative information as measured by the Information Preference Scale (IPS) ($p = 0.060$ without demographics; $p = 0.084$ with them). Being in the

treatment is associated with an increase of approximately 0.25 standard deviations in the information preference scale. Looking to the four separate question groups in the IPS scale, we find that the effect is driven by the finance and personal components, rather than the health and general components.

Emotion regulation as a potential mechanism. In Table 2 we show that the treatment had a positive effect on the non-react scale of the FFMQ ($p = 0.041$ without demographics; $p = 0.049$ with them).[3] In terms of magnitudes, being in the treatment group is associated with an increase of approximately 0.27 standard deviations in the non-react scale. The items of the scale are all about not reacting to distressing inner experience. This inner experience could include anticipatory emotions such as worry or regret. This evidence supports regulation of anticipatory emotions as a mechanism by which the mindfulness training was able to reduce tendencies for information avoidance.

4. Discussion

In this paper we have provided evidence on mindfulness as a cause of differences between individuals in their susceptibility to information avoidance. The costs of information avoidance for individuals, society and the economy are potentially substantial (from individuals unwilling to learn about their health, including whether or not they carry infectious diseases, to students unwilling to check their marks, to investors holding off looking at their stocks' performance (Ho et al., 2020)) so understanding what might drive some individuals to avoid information more than others is important. Our evidence suggests that people in the population who spend more of their time inhabiting mindful states are better able to look at potentially negative, but nonetheless useful, information about themselves and the world. Supplementary evidence suggests that it may be mindfulness's effects on emotion regulation (specifically, non-reaction to emotions) that acts as a potential mechanism through which this greater tolerance for information operates.

An important concern about the randomised control trial is whether subjects in the treatment group actually engaged with the guided meditations. The compliance measures were encouraging in this regard in that it appeared that significant proportions of the subjects were listening to the recordings (e.g. not switching off the browser tab, and clicking to the next page when the instructor asked them to at the end of the recording). However, it could be that the subjects listened to the recordings but did not practice the meditations. Although this is hard to rule out, it seems difficult to square with the evidence, which showed that subjects in the treatment group developed higher levels of non-reaction, a known effect of meditation. An additional concern is that subjects in the treatment group, once they knew

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[2] See Appendix A–C for the items of the IPS, FFMQ and PSS measures.

[3] The effects on the other facets of mindfulness were not as significant (see Appendix I).

that meditation was their daily activity, would have certain expectations about the effects of meditation, and this would then influence their responses on the information avoidance measure (an "experimenter demand" effect). Given that information avoidance is an unknown effect of meditation (not discussed in the public domain), and that no relevant cues were given during the interventions in relation to information avoidance, we are less concerned about experimenter demand in relation to this outcome. Nonetheless, we controlled the expectations that could be managed in the design as best as possible, with both the treatment and control groups being told the same message in regards to their activity at the start of the interventions: that it had been found to have a "positive effect on people's mood and wellbeing".

Our paper adds information avoidance to the growing list of documented benefits of mindfulness. This result has potentially strong policy implications. "Nudging" (Thaler and Sunstein, 2009) has become a staple of behavioural policy, being employed in various governments throughout the world. However, by shaping individual choices without their knowledge, it has been criticised as a potential threat to individual autonomy.[4] Making better decisions through greater levels of mindfulness, on the other hand, is a fully conscious process, so mindfulness training could provide governments with a more ethical approach to ameliorating cognitive biases. Our evidence shows that mindfulness is able to reduce information avoidance, but more work is needed to test its effects on a wider array of cognitive biases. For example, mindfulness (by managing the emotions triggered by beliefs) might also affect the processes underlying "motivated beliefs" (such as wishful thinking).[5] We hope our investigation will encourage more research in this area.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2023.110997.

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[4] See, for example, Hausman and Welch (2010).
[5] See Bénabou and Tirole (2016) for a review.