

COMBATING IMPLICIT BIAS WITH MEDITATION

By

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ABSTRACT

We investigated the effects of a mindfulness meditation and loving-kindness meditation on implicit bias as well as the cognitive and emotional pathways through which these techniques act. We did this through a lab experiment in the Wharton Behavioral Lab in January 2017. We randomized 224 participants into three groups: a mindfulness meditation group, a loving-kindness meditation group, and a mind-wandering control group. After receiving one of the inductions, participants completed an Implicit Association Test measuring implicit bias against people with disabilities (IAT: Greenwald et al.,1988), as well as a set of survey questions. Although we were unable to demonstrate a reduction in overall implicit bias scores, we found a significant reduction in error percentage on the IAT for participants in the loving-kindness meditation group as compared to the control group. This effect was mediated by state compassion and positive state pleasantness, and is suggestive of reduced implicit bias.

Keywords

implicit bias, mindfulness, meditation, loving-kindness, compassion, empathy, emotions

INTRODUCTION

Over the past few decades, the concepts and practices of mindfulness meditation have become increasingly mainstream in the Western world. These practices have origins in Buddhist tradition and were in part brought over by groups of modernist Western meditators who spent years studying in communities in South or East Asia and returned to teach in the West (Kucinskias, 2014). The surge in popularity of Yoga also brought with it an interest in mindfulness. As mindfulness becomes increasingly incorporated into Western cultural dialogue, it is taking on associations of health, longevity, and productivity.

These associations, coupled with studies demonstrating their viability, have been driving forces in the adoption of mindfulness practices in the American workplace. Organizations such as Google, Aetna, Target, Stanford, Yale, the US military, and K-12 Public Schools have adopted the practices, seeking increased stakeholder efficiency and satisfaction (Kucinskias, 2014). In such contexts, mindfulness is often summarized as openly attending, with awareness, to one's present moment experience (Creswell, 2017). In cultivating mindfulness, these programs include extensive practice of *vipassana* meditation, in which the practitioner, while sitting, standing, walking, or lying down, focuses their attention on experiences happening in the moment, and uses anchors such as the breath, bodily sensations, sounds, and thoughts to ground themselves in the present.

In the Buddhist traditions and the derived secular movement, another essential practice that often accompanies mindfulness meditation is the loving-kindness meditation (also known as *metta* in Sanskrit, or abbreviated as LKM). A formal LKM involves a focused effort to cultivate feelings of compassion towards the self and others, often through conjuring up phrases and

images of well-wishing (Law, 2011). While the *vipassana* practice allows the practitioner a heightened awareness of the now, the *metta* practice can help them bring kindness to the difficult sensations or thoughts that arise through the practice, possibly leading to higher levels of compassion or emotional awareness. Much research has been done on how mindfulness meditation can lead to workplace gains, and how *metta* can increase positive affect and emotional connectivity. However, there is yet work to be done in comparing the effects of both practices, and the two combined, on factors that could provide further benefits in the workplace.

In this study, we examined the effects of meditation on implicit bias, which has far-reaching consequences in the workplace. Specifically, we conducted a lab study on the experimental effects of two different types of meditation, mindfulness meditation and loving-kindness meditation, on implicit bias, as measured by Implicit Association Tests (IATs, Greenwald et al., 1988). An IAT is a task in which participants are shown symbols and words and asked to categorize them into appropriate categories as quickly as they can. In our case, we used an IAT focused on disability bias. Past studies have looked at the impact of mindfulness induction on implicit age and racial bias using the IAT (Lueke and Gibson, 2014) and on sunk cost bias to a relevant decision making task (Hafenbrack, Kinias, & Barsade, 2014). Others have looked at the effect of a short LKM on the attentional blink (May and Burgard, 2011), or a longer period of LKM training on bias against Black people and homeless people using the IAT (Kang, Gray, and Dovidio, 2014). However, we found that there was research yet to be done on the effects of a shorter LKM induction on implicit bias, especially in comparison to a mindfulness meditation condition.

LITERATURE REVIEW

Section 1: Mindfulness Meditation in the Workplace

Trait mindfulness has been shown to have far-reaching effects, including on performance and satisfaction in the workplace. One literature review found that promoting mindfulness practice across schools and workplaces could create more sustainable ways of living, for a variety of reasons (Ericson, Kjonstad, and Barstad, 2014). For example, mindfulness measures in leaders are negatively correlated with dysfunctional outcomes such as anxiety, depression, and burnout (Roche et al., 2014), and overall measures of mindfulness are associated with self-control and psychological functioning (Bowlin and Baer 2011). Furthermore, supervisor mindfulness has been positively associated with employee wellbeing and performance (Reb, Narayanan & Chaturvedi, 2014), as has employee awareness as a consequence of mindfulness (Reb, Narayanan, & Ho, 2015). One reason is that employees higher in dispositional mindfulness engage in fewer hostile or counterproductive work behaviors (Krishnakumar & Robinson, 2015).

These benefits are achievable through sustained mindfulness practice. A 10-day self-training mindfulness intervention led to less emotional exhaustion and more job satisfaction among employees (Hülshager, Alberts, Feinholdt, & Lang, 2013), and intensive training over the same time duration has led to improvements in depressive symptoms and on performance measures of working memory and sustained attention (Chambers et al., 2008). Intensive sessions lasting as little as two to five weeks led to decreased mind-wandering and improved GRE scores (Mrazek et al., 2013), and also increased attentional task performance in a group of incarcerated youth (Leonard et al., 2013). Slightly longer programs of eight weeks to a few months have been shown to facilitate moral reasoning (Shapiro, Jazaieri, and Goldin, 2012), bolster attentional

performance in military cohorts (Jha et al, 2015), and improve perceptual discrimination and sustained attention (Maclean et al., 2010).

Even quick sessions of meditation have demonstrated positive cognitive and interpersonal outcomes. Just minutes of mindfulness can promote generosity and altruism (Hafenbrack and Noval, 2016), and foster temporary trust and pro-social behavior in an investment game (DiBartolomeo & Papá, 2016). Short practice can also serve as a buffer between injustice and retaliation (Long & Christian, 2015), and reduce mind wandering even when compared to passive relaxation or reading (Mrazek, Smallwood, & Schooler, 2012). There is also evidence that a short mindfulness intervention can increase resistance to the sunk-cost bias, which can be costly in high-stakes business decisions (Hafenbrack, Kinias, & Barsade, 2014).

Some research has also linked mindfulness meditation to interpersonal outcomes. However, a recent meta-analysis of mindfulness interventions suggests that “there is currently very little mindfulness intervention RCT research on interpersonal outcomes” (Creswell, 2017). The research that has been done focuses on measures of relationship satisfaction (Carson, Carson, Gil & Baucom 2004), loneliness (Creswell et al., 2012), and compassionate pro-social behavior (Condon, Desbordes, Miller, and DeSteno, 2013). Although mindfulness meditation may have an effect on these interpersonal factors in the short run, it is possible that LKM is better suited to achieving pro-social outcomes.

Section 2: Loving-Kindness Meditation

Studies on LKM in both short sessions and over longer training periods have demonstrated that it can have significant positive effects on emotional wellbeing. A meta-analysis of 22 randomized control trials using LKM showed that it was effective in promoting a

variety of health benefits, including decreasing depression and increasing mindfulness, self-compassion, and positive emotions (Galante, Bekkers, and Gallacher, 2014). An earlier literature review also found that the technique was associated with an increase in positive affect, decrease in stress-response, and enhanced processing of emotions and empathy in the brain (Hofmann, Grossman & Hilton, 2011).

Some of the studies employed interventions of 6-8 weeks in which groups of participants underwent compassion training that included formal LKM practice. These programs were shown to improve lower-back pain in patients (Carson, 2005), decrease self-criticism (Shahar et al., 2015), and reduce implicit bias against stigmatized social groups (Kang, Gray, and Dovidio, 2014). LKM has also been shown to cause structural changes in the body and brain, including increasing vagal tone, which is associated with physical health (Kok et al., 2013), and increasing telomere length in women, which is linked with longevity and lower chronic stress (Hoge et al., 2013). These changes were enduring; in a 15-month follow-up survey, participants who had undergone an LKM intervention noted that they continued experiencing more positive emotions, and this effect was amplified for those who had continued meditating (Cohn and Frederickson, 2010).

Research has also been done on the effects of shorter LKM inventions, with mixed results. One study demonstrated that a short LKM could provide relief for people with migraines (Tonelli and Wachholtz, 2014), while another failed to demonstrate that brief LKM could mitigate the attentional blink, which is a reduced ability to detect a stimulus presented too quickly (May and Burgard, 2010). Thus, there is more work to be done to examine the short-term effects of a brief LKM, which is part of the goal of this study.

Section 3: Overview of Implicit Bias and the IAT

One theoretical framework on human function is that we generally behave and make decisions under conscious control. Over the past few decades however, research has begun to point to implicit biases, or unconscious mental processes, that play a large role in our everyday conduct.

In a paper on the scientific foundations of implicit bias as it pertains to law, Anthony Greenwald and Hamilton Krieger summarize research that counters the notion of human behavior as mainly conscious and under control. They point to mental processes that include “implicit memory, implicit perception, implicit attitudes, implicit stereotypes, implicit self-esteem, and implicit self-concept,” which are established in the body of research around implicit bias (Greenwald and Krieger, 2006). Such processes can lead us to make judgments about other people or ourselves of which we are not consciously aware, but affect how we interact with others.

In the psychological literature, cognitive functioning is often broken down into two systems: System I, which is rapid and intuitive, and System II which is slower and more deliberate (Kahneman, 2011; Lagnado and Sloman, 2006). The automatic character of implicit bias suggests that it operates within system I: “implicit bias is largely automatic; the characteristic in question (skin color, age, sexual orientation) operates so quickly that people have no time to deliberate” (Jolls and Sunstein, 2006). As a result, implicit bias can be very tricky to measure.

One of the most commonly used measures of implicit bias is the IAT, or Implicit Association Test. IATs are “empirically validated methods of assessing unconscious beliefs that

have been employed in the exploration of implicit thoughts and emotions about race, mental illness, disability, and age” (Greenwald et al., 2009). Greenwald, McGhee, and Schwartz introduced the IAT in 1998. It operates by measuring “differential association of two target concepts with an attribute.” (Greenwald, McGhee, and Schwartz, 1998) For example, a race IAT focused on measuring implicit bias against Black people will show the participant pleasant and unpleasant words as well as pictures of black and white faces. In a set of sequential tasks, different categories will be bucketed with each other, and the participant will need to match the words and images to the correct bucket rapidly by pressing a key. The reaction time with which the participant makes these associations is reflective of implicit attitudes (Greenwald, McGhee, and Schwartz, 1998).

Section 4: Meditation and Implicit Bias

Previous studies have shown a relationship between meditation and implicit bias as measured by an IAT. Kang, Gray, and Dovidio (2014) showed that a 6-week loving-kindness practice decreased implicit bias against homeless people and black people. Lueke and Gibson (2015) demonstrated that a 10-minute mindfulness meditation induction lowered activation of bias against blacks and elderly people. Hanley et al. (2015) showed an association between mindfulness and lower implicit bias towards the variability of personality and intelligence. These studies add credence to the idea that although implicit bias refers to automatic and unconscious processes, they can be accessed consciously and attended to under the right conditions (Dane, 2011). This study extends the previous research by looking at whether, and how, a 15-minute mindfulness meditation and a 15-minute loving-kindness meditation induction influence implicit bias against people with disabilities.

SIGNIFICANCE AND MOTIVATION

Section 1: Implicit Bias and Discrimination

Implicit bias has real consequences in law, education, medical settings, the workplace, and other social environments. In his paper “On the Epistemic Costs of Implicit Bias,” Dr. Tamar Gendler (2011) argues that these costs are not only moral, but also epistemic. They can range from impairing cognitive performance and increasing cognitive exhaustion to creating difficulty in mentally encoding individuating information found in faces. For example, stereotype threat, or implicit association between membership in a group and expertise in certain domains, can cause Blacks and Latinos to perform poorly on tasks described as diagnostics of intelligence (Gonzalez, Blanton & Williams, 2002). Implicit bias also leads to cross-race recognition deficit, in which faces of the out-group are less remembered than faces of the in-group (Meissner & Brigham, 2001).

In the healthcare setting, Bryne and Tanesini (2015) explore the fundamental “inconsistency” between lower quality healthcare that minorities receive and the stated importance that healthcare workers place on equality. They summarize evidence that these disparities are partially driven by unconscious biases, particularly in a field that involves high levels of stress and elevated cognitive workload.

In the courtroom, implicit bias can lead to discriminatory application of the law. In the criminal path, bias occurs at multiple stages, from the time that police investigate a neighborhood following a crime report and detain a suspect, to the prosecutor charging that suspect, to the judge’s decisions about bail and detention and a jury’s verdict on whether the defendant is guilty (Kang et al., 2012). In the civil path, and particularly in federal employment discrimination

cases, there are also many opportunities for implicit bias to color judgement. These cases begin with alleged discrimination and touch on grueling administrative solutions, lengthy claims under the Federal Rule of Civil Procedure 56, and the jury's subjective verdict in the trials. Kang demonstrates that implicit bias is present in all of these stages.

In the workplace, implicit bias can cause social cognitive pitfalls that undermine explicit commitments to equality and impair managers' performance (Chugh, 2004). This can take place, for example, through conflicting verbal and non-verbal cues resulting in failures in group work. In a study where black and white participants were paired for a problem-solving task based on explicit and implicit bias, the least effective dyads were those in which the white participant had low explicit racism but high implicit racism (Dovidio, 2001).

Section 2: Disability Bias in the Workplace

The effects of implicit bias in the workplace extend beyond the micro-scale of workplace performance to the macro-scale of overall employment. In 2015, the National Bureau of Economic Research conducted a landmark study in an attempt to explain what researchers termed "the Disability Employment Puzzle." Employment statistics for those with disabilities are alarming: for working-age people with disabilities only half as many are employed (34% in 2013 compared to 74% of those without disabilities) and the unemployment rate is twice as high (12.5% in 2014 compared to 5.9% for those without disabilities). There is also evidence that people with disabilities get lower pay and less training (Schur, Adya, & Ameri, 2015).

In an attempt to explain this "Employment Puzzle," researchers conducted a study in which they sent in applications to 6,000 advertised accounting positions with fictional applicants,

some with disabilities (that would not limit productivity in accounting) and some without. The fictional applicants with disabilities received 26% fewer expressions of employer interest, and this gap was especially apparent among applicants that were “more experienced” and those applying to jobs at smaller companies. This finding suggests that disabled applicants experience unwarranted bias, whether implicit or explicit.

The study followed the method of Bertrand and Mullainathan (2004) who examined racial bias in the Boston and Chicago labor markets by sending fictitious resumes to help-wanted ads. They altered the resumes so that the names were either white sounding (eg. Emily, Greg) or African-American-sounding (eg. Lakisha, Jamal). White sounding names received 50% more interview invitations. This result helps explain how explicit or implicit bias might be responsible for nearly double unemployment rates in the African American community according to the Bureau of Labor Statistics (2016), at 8.5% compared to 4.4% of whites in Q3 2016. The results of these two studies suggest that bias can have detrimental effects on workplace diversity and equity.

Section 3: The Role of Meditation

We believe that meditation should be explored as an approach to the crucial and elusive issue of reducing implicit bias. Initial successes using meditation in research by Kang, Gray, and Dovidio (2014) and Lueke and Gibson (2015) suggest that this is a ripe area for further exploration.

Meditation practices have already become increasingly incorporated into workplaces, educational curricula, medical practice, and other areas of modern western life. Pop literature has

praised mindfulness as the foundation of healthy living and emotional intelligence and it has adopted by companies such as Google, Target, Aetna, and General Mills in programs intended to increase employee satisfaction and effectiveness (Gelles, 2015).

However, such meditation practices are difficult to adopt and even more difficult to maintain over a long period. Those who believe that results can only be attained by long-term practitioners or “expert” meditators may get quickly discouraged as they struggle to keep up with smartphone apps or introductory programs that encourage consistent practice. The fact that the effects of meditation are not immediately observable can exacerbate this frustration.

As a result, we chose to focus on the short-term effects of a brief meditation practice for a general audience that wishes to achieve decreased implicit bias, but does not have the self-confidence – or want to take the time - to undertake a long-term commitment to meditation (Hafenbrack, 2017). If we are able to demonstrate that just a short meditation can be effective, we may see increased uptake of brief mindfulness and LKM practices. These practitioners may ultimately decide to explore the practice further to achieve the longer lasting outcomes that have been demonstrated through research on longer-term training.

Through our exploration of LKM specifically, we hope to reach an audience that has tried mindfulness meditation and is looking for research about a different or additional complementary practice. In the Buddhist tradition, the two practices accompany each other, but the current literature is missing an explanation of the comparative effects. As a result, the ongoing debate may be lacking a key element that could make meditation programs in the workplace more effective.

RESEARCH QUESTION AND HYPOTHESIS

Primary Objectives:

- To contrast and compare the effects of a 15-minute mindfulness meditation induction, a 15-minute loving-kindness meditation induction, and a 15-minute mind-wandering control on implicit bias as measured by an Implicit Association Test.
- To investigate the cognitive and emotional pathways through which the two experimental inductions act.

Question:

How will people who undergo a 15-minute mindfulness meditation, a 15-minute loving-kindness meditation, and a 15-minute mind-wandering control respond differently to a subsequent measure of implicit bias? What are the different cognitive and emotional pathways through which these meditations act on implicit bias that can explain the results?

Hypothesis:

We expect that both the mindfulness and loving-kindness meditation conditions will mitigate implicit bias by acting through divergent pathways. The mindfulness meditation will act by increasing temporal focus, lowering negative affect, and decreasing focus on the self. The lovingkindness meditation will act by engendering compassion and increasing positive affect.

We believe the mindfulness induction will reduce the likelihood that biases arrive by increasing focus on the present moment. Hafenbrack et al. (2014) demonstrated that a brief mindfulness meditation induction increased resistance to the sunk cost bias, which is included as

one of the Adult Decision-Making Competence tests. This effect was mediated by temporal focus and negative affect, which we believe will also influence implicit bias. Burgess, Beach, and Saha (2016) suggest that such an increase in temporal focus produced by meditation can reduce implicit bias against stigmatized groups by decreasing the likelihood that implicit biases will arise. Lueke and Gibson (2015), using a Quad Model analysis, demonstrated that a similar brief mindfulness meditation acted to reduce bias by decreasing these automatic activations. Burgess, Beach, and Saha (2016) also suggest that when biases do arrive, mindfulness can increase a medical provider's ability to control biased responses through increased awareness.

Furthermore, they argue that decreased cognitive load can reduce implicit bias. In our experiment, we believe that lower negative affect produced by the mindfulness meditation will reduce implicit bias. In addition to temporal focus, Hafenbrack et al. (2014) demonstrated that negative affect was a mediator between mindfulness and resistance to the sunk cost bias. Hu, et al. (2015) showed that implicit social biases could be unlearned during sleep, further suggesting that rest and a decrease in cognitive load might be a pathway to lower implicit bias. To a lesser extent, LKM may also produce decreased negative affect and cognitive load; Kang, Gray, and Dovidio (2013) demonstrated that an LKM led to decreased stress and consequently decreased bias against homeless people.

However, the loving-kindness meditation will primarily decrease implicit bias by stimulating feelings of compassion. Although compassion and empathy have both been associated with mindfulness as well as with LKM (Lim, Condon, and DeSteno, 2015), we hypothesize that the LKM will act more through compassion than through empathy in its effect on implicit bias towards outgroup members. Neuroscience studies on meditation have shown that

empathy and compassion are distinct, and suggest that mediation acts through compassion. Singer and Klimecki (2015) summarize these findings and make the distinction in a paper that describes compassion as “feeling *for* and not feeling *with* the other.” While empathy involves sharing in the suffering of the other party, compassion is characterized by warmth, concern, and “a strong motivation to improve the other’s wellbeing.”

These differences are also apparent in analyses of neural network activations. Singer and Klimecki (2015) performed a series of studies in their lab where they had participants undergo empathy or compassion training. They found that compassion-related brain networks differed from empathy-related brain networks, and that while participants who underwent compassion training showed increased positive affect, those who underwent empathy training had an increase in self-reported negative affect (subsequent compassion training could reverse this effect.) In practice, Condon, Desbordes, Miller, and Desteno (2013) showed that participants who went through 8-week programs in mindfulness meditation or loving-kindness meditation were five times as likely to engage in an act of compassion in a laboratory setting.

In contrast to compassion, empathy itself is also highly subject to in-group bias, which would make it a poor antidote to implicit bias. In fMRI studies, Singer and Klimecki (2014) showed that the amount of empathy experienced in the brain was dependent on perceived group membership and perceived fairness of the other person. Bloom (2016) argues that "empathy is subject to bias — both laboratory studies and anecdotal experiences show that empathy flows most for those who look like us, who are attractive and who are non-threatening and familiar." Furthermore, Maister, et al., (2015) showed that ownership of an “outgroup body” was associated with reduction in implicit biases against that outgroup, suggesting that empathy is

dependent on physical characteristics. Even if the LKM did produce increase levels of empathy, which we do not expect, the increased negative affect associated with empathy training and the experience of empathic distress could actually increase levels of implicit bias.

Creswell (2017) specifically addresses the idea that the two meditation interventions may act through divergent emotional and cognitive pathways. He argues that while mindfulness interventions influence outcomes through meta-cognitive awareness and decentering mechanisms (observing thoughts and feelings as objective events), allowing practitioners distance and perspective, LKM interventions influence outcomes through positive affect mechanisms that may arise through the celebration of all emotions and the sending of kindness (Creswell, 2017), and through increased compassion. A paper on how mindfulness may affect romantic relationships describes some of the pathways through which the LKM creates this effect (Karremans, Schellekens, and Kappen, 2015). Given the above associations, we hypothesized that both the mindfulness meditation and LKM inductions would reduce implicit bias on the IAT but through divergent pathways.

STUDY METHODOLOGY

We conducted a lab experiment in the Wharton Behavioral Lab in January 2017. Over the course of four days, 224 participants took part in the study. Of these, 162 (72%) identified as female and 62 (28%) as male. The majority of these participants (83%) were students (primarily undergraduate students) at the University of Pennsylvania. The median age of participants was 21, and the average age was 23.59 ($SD = 8.86$). Almost all of the participants in the study (93%) were native English speakers. Notably, many participants were regulars at the Wharton Behavioral Lab; the median number of sessions done was 23 and the average was 37.

Upon entering the lab, participants were seated at individual workstations with computers and headphone sets. They were told that they would be participating in a study investigating emotion and performance on an attention-based task and were instructed to take their time. They then opened an online Qualtrics survey. Prior to engaging in the study, they completed an online consent form, which advised them that study participation was voluntary and they could end participation at any point.

The program randomized participants into three groups: a mindfulness meditation induction group, a loving-kindness meditation induction group and a mind-wandering control group. In the mindfulness meditation group, participants listened to a 15-minute meditation induction recorded by a professional mindfulness coach, adapted from a script used in previous studies (Hafenbrack, et al. 2014, Arch & Craske, 2006). In the LKM induction condition, participants listened to a 15-minute LKM recording crafted to mirror the structure and flow of the other two tapes. It was recorded by a Director at the Penn Program for Mindfulness with content focused on generating feelings of kindness toward the self and others. In the mind-

wandering group, participants listened to a 15-minute mind-wandering induction used in previous experiments and intended to replicate a baseline mental state (Hafenbrack, et al. 2014, Arch & Craske, 2006, Kiken & Shook, 2011). All of these meditation scripts are included in the appendix.

After receiving one of the meditation or control inductions, participants completed an Implicit Association Test measuring implicit bias against people with disabilities (IAT: Greenwald et al., 1988). Information on the creation and analysis of the IAT is included in the following section. Following the IAT, participants completed a measure of explicit disability bias typically used in conjunction with the test (Hofmann, et al., 2005, and Nosek, 2005.).

Next, participants were presented with a set of 13 “manipulation check” questions in randomized order. These questions were intended to measure the extent to which participants, at the end of the recording, felt a sense of mindfulness, kindness, or focus on other people as opposed to the self.

Participants then completed the State Positive and Negative Affectivity Scale (PANAS, Watson, Clark, & Tellegen, 1988), the State Pleasantness Scale (Barsade, 2002), and four items measuring state compassion.

They then completed the Compassionate Love for Humanity Scale (Sprecher & Fehr, 2005), which consists of eight items measuring trait compassion, and the Empathetic Concern Scale (Davis, 1980), which consists of 14 items measuring trait empathy. They also completed an adapted version of the Inclusion of Other in Self Scale (Aron, Aron & Smollan, 1992) to measure feelings of connectedness with strangers. All of these scales are included in the appendix.

Finally, participants filled out two sets of demographic questions. The first set included questions relating to experiences of disability in the participant's personal and family lives. The second set included questions about factors such as age, gender, nationality, and country of birth, and questions about previous experience with yoga and meditation. We also asked participants what they thought we were testing and to which recording they had listened.

In completing all of these tasks, participants took between 23 minutes and 52 minutes. The median time was 33 minutes and the average was 33.93 minutes. All participants completed the study and were paid \$10 for their time. One participant fell asleep during the induction, but was woken up and completed the study. She noted that "the recording was very soothing," and caused her to fall asleep. We collected survey data for participants anonymously in Qualtrics, and IAT data in a separate file that we matched to this data by ID number.

BUILDING THE IMPLICIT ASSOCIATION TEST

Building the IAT

We built and scored the Implicit Association Test (IAT) following the guidelines established by Greenwald, Nosek, and Banaji (2003). As described above, the test provides a measure of the strengths of automatic associations. We modeled the front end of the test after a sample provided on Harvard’s Project Implicit, although the instructions given to participants were slightly different.

Over the course of seven blocks, participants were shown symbols representing abled or disabled persons, and words that carried positive or negative associations. These were shown according to the following standard frameworks. Participants were randomized between frameworks A and B so that some would first be presented with the “Good+Abled” pairing and others with the “Good+Disabled” pairing on keys “E” and “I.”

		Framework A		Framework B	
Stage	Number of trials	Assigned to “E”	Assigned to “I”	Assigned to “E”	Assigned to “I”
1	20	Abled	Disabled	Disabled	Abled
2	20	Good	Bad	Good	Bad
3	20	Abled Good	Disabled Bad	Disabled Good	Abled Bad
4	40	Abled Good	Disabled Bad	Disabled Good	Abled Bad
5	20	Disabled	Abled	Abled	Disabled
6	20	Disabled Good	Abled Bad	Abled Good	Disabled Bad
7	40	Disabled Good	Abled Bad	Abled Good	Disabled Bad

The following image stimuli were drawn from the Project Implicit Website and were developed specifically for the disability IAT by Pruett and Chan (2006):



While there is a more standard set of image stimuli for the disability IAT, different word stimuli have been used in different studies (Wilson and Scior, 2013). For this study, we used the following pleasant and unpleasant word stimuli drawn from White, Gordon, & Jackson (2006):

Good: honour, lucky, diamond, loyal, freedom, gift, happy, jolly, rich, love

Bad: evil, rotten, poverty, disaster, vomit, hatred, sad, greedy, dirty, worthless

We chose these word stimuli because they were varied and from a study that both demonstrated generally negative implicit attitudes towards athletes with physical disabilities and did not produce a difference in IAT scores between male and female participants (White, Gordon and Jackson, 2006). Retrospectively, it may have been more appropriate not to include “poverty” and “rich” in the stimuli. These assume a value-judgement on socio-economic status and may produce hesitation or resentment in participants. Feedback suggested that the word “diamond” was also more difficult to automatically associate with “good” because it can be confused for a shape and even a physical diamond may be difficult to associate with “good.”

Scoring the IAT

We built the IAT so that it could be scored according to the "D measure with built-in error penalty" (D-biep) described by Greenwald, et al. (2003). To do this, we displayed a red X when subjects made an incorrect response, and required them to make the correct response before proceeding to the next stimuli. We used 450 milliseconds as the latency between trials and recorded error latency to the occurrence of the eventual correct response.

We computed the D-biep scores using SPSS code available on Greenwald's website, which employs the following method: using data from trials 3, 4, 5, and 6, we first eliminated trials with latencies $> 10,000\text{ms}$ and subjects for whom more than 10% of trials had latencies less than 300ms (5 participants in our trials). We then computed the mean of correct latencies for each block, pooled standard deviations across trials, and replaced error latencies by the block mean plus a built-in error penalty of 600ms. We averaged the resulting values, computed the differences between trials with opposite associations, and divided each difference by its associated standard deviation. The D score is the average of these two quotients.

We built the IAT directly into Qualtrics using Javascript, and outputted a .dat file that was read by the SPSS code. This code assumes two randomized frameworks. It matches the participants to the corresponding framework based on an even or odd user ID, but provides no other indication of which category of stimuli were presented in which trials. During our first day in the lab, we failed to record the randomized framework that the participants received. The resulting calculation gave us absolute values of the bias scores, but no indication of the direction of the bias (it is unlikely but theoretically possible that the bias went the other way). We quickly

corrected this oversight, and eliminated the ambiguous data from our analyses. Data from days 2-4 outputted correctly.

ANALYSIS OF DATA

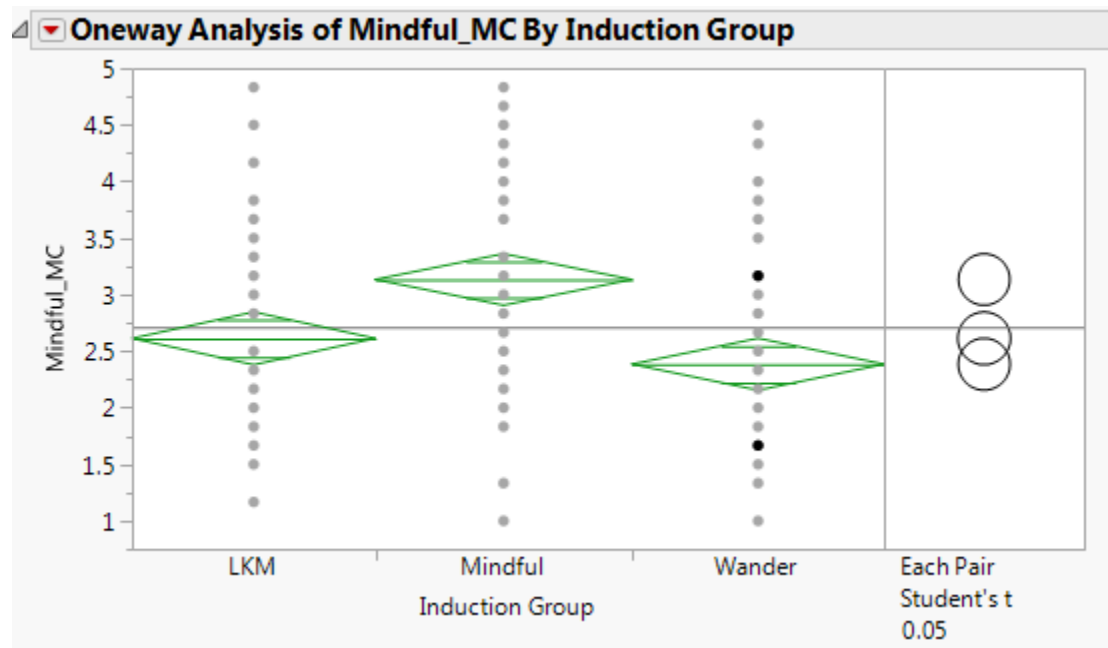
Subjects in the Analyses

We removed a few groups of participants from the data set for analysis purposes. As described in the previous section, all participants who took the study on the first day had uninterpretable bias scores due to an error in data collection. We removed data for these participants from all analyses. In addition, according to the guidelines set forth by Greenwald, Nosek, and Banaji (2003), we removed all participants for whom more than 10% of IAT trials had latency less than 300ms. A high frequency of low-latency trials indicates a participant who was guessing rather than taking the task seriously. We chose not to remove participants with asthma (19) or other conditions affecting breathing (2), as has been done in previous studies (Hafenbrack, et al. 2014 and Arch and Craske, 2006) because we were testing a larger set of inductions and were interested in general effects across the population base. After making these changes, 164 participants were included in the analyses. Of these, 53 had received the loving-kindness induction, 56 had received the mindfulness induction, and 55 had received the mind-wandering induction.

Manipulation Checks

To determine whether the inductions had produced an effect, we ran one-way ANOVA analyses of the three manipulation check scores on the Induction Group. All of these tests showed a significant difference in effect by induction group.

For the mindfulness manipulation check, the inductions produced significantly different effects ($P < .0001$). For individual mean comparisons, the mindfulness induction produced a statistically higher manipulation check score than both the LKM and control group. The LKM and control group were not significantly different.



Analysis of Variance

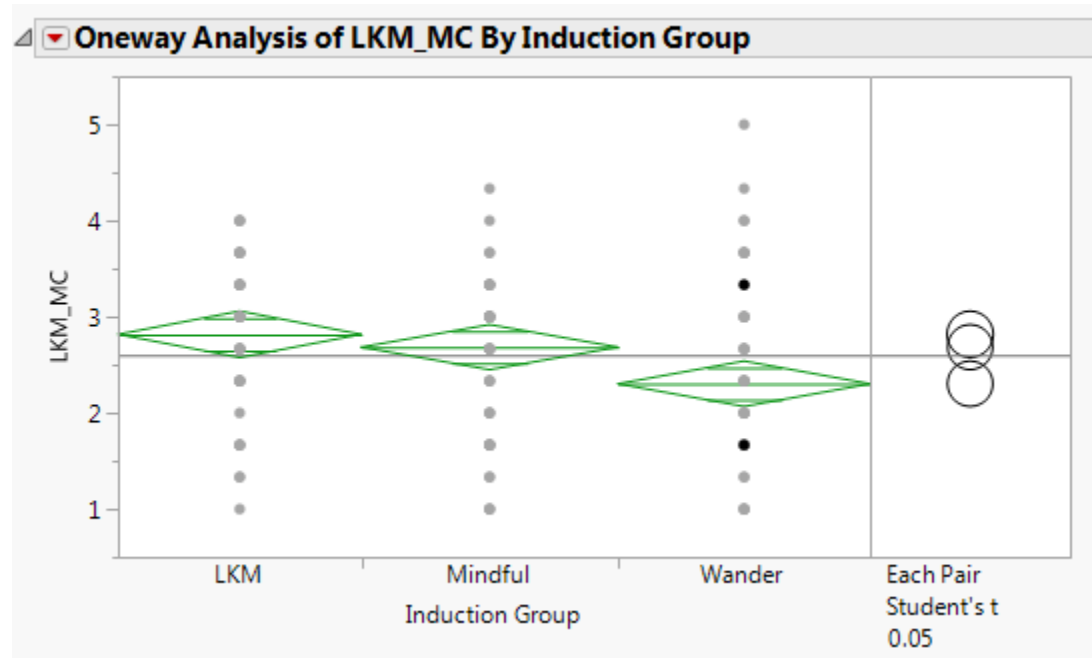
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Induction Group	2	16.37218	8.18609	11.0389	<.0001*
Error	161	119.39255	0.74157		
C. Total	163	135.76474			

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
Mindful	Wander	0.7490801	0.1634789	0.426241	1.071920	<.0001*
Mindful	LKM	0.5207210	0.1650278	0.194823	0.846619	0.0019*
LKM	Wander	0.2283591	0.1657556	-0.098976	0.555695	0.1702

For the loving-kindness manipulation check, the means were significantly different ($P = .0085$). Both the LKM and mindfulness inductions produced significantly higher manipulation

check scores than the control group. The LKM mean was higher than the mindfulness mean, but not significantly.



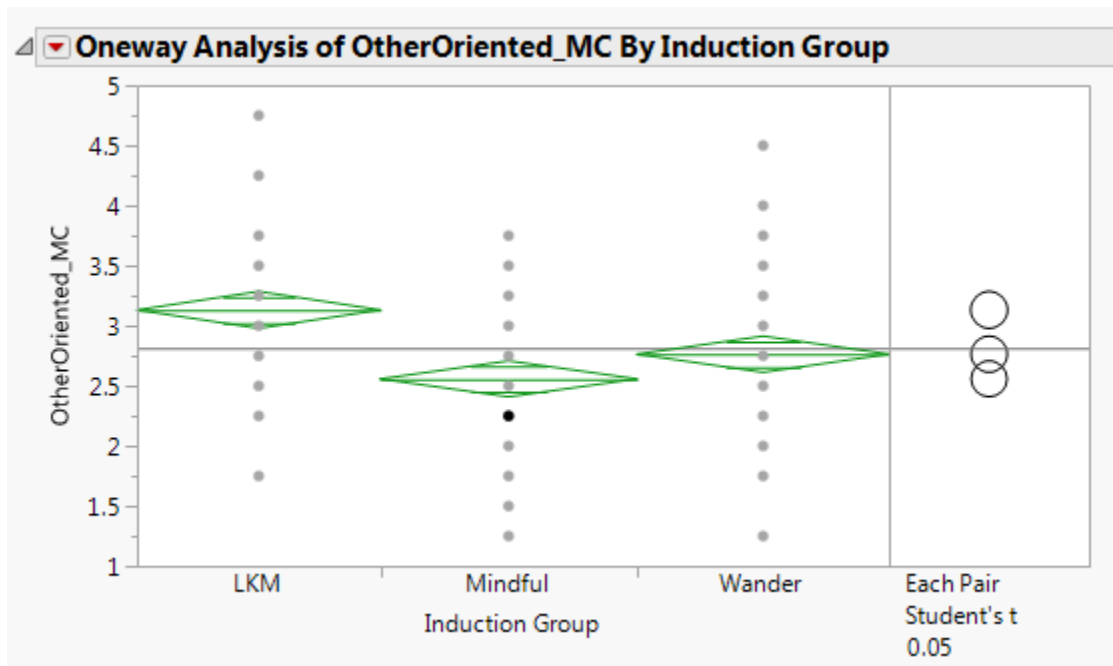
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Induction Group	2	7.76033	3.88016	4.9124	0.0085*
Error	161	127.16854	0.78987		
C. Total	163	134.92886			

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
LKM	Wander	0.5145798	0.1710683	0.176753	0.8524068	0.0031*
Mindful	Wander	0.3814935	0.1687186	0.048307	0.7146804	0.0251*
LKM	Mindful	0.1330863	0.1703171	-0.203257	0.4694298	0.4357

For the “Other Oriented” manipulation check, means were significantly different among induction groups ($P < .0001$). The LKM produced significantly higher scores than both the mindfulness and control inductions ($P < .0001$, $P = .0009$). The mindfulness induction produced a marginally significant lower mean than the control, indicating focus on the self rather than on others ($P = .0573$).



Analysis of Variance

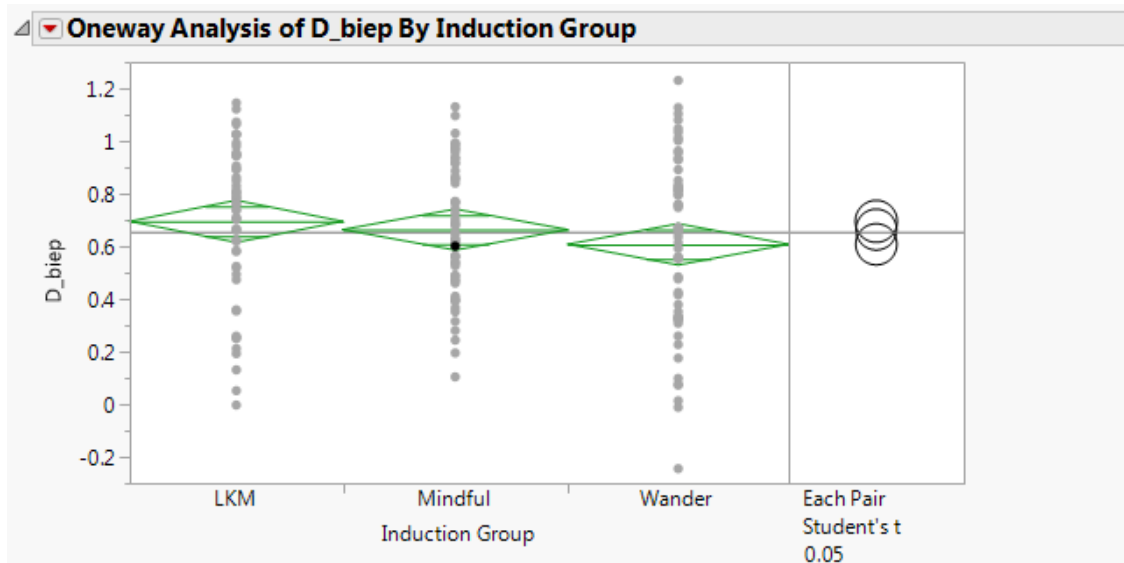
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Induction Group	2	9.170247	4.58512	14.3336	<.0001*
Error	161	51.501628	0.31989		
C. Total	163	60.671875			

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
LKM	Mindful	0.5740398	0.1083874	0.359995	0.7880841	<.0001*
LKM	Wander	0.3684391	0.1088655	0.153451	0.5834275	0.0009*
Wander	Mindful	0.2056006	0.1073702	-0.006435	0.4176361	0.0573

Implicit Bias by Induction Group

A one-way ANOVA analysis for implicit bias by induction did not show a statistically significant difference between groups:

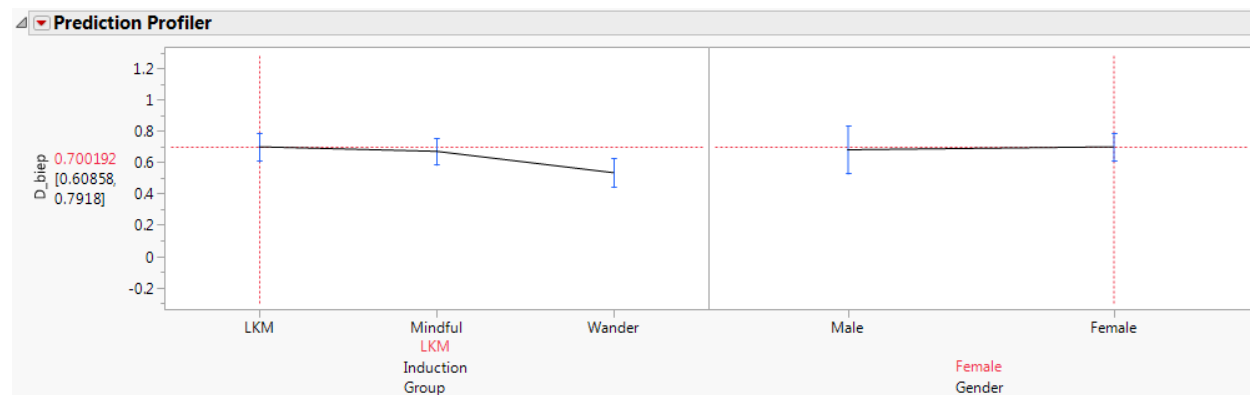
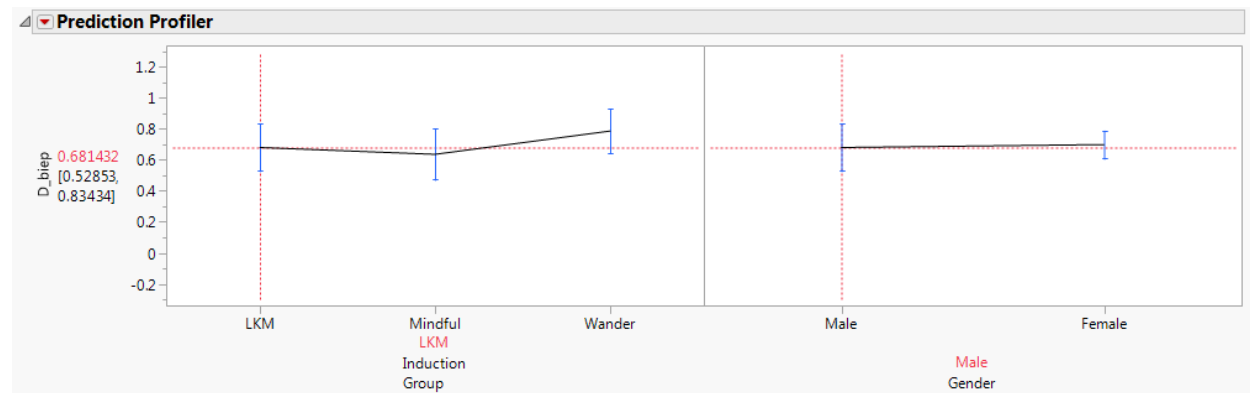


Overall, male-identified participants had higher implicit bias scores than women (.71 vs .64), although these differences were not significant ($P = .17$). However, there was a significant interaction effect ($P = .0371$) between gender and induction group on implicit bias when we ran a 3x2 ANOVA with an interaction.

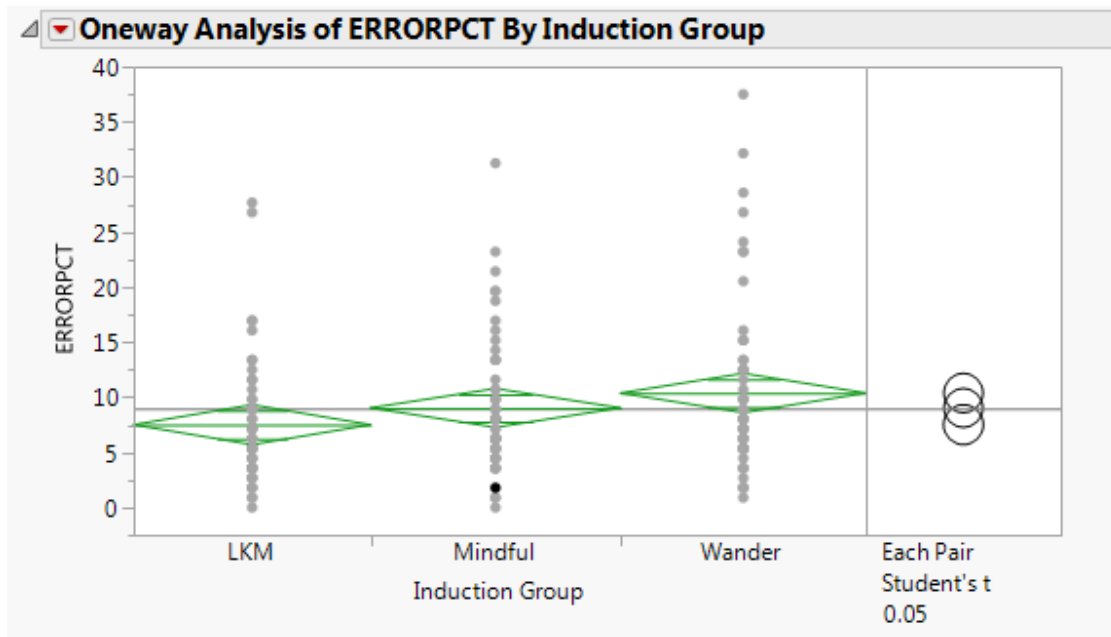
Effect Tests					
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Induction Group	2	2	0.03059478	0.1823	0.8335
Gender	1	1	0.13854189	1.6512	0.2007
Induction Group*Gender	2	2	0.56432588	3.3628	0.0371*

The LS Means Plot and Prediction Profiler show that males had a higher implicit bias set point than females following the mind-wandering induction, and that the LKM and mindfulness

inductions decreased bias in males (although not significantly), while increasing implicit bias in females (significantly).



When looking at error percentage on the IAT, there was an overall marginally significant difference by induction group ($P = .0850$). When looking at the ordered differences report, subjects in the LKM group had statistically significantly lower error on the IAT than subjects in the control group ($P = .00267$).



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Induction Group	2	223.4130	111.707	2.5034	0.0850
Error	161	7184.0882	44.622		
C. Total	163	7407.5012			

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
Wander	LKM	2.876133	1.285777	0.33697	5.415295	0.0267*
Mindful	LKM	1.526701	1.280130	-1.00131	4.054713	0.2348
Wander	Mindful	1.349432	1.268116	-1.15485	3.853718	0.2889

When introducing gender in a 3x2 ANOVA with interaction, we found that both gender and the induction group had a significant effect on IAT error percentage ($P=.00014$ and P

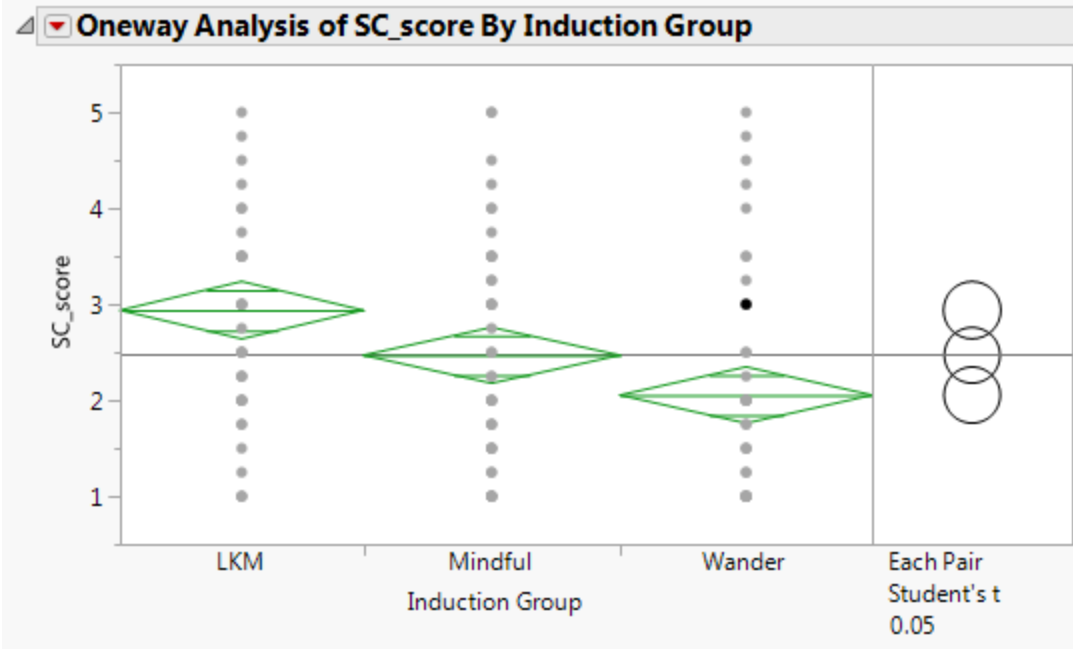
= .0292 respectively). The overall model was a significant predictor of IAT error as well ($P = .0034$). The LS Means Plot shows that most of this effect occurred in males, who had a significantly lower error percentage after the LKM induction:



Mediators by Induction Group

We ran linear ANOVA analyses to test the effect of the of the induction group on the mediators we measured, including the results of the following scales: Inclusion of Other in Self, Trait Empathetic Concern, Trait Compassion, State Positive and Negative Affectivity, State Pleasantness, and State Compassion. We saw significant differences by induction group for state pleasantness, state compassion, and inclusion of other in self, but not for state positive or negative affect or any of the trait scales.

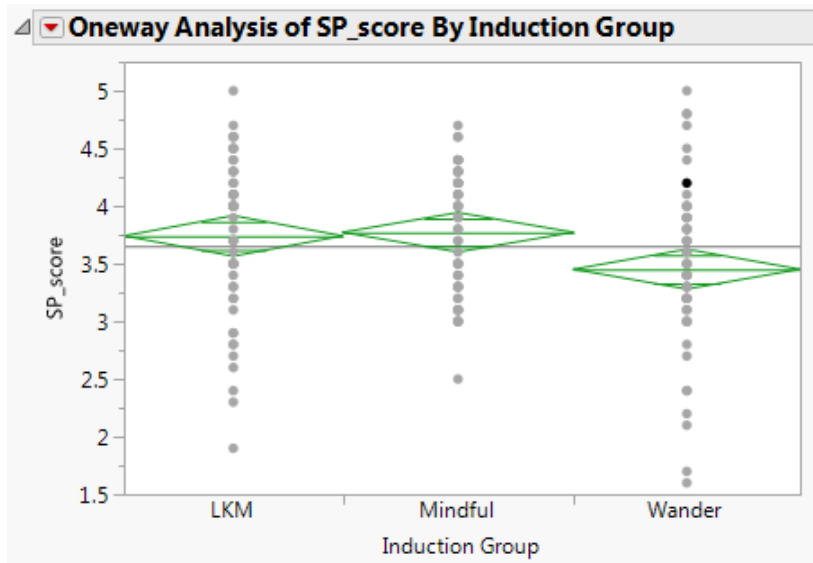
State compassion differed the most significantly by group ($P = .0003$), with the LKM induction producing the highest levels of compassion, followed by the mindfulness induction and finally the mind-wandering induction with significantly lower levels of compassion than both experimental groups.



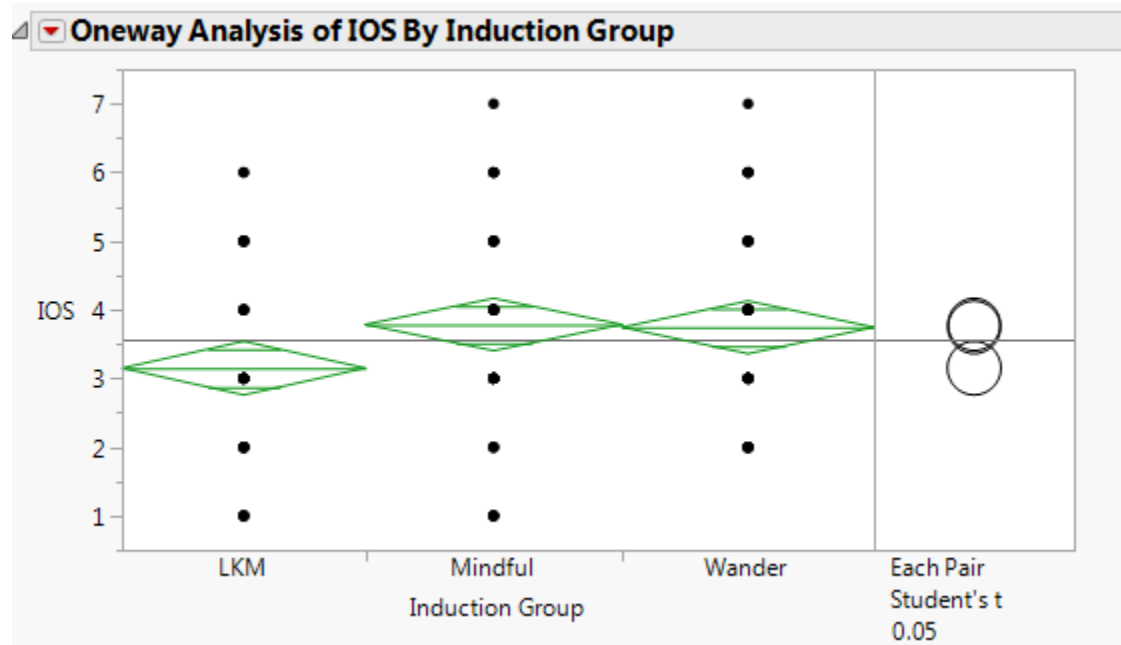
Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
LKM	Wander	0.8841338	0.2124217	0.4646416	1.303626	<.0001*
LKM	Mindful	0.4699292	0.2114889	0.0522792	0.887579	0.0277*
Mindful	Wander	0.4142045	0.2095041	0.0004742	0.827935	0.0497*

State pleasantness was also significantly higher in both the LKM group and mindfulness group than the mind-wandering group ($P = .0185$).



We also found that participants in the LKM group had significantly lower levels of inclusion of other in self than the other two groups ($P = .0404$):



We then ran ANCOVA analyses of implicit bias scores on all of these mediators with and without interaction effects, but did not find significant effects on overall scores of implicit bias.

However, we did find that state compassion and state positive pleasantness mediated the effect of

the induction group on overall error rates on the IAT, and that negative affect was significantly negatively correlated with error rates.

In a multiple regression of state compassion and induction group on error percentage, we found a significant effect of induction group ($P = .0216$) and significant interaction ($P = .0080$). The LKM in particular was shown to increase state compassion (see section below), and this effect was associated with decreased error rates.

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Model	5	717.1802	143.436	3.3874	
Error	158	6690.3210	42.344		
C. Total	163	7407.5012			0.0062*

Parameter Estimates					
Term	Estimate	Std Error	t Ratio	Prob> t	
Intercept	8.1359515	1.286817	6.32	<.0001*	
Induction Group[LKM]	-1.649783	0.776275	-2.13	0.0351*	
Induction Group[Mindful]	-0.399048	0.734189	-0.54	0.5875	
SC_score	0.5230767	0.46579	1.12	0.2631	
Induction Group[LKM]*(SC_score-2.48171)	-1.115706	0.673227	-1.66	0.0995	
Induction Group[Mindful]*(SC_score-2.48171)	-0.920656	0.656967	-1.40	0.1631	

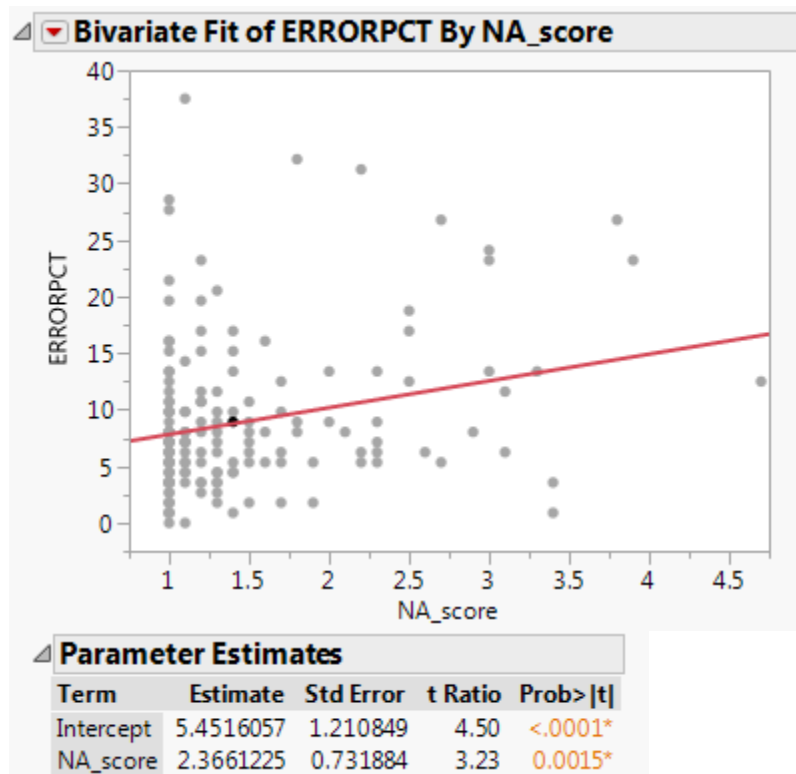
Effect Tests					
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Induction Group	2	2	332.71382	3.9287	0.0216*
SC_score	1	1	53.39983	1.2611	0.2631
Induction Group*SC_score	2	2	421.40800	4.9760	0.0080*

In a multiple regression of state pleasantness and induction group on error percentage, we found a significant effect of induction group ($P = .0296$) and interaction effect ($P = .0221$). Increased state pleasantness produced by the LKM and mindfulness inductions served to reduce overall error percentage.

Effect Tests					
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Induction Group	2	2	310.67585	3.5982	0.0296*
SPP_Score	1	1	10.28191	0.2382	0.6262
Induction Group*SPP_Score	2	2	337.20432	3.9054	0.0221*

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	586.4648	117.293	2.7169
Error	158	6821.0364	43.171	Prob > F
C. Total	163	7407.5012		0.0220*

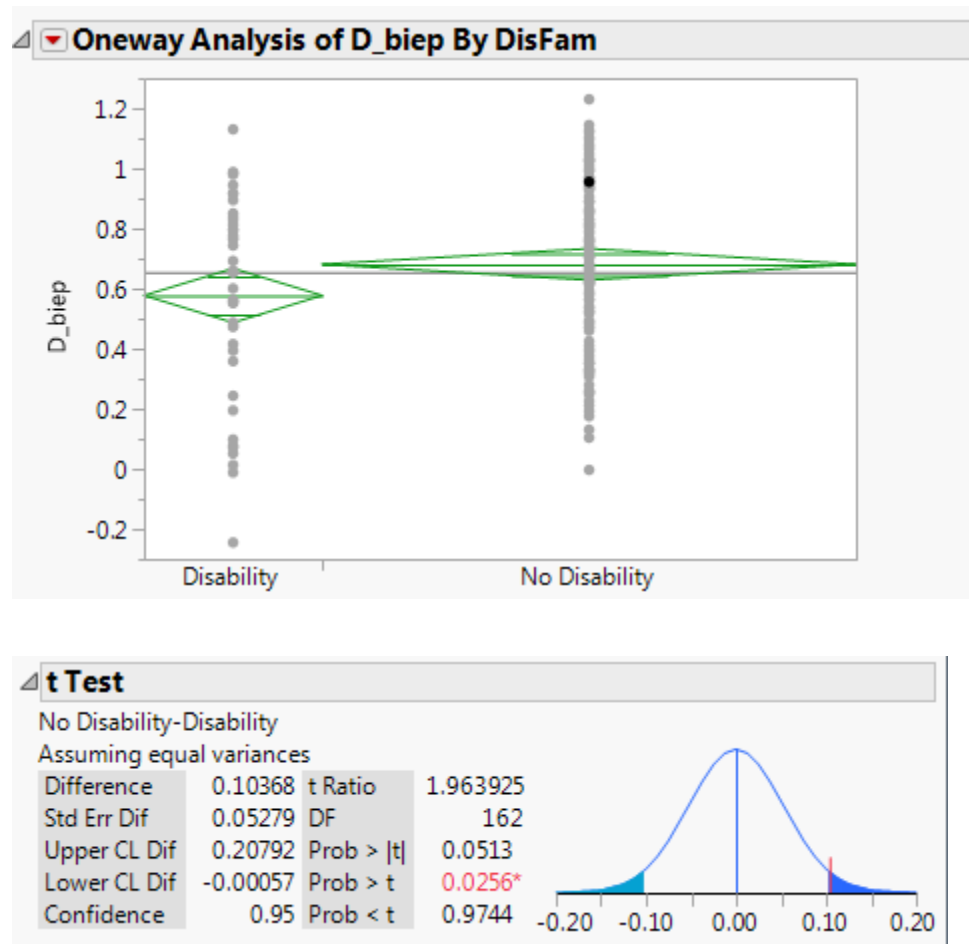
In a linear regression, negative affect was a strong predictor of error percentage, with higher negative affect leading to significantly higher levels of error ($P = .0015$):



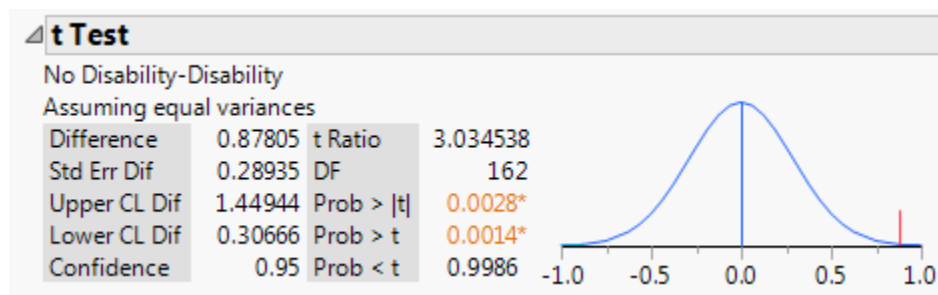
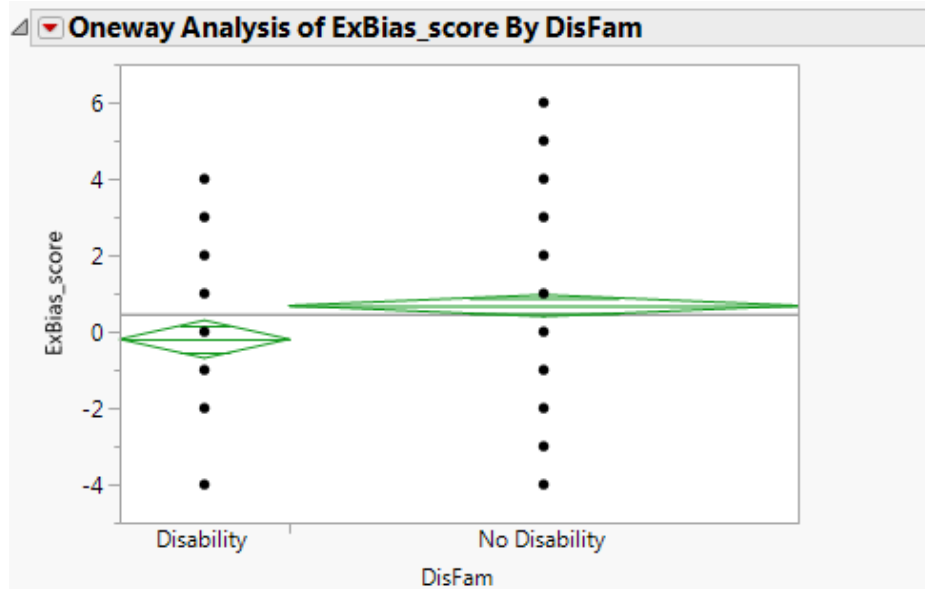
Disability-Related Demographic Tests

We ran one-way ANOVA analyses of implicit bias scores and disability-related demographics. The sample size of participants with a self-reported disability (9) was too small to

see any significant effect, but there was a significant difference in implicit bias for people who reported having family or friends with disabilities or learning difficulties. Participants in this group showed lower implicit bias than people who did not report having close relationships with someone who was disabled:



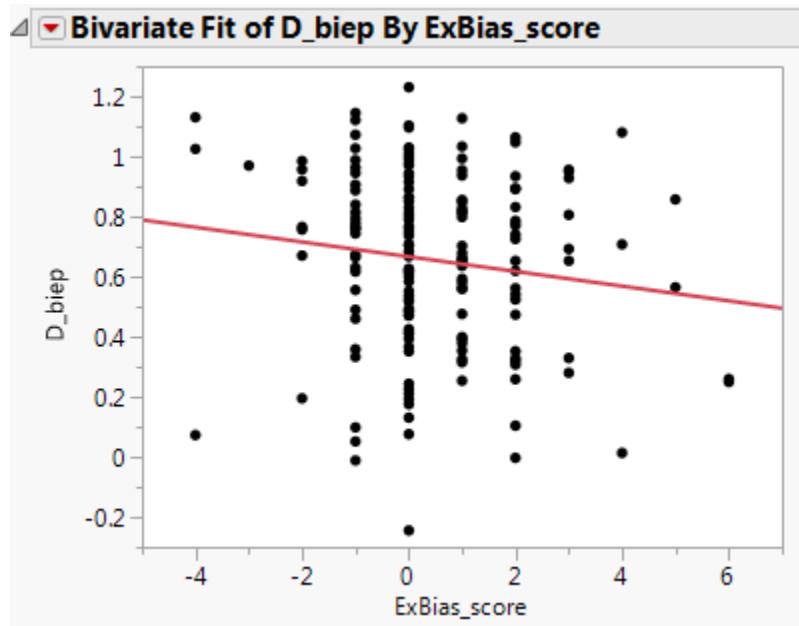
When comparing explicit bias scores across disability-related demographics, we also found that those who had family members with disabilities reported significantly lower levels of *explicit bias* than those who did not ($P = .0014$).



Analysis of Explicit Bias

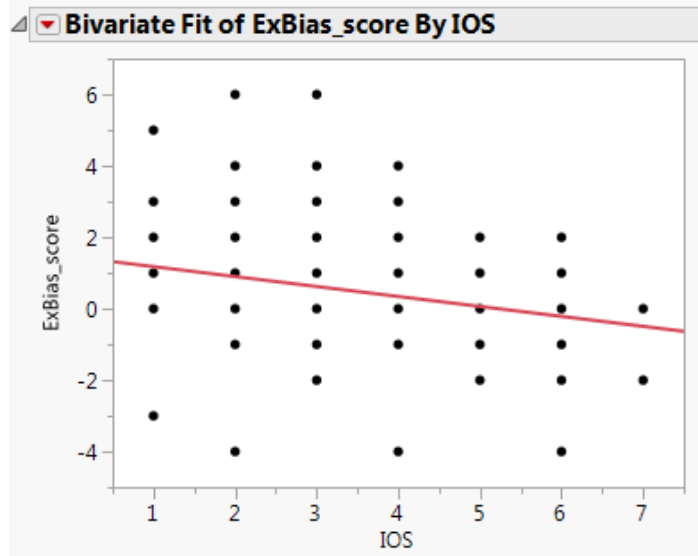
Using survey data on attitudes toward disabled and abled persons, we calculated a score for explicit bias where higher positive numbers signified greater bias against disabled people and higher negative numbers signified greater bias against abled people. We also took the absolute value of this measure as an indicator of overall bias, where numbers further from zero indicate higher levels of bias. Using a linear regression model, we found no significant relationship between these explicit bias scores and levels of implicit bias.

However, in the linear regression of implicit bias scores by explicit bias scores, we found a *marginally significant* inverse relationship ($P = .0815$). Those that reported higher levels of explicit bias were marginally less implicitly biased and vice-versa.

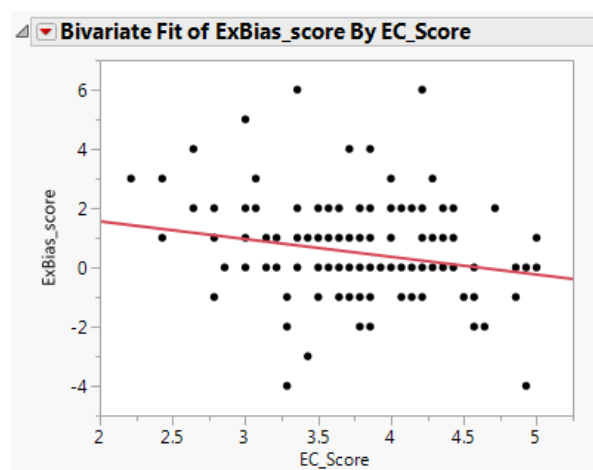
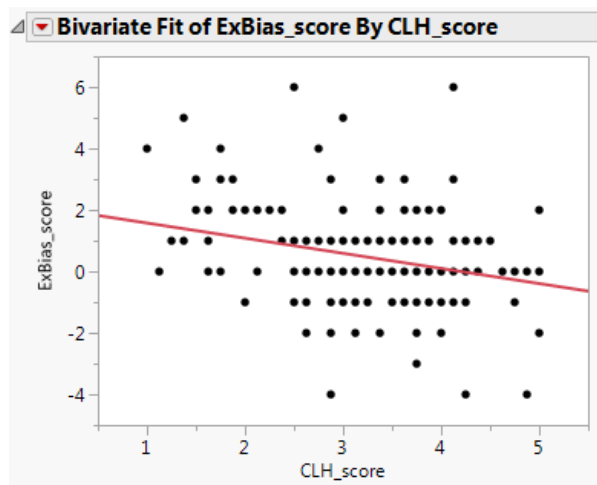


We also found significant relationships between some of the mediators we measured and explicit bias scores. There was an inverse relationship between Inclusion of Self in Other and explicit bias ($P = .0014$) that held for the absolute value measure of explicit bias as well.

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	1.4579357	0.329962	4.42	<.0001*
IOS	-0.278806	0.085632	-3.26	0.0014*



There was a significant negative relationship between both measures of explicit bias and compassionate love for humanity ($P = .0004$, $P = .0096$ for absolute value). We also found a significant negative relationship between explicit bias and empathetic concern ($P = .0119$) which was marginally significant as well for the absolute value measure.



DISCUSSION

Implicit Bias

Neither the 15-minute LKM induction nor the 15-minute mindfulness induction produced significant effects on overall IAT disability D-biep scores as compared to the mind-wandering condition. Because we did not get a main effect, we were unable to measure any mediating effects using multiple regression, and running these models with an interaction effect did not significantly predict implicit bias scores. As such, we were unable to recreate the reduction in implicit bias scores found by Lueke and Gibson (2015) who used a shorter mindfulness induction and measured age and race bias, or Kang, Gray and Dovidio (2014) who used an 8-week LKM training. Unconscious biases are elusive by definition, and the IAT is an imperfect measure of this already obfuscated phenomenon (Blanton, et al. 2009). However, our results do point to some pathways through which the mindfulness and loving-kindness inductions might reduce bias. These findings may contribute to developing appropriate training for optimal bias reduction.

Specifically, we found a significant reduction in error percentage on the IAT for participants in the LKM group. Male participants mainly drove the effect, which was mediated by both state compassion and positive state pleasantness. Reduced error percentage is one indicator of decreased implicit bias because participants generally make errors on the IAT when presented with the pairing combination abled+bad and disabled+good. Clicking the correct key is difficult in this task because of implicit associations between abled+good and disabled+bad. Thus, a lower error percentage may indicate that participants in the LKM group were more able to overcome the implicit biases that arose, allowing them to choose the correct response.

The reason that decreased error might not necessarily translate to overall D-biep scores is that these overall scores also factor in reaction time. Specifically, when participants make an error, we replace their latency for that instance by the block mean plus 600ms. Thus avoiding an error on the disabled+good, abled+bad stage will actually *increase* the implicit bias score if the time lapsed is greater than the block mean plus 600ms.

It is also important to note here that although the IAT has long been the standard for assessing implicit bias, some researchers have questioned its scoring mechanisms and predictive validity. In a chapter on the reliability and validity of the IAT, Lane et al. (2007) review a group of studies using the IAT to report test-retest reliabilities that range from $r = .25$, in sessions conducted a year apart with $N = 52$, to $r = .69$, in sessions conducted a month apart with $N = 80$. In the study with the largest sample size conducted by Greenwald & Farnham (2000), with $N = 145$, same-session tests only led to a test-retest reliability of $.43$. Although the authors interpret these numbers as showing “reasonably good reliability over multiple assessments of the task,” they also find lacking “convergent validity” in the relationship of the IAT to other implicit measures. Because two IATs intended to measure the same construct can vary widely, they also note that a single IAT is “not necessarily a good measure of the target construct.” Critics including Oswald et al. (2013) have scrutinized the predictive validity of the overall score, although the topic is heavily debated. The authors conducted a meta-analysis of studies that employ IAT scores, measures of explicit bias, and other measures of inter-group bias. They found that IAT scores were poor predictors of bias in categories such as interpersonal behavior, person perception, micro behavior, and policy preference, and no better than explicit bias scores at predicting these outcomes. Given these criticisms, it may actually be beneficial to look at error rates, which are more intuitively interpretable than calculated D-biep scores.

There are also plausible explanations in the literature for why the LKM induction may have reduced error rates without affecting overall scores. Van Nunspeet, Ellemers, and Derks (2014) suggest that activating people's motivation to be moral can reduce implicit bias. It is plausible that LKM participants had this increased motivation, which would be reflected in reduced error because of better effort, but not in reaction time. It also may be that participants in this group and the mindfulness group were more motivated, more attentive to the task, or had increased perception.

To disentangle these effects, further analysis of this data and data in future experiments would employ The Quad Model of Implicit Task Performance, as described by Conrey, et al. (2015). This model breaks down four distinct processes that contribute to overall IAT bias measures. Specifically, bias includes 1) automatic activation of an association (AC), 2) the ability to determine the correct response (discriminability; D), 3) the success at overcoming biased activations (OB), and 4) the influence of other general response biases (G). In five different studies, Conrey, et al. (2015) validate the model as an effective way to mathematically disentangle these effects and explain IAT bias scores.

Lueke and Gibson (2015) used a Quad Model Analysis in their study of mindfulness meditation and implicit bias; in addition to demonstrating an overall reduction in implicit race and age bias following a 10-minute mindfulness meditation, they were able to break down the IAT scores using the model. For both the race and age IATs, they found that the AC parameter was significantly lower for the mindfulness condition, indicating lower activations of old/bad and black/bad associations. They also found lower discriminability in the control condition than

in the mindfulness conditions. Relevant to our results, they found that for the age IAT, the guessing component was higher for the control condition.

We did find that males and females reacted differently to the inductions; males given the mind wandering induction had a higher bias set point than females in the same group, but males given the mindfulness and LKM inductions showed a reduction in bias while females showed a significant increase in implicit bias ($P = .0362$).

In developing and validating the Disability IAT, Pruett and Chan (2006) aimed to test the relationship and predictive ability of a set of demographic variables including age, gender, ethnicity, and disability-related factors on implicit attitudes. They specifically selected symbols for disability and ability (the same ones we used in our study) to be neutral for race and gender. In their experiment, they failed to explain a significant amount of variation in implicit or explicit bias scores using basic demographic variables including gender. Given this, it seems surprising that males in our experiment had a higher bias set point than females. Moreover, it is curious that females given the mindfulness and LKM inductions experienced a significant increase in implicit bias. It is possible that the mind-wandering induction does not replicate a baseline state and that the inductions affected males and females differently. However, the gender results are less surprising when use error rates as an indicator of implicit bias. Here, the mindfulness and LKM inductions produced lower error rates for both males and females, and this effect was especially pronounced among males in the LKM group. Either way, more research is needed to disentangle the divergent effects of these experimental inductions by gender identity.

When looking at the relationship between disability-related demographic factors and implicit bias scores, we found that people who had family or friends with disabilities or learning

difficulties had lower levels of implicit bias. These participants may have many positive associations with disabled people. In fact, the only participant out of the 164 who had a significant bias in favor of people with disabilities was in this category.

In developing the Disability IAT, Pruett and Chan (2006) found that contact with disabled persons was the dominant predictor of implicit bias scores. They used the *Contact with Disabled Persons (CPDS)* scale developed by Yuker and Hurley (1987) to measure this. Using a hierarchical multiple regression model that included demographic and psychological variables, they found that scores on the CDPS showed the highest predictive ability for implicit attitudes toward people with disabilities. However, they also found that report of a personal disability or a family member with a disability failed to offer any predictive ability for implicit bias. The authors explain that this may be because there were too few data points for their analysis; by contrast, the CDPS was a more comprehensive measure because it focused on the quantity of all participants' contact with disabled persons in multiple settings. In our sample, 25% of participants (41 out of 164) reported having a family member or close friend with a disability, and we did see an effect on implicit bias.

Participants with friends or family members with disabilities also reported significantly lower levels of explicit bias on average ($P = .0014$). A further examination of explicit bias revealed that higher scores on the Inclusion of Other in Self Scale, the Compassionate Love for Humanity Scale, and the Empathetic Concern scale all predicted lower levels of explicit bias.

However, lower explicit bias scores did not translate into lower implicit bias. In fact, using linear regression, lower explicit bias scores marginally significantly predicted higher levels of implicit bias ($P = .0815$). In their 2006 study, Pruett and Chan found that IAT scores had no

relationship with the Attitude toward People with Disabilities Scale, which they used to measure explicit bias. Our results were only marginally significant and suggest that participants who claimed to be less biased toward people with disabilities were equally (or perhaps more) implicitly biased. Participants who fall into this category of low-explicit, high-implicit bias contribute equally to bias at the community level. In speaking about race, Gaertner and Dovidio (1986) describe this phenomenon as “the aversive form of racism” where egalitarian values are espoused alongside deep implicit racial prejudice.

In a chapter on the relationship between implicit and explicit measures of intergroup bias, Dovidio, Kawakami and Beach (2001) argue that implicit and explicit measures involve different processes that are not always correlated. In a summary of the empirical findings on the relationship between explicit and implicit racial attitudes across 27 tests including 1562 participants, they found a significant but modest positive relationship between the two measures.

Manipulation Checks and Mediators

Significant manipulation checks showed that the inductions were successful at producing intended effects. Participants who underwent the mindfulness induction reported higher levels of mindfulness following the induction ($P < .0001$), and participants who underwent the LKM induction reported higher levels of kindness and compassion toward the self and others following the induction ($P = .0085$). LKM participants reported greater focus on others compared to the control group ($P = .0009$) while mindfulness participants reported a greater focus on the self over others, although this last effect was only marginally significant ($P = .057$). These results

demonstrate that we were able to produce reported feelings of mindfulness, compassion, and focus on others through the meditation inductions.

We hypothesized that the LKM would have a greater effect on compassion than empathy, and that this compassion would lead to a reduction in implicit bias. Indeed, although the LKM led to the highest reported levels of *focus on others*, LKM participants reported *lower levels of inclusion of other in self* than participants in the other two groups ($P=.04$). This finding supports our hypotheses that LKM works through compassion, which is “feeling *for*” the other, rather than through empathy, which is “feeling *with*” the other (Singer and Klimecki, 2014). Participants were able to include other people in their thoughts without entering empathetic distress.

State compassion scores also reflected the compassionate response produced by the LKM. Participants in this group had the highest levels of state compassion by a large margin. We also tested for trait compassion and trait empathy, but did not find any significant differences by induction group, or any significant effects on implicit bias. These scales might have been more appropriate for measuring the effects of a longer period of meditation training, rather than 15-minute inductions. Future research on short-form LKM should investigate state empathy as well.

We also hypothesized that both the mindfulness meditation and the LKM would act on implicit bias by increasing positive affect. We did not see any significant relationship between induction group and positive or negative affect, but we did find that participants in both of these conditions had significantly higher levels of state pleasantness. When this effect was broken down, we found that it was driven by both lower negative state pleasantness and higher positive

state pleasantness. We suggest that further research include pleasantness measures in addition to the traditional PANAS.

Our failure to increase positive affect is somewhat inconsistent with results found by Klimecki et al. (2014), although positive state pleasantness might represent an equivalent for a shorter induction. Their study found that compassion training increased positive affect and reversed an increase in negative affect caused by empathy training and exposure to human suffering. The researchers found an explanation for these effects on the neural level; empathy training actually increased activation in brain circuits associated with negative affect while compassion training increased activation in networks associated with affiliation and reward.

We also hypothesized that the mindfulness induction would increase temporal focus and decrease focus on the self. Manipulation checks revealed that participants who received this induction reported the highest levels of grounding in the present moment, or increased temporal focus. However, they also reported the highest levels of thoughts focused on the self rather than others, which was the opposite effect of the LKM induction.

It is possible that we did not effectively measure the decentering mechanism of mindfulness. Shapiro (2006) originally proposed that mindfulness acts through a reperceiving mechanism (akin to decentering, deautomatization or detachment), which allows participants to disidentify from the contents of consciousness. This is essentially a shift from seeing the self as “subject” to seeing the self as “object” in the stream of consciousness. The extent to which a participant’s thoughts focused on themselves versus others (which is what we measured in our study) does not appropriately capture this decentering effect.

When we asked participants about the degree to which their thoughts focused on the self, we also neglected to differentiate between thoughts of the self in the present moment and thoughts of the self across time. Farb et al. (2007) suggests that mindfulness decentering mechanisms act not simply by reducing focus on the self, but by separating momentary self-reference from extended self-reference. Using fMRI imaging, they showed that mindfulness dissociated these two types of self-reference. We failed to capture this more nuanced effect, and future research might refine the manipulation check to account for both forms of self-reference more explicitly.

CONCLUSION

The moral and epistemic costs of implicit biases demand that we work toward techniques to reduce their impact. In healthcare delivery, for example, these biases drives large disparities in healthcare for stigmatized patients. Zestcott, Blair and Stone (2016) cite “an urgent need for more research to test the extent to which interventions [to reduce implicit bias] are effective, both immediately and during the course of health care delivery.”

Recent studies have pointed to mindfulness and compassion training as potential antidotes to implicit bias. We attempted to extend this research by investigating the effects of brief mindfulness and loving-kindness meditations on implicit disability bias, and by exploring the cognitive and emotional pathways through which the two techniques act.

We investigated these pathways through an experimental study with 224 participants. We were unable to demonstrate that the techniques led to an overall reduction in implicit bias scores compared a control group. However, we found evidence that the LKM significantly reduced error rates on the disability IAT as compared to the control group and that state compassion and positive state pleasantness mediated this effect.

We also found that even short 15-minute inductions could produce intended states of mindfulness and compassion and modulate how individuals relate to others. In particular, our data supported the hypotheses that LKM acts through compassion rather than empathy and that both mindfulness meditation and LKM can increase state pleasantness. It also suggested that the two experimental inductions act differently in how they affect the intensity and nature of focus on the self and others.

We also saw that the experimental inductions affected implicit bias levels differently for males and females, with males seeing a greater reduction in implicit bias and error rates following the LKM. When looking at explicit bias, we found that higher levels of trait compassion, empathy, and inclusion of other in self were correlated with lower explicit bias.

Going forward, we encourage additional research on the comparative effects of brief mindfulness meditation and LKM, as well as these practices over longer periods. Longer-term practice may allow the short-term effects of the brief inductions on compassion and relating to others to accumulate into trait effects. Our research suggests that ultimately these techniques may prove effective at reducing implicit bias.

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APPENDIX

Consent and Information Form



Title of Research Study: Emotion, Attention and Response Time
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Principal Investigators:

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Emergency Contact:

The purpose of this study is to investigate emotion and response time on an attention-based task.

This study will be conducted by Professor Sigal Barsade and Tai Bendit at the Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania. You must be 18 years or older to participate in this study.

- If you agree to be in this study, you will be asked to listen to a recording, complete a survey and complete an attention-based task.
- You will receive \$10 for your participation in this study.
- Participation in this research is voluntary. Beyond the monetary compensation for this study, you will not receive any direct benefits from the study. There are no known risks associated with your participation in this research beyond those of everyday life.

- You may refuse to participate or withdraw at any time during this study without penalty.

Additionally, you may withdraw your information from the study even after completion of the study, and may do so via phone or email. If you withdraw, you will still receive \$10 payment for participation.

- While filling out the questionnaires, you have the right to skip or not answer any questions that you prefer not to answer.

- You have the right to ask questions about this study at any time while completing the questionnaire.

- If you have additional questions or wish to report a research-related problem, you may contact the faculty sponsor, Sigal Barsade, at (215) 898-1373 or email her at barsade@wharton.upenn.edu.

- There are no known risks to your participation in this research. There are no direct benefits to you for participating, but this research is intended to help the investigators learn more about cognitive processes.

- If you have questions about your rights and welfare as a volunteer in the research study, please contact the Office of Regulatory Affairs at the University of Pennsylvania at 215-898-2614 and/or Professor Sigal Barsade.

- Confidentiality of your research records will be strictly maintained by ensuring all data is kept in a locked room, and only the primary investigator and her research team will have access to this data.

When you sign this document, you are agreeing to take part in this research study. If you have any questions or there is something you do not understand, please ask. If you would like, you will receive a copy of this consent document.

Signature of Subject _____

Print Name of Subject _____

Date _____

SURVEY MATERIALS – Disability Explicit Bias

From Harvard Project Implicit

How cold or warm do you feel toward disabled people?

- Very Cold (1)
- Cold (2)
- Neutral (3)
- Warm (4)
- Very Warm (5)

How cold or warm do you feel toward abled people?

- Very Cold (1)
- Cold (2)
- Neutral (3)
- Warm (4)
- Very Warm (5)

Which statement best describes you?

- I strongly prefer Abled Persons to Disabled Persons (1)
- I moderately prefer Abled Persons to Disabled Persons (2)
- I slightly prefer Abled Persons to Disabled Persons (3)
- I like Abled Persons and Disabled Persons equally (4)
- I slightly prefer Disabled Persons to Abled Persons (5)
- I moderately prefer Disabled Persons to Abled Persons (6)
- I strongly prefer Disabled Persons to Abled Persons (7)

Timing

- First Click (1)
- Last Click (2)
- Page Submit (3)
- Click Count (4)

SURVEY MATERIALS – Manipulation Checks

For the following questions, please answer in regards to how you felt at the end of the audio recording that you listened to. Please bring to mind how you felt at the end of the recording, before you began filling out the rest of the survey, and answer the following questions with your feelings at that time period in mind.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

1. How much were you focused on your breathing at the end of the recording you listened to?
2. How much were you able to generate feelings of kindness and compassion after the recording you listened to?

How much do you agree with the following statements? (RANDOMIZED ORDER)

3. "At the end of the recording, I was very focused on the physical sensations of my breath."
4. "At the end of the recording, I felt kindness towards myself."
5. "At the end of the recording, I was in touch with my body."
6. "At the end of the recording, my thoughts were focused on the future or past."
7. "At the end of the recording, my thoughts were focused on the present moment."
8. "At the end of the recording, I was mostly thinking about the present moment."
9. "At the end of the recording, I felt affection and sympathy for others."
10. "At the end of the recording, I was thinking about other people."
11. "At the end of the recording, I was thinking about my life."
12. "At the end of the recording, I was thinking about my relationships."
13. "At the end of the recording, I was focused on myself."
14. Timing
 - a. First Click (1)
 - b. Last Click (2)
 - c. Page Submit (3)
 - d. Click Count (4)

SURVEY MATERIALS - State Affectivity (PANAS)

State Positive and Negative Affectivity (PANAS)

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of Positive and Negative Affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070.

Instructions.

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you felt this way at the end of the audio recording that you listened to, that is, about 15 minutes after the beginning of this study.

1=very slightly or not at all; 2=a little; 3=moderately; 4=quite a bit; 5=extremely

Interested	Irritable	Guilty	Determined
Distressed	Alert	Scared	Attentive
Excited	Ashamed	Hostile	Enthusiastic
Upset	Inspired	Jittery	Proud
Strong	Nervous	Active	Afraid

State Pleasantness

Barsade, Sigal G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly*, 47, 644-675.

Instructions

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you felt this way at the end of the audio recording that you listened to, that is, about 15 minutes after the beginning of this study.

1=very slightly or not at all; 2=a little; 3=moderately; 4=quite a bit; 5=extremely

happy	pleasant
pessimistic	optimistic
warm	unhappy
sad	lethargic
gloomy	depressed

State Compassion

Instructions

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent

you felt this way at the end of the audio recording that you listened to, that is, about 15 minutes after the beginning of this study.

1=very slightly or not at all; 2=a little; 3=moderately; 4=quite a bit; 5=extremely

affectionate

caring

Compassionate

tender

SURVEY MATERIALS - Compassionate Love for Humanity Scale

Sprecher, S. & Fehr, B. (2005). Compassionate love for close others and humanity. *Journal of Social and Personal Relationships*, 22, 629-651.

Read each item and then mark the appropriate answer in the space next to that item. Indicate to what extent you felt this way at the end of the audio recording that you listened to, that is, about 15 minutes after the beginning of this study.

1=not like me; 2=a little like me; 3=moderately like me; 4=quite a bit like me; 5=extremely like me

1. I tend to feel compassion for people, even though I do not know them
2. When I hear about someone (a stranger) going through a difficult time, I feel a great deal of compassion for him or her.
3. I feel considerable compassionate love for people from everywhere.
4. One of the activities that provides me with the most meaning to my life is helping others in the world when they need help.
5. I would rather engage in actions that help others, even though they are strangers, than engage in actions that would help me.
6. I often have tender feelings toward people (strangers) when they seem to be in need.
7. I feel a selfless caring for most of humankind.
8. If a person (a stranger) is troubled, I usually feel extreme tenderness and caring.

Timing

- First Click (1)
- Last Click (2)
- Page Submit (3)
- Click Count (4)

SURVEY MATERIALS – Empathetic Concern Scale

Davis, M.H., 1980. A multidimensional approach to individual differences in empathy. JSAS Catalog Psychol 10, 85.

Read each item and then mark the appropriate answer in the space next to that item. Indicate to what extent you felt this way at the end of the audio recording that you listened to, that is, about 15 minutes after the beginning of this study.

1=not like me; 2=a little like me; 3=moderately like me; 4=quite a bit like me; 5=extremely like me

Empathic Concern Items

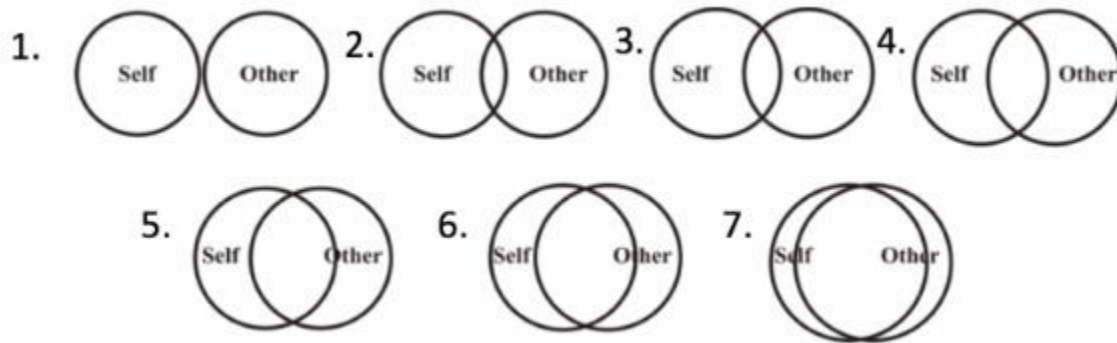
1. I am often quite touched by things that I see happen.
2. Seeing warm, emotional scenes melts my heart and makes me teary-eyed.
3. When I watch a sad, "tear-jerker" movie, I almost always have warm, compassionate feelings for the characters.
4. I would describe myself as a pretty soft-hearted person.
5. Occasionally I am not very sympathetic to my friends when they are depressed.
6. Usually I am not extremely concerned when I see someone else in trouble.
7. Sometimes I don't feel sorry for other people when they are having problems.
8. When I see someone being treated unfairly, I sometimes don't feel very much pity for them.
9. When a friend tells me about his good fortune, I feel genuinely happy for him.
10. When I see someone being taken advantage of, I feel kind of protective toward them.
11. I care for my friends a great deal.
12. I often have tender, concerned feelings for people less fortunate than me.
13. When someone gets hurt in my presence, I feel sad and want to help them.
14. I feel sad when I see a lonely stranger in a group.

Timing

- First Click (1)
- Last Click (2)
- Page Submit (3)
- Click Count (4)

SURVEY MATERIALS - Inclusion of Other in Self Scale

Aron, A., Aron E. N., & Smollan, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology*, 63, 596-612.



Which of the above diagrams best represents your relationships with strangers?

Timing

- First Click (1)
- Last Click (2)
- Page Submit (3)
- Click Count (4)

SURVEY MATERIALS - Disability Demographics

In the last 30 days, how much health-related difficulty did you have in taking care of your household responsibilities?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- Not at all (5)

In the last 30 days, how much were you affected by your health?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- Not at all (5)

In the last 30 days, how much was your health a drain on the financial resources of you and your family?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- Not at all (5)

In the last 30 days, how much did your health cause problems for joining community activities (e.g., birthday parties, religious activities, festivities)?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- Not at all (5)

Do you have a disability or learning difficulty?

- Yes (1)
- No (2)

Do you have a close friend or family member with a disability or learning difficulty?

- Yes (1)
- No (2)

Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

SURVEY MATERIALS - Demographics

What is your age?

What is your gender?

- ☐ Male (1)
- ☐ Female (2)

What is your nationality?

- ☐ American (1)
- ☐ Other (2) _____

What is your native language?

- ☐ English (1)
- ☐ Other (2) _____

Which country were you born in?

- ☐ The United States (2)
- ☐ Other (3) _____

Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

What is your ethnicity?

- American Indian or Alaskan Native (1)
- East or Southeast Asian (2)
- Black or African-American (3)
- Hispanic or Latino (4)
- Native Hawaiian or Other Pacific Islander (5)
- White/Caucasian (6)
- Other (7)

Have you meditated today?

- ☐ No (1)
- ☐ Yes (2)

How often do you meditate?

- ☐ Never (1)
- ☐ Less than Once a Month (2)

- ☐ Once a Month (3)
- ☐ 2-3 Times a Month (4)
- ☐ Once a Week (5)
- ☐ 2-3 Times a Week (6)
- ☐ Daily (7)

How much meditation training have you had?

- ☐ None (1)
- ☐ Hours (2)
- ☐ Days (3)
- ☐ Weeks (4)
- ☐ Months (5)
- ☐ Years (6)

How often do you do yoga?

- ☐ Never (1)
- ☐ Less than Once a Month (2)
- ☐ Once a Month (3)
- ☐ 2-3 Times a Month (4)
- ☐ Once a Week (5)
- ☐ 2-3 Times a Week (6)
- ☐ Daily (7)

How much yoga training have you had?

- ☐ None (1)
- ☐ Hours (2)
- ☐ Days (3)
- ☐ Weeks (4)
- ☐ Months (5)
- ☐ Years (6)

To what extent did you follow the recorded instructions?

- ☐ Not at all (1)
- ☐ A little (2)
- ☐ Moderately (3)
- ☐ Mostly (4)
- ☐ Completely (5)

Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

Do you have asthma or any other condition which affects your breathing?

- ☐ No (1)
- ☐ Yes, I have asthma (2)
- ☐ Yes, I have... (please type condition) (3) _____

Are you currently an undergraduate student at UPenn?

- ☐ Yes (1)
- ☐ No (If not, please type your current occupation) (2) _____

What is your current class year?

- ☐ Freshman (1)
- ☐ Sophomore (2)
- ☐ Junior (3)
- ☐ Senior (4)
- ☐ 5th year or above (5)

Had you taken any part of this survey before? If so, what part?

What is your major?

What do you think we are testing in this study?

Did the recording that you listened to ask you to focus on your breathing?

- ☐ No (1)
- ☐ Yes (2)

Did the recording that you listened to ask you to focus on whatever thoughts came to mind?

- ☐ No (1)
- ☐ Yes (2)

Did the recording that you listened to ask you to generate feelings of kindness?

- ☐ No (1)
- ☐ Yes (2)

Do you have any questions or comments?

Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

Loving Kindness Induction

Adapted from UCLA Mindful Awareness Research Center by Tai Bendit and Dr. Karen Bowles of the Penn Program for Mindfulness.

(00:00) Now we're going to do a focused practice of cultivation of positive emotion for 15 minutes. In this case, kindness and desire for someone to be happy, or yourself to be happy.

(00:15) It's not dependent on something, it's not conditional. It's just a natural opening of the heart to someone else or to yourself

(00:30)

If you find yourself getting distracted . . . that is fine . . . just return to the script . . . There is no right or wrong way to do this . . . Feel free to relax as you go through the experience.

(00:50)

To begin this practice... Let yourself be in a relaxed and comfortable position...

You can check in to your body and notice how you're feeling right now... Letting whatever is here, be here... close your eyes

<pause **00:10** pause> . . .

(1:20) Now let yourself bring to mind... Someone whom, the moment you think of them, you feel happy... See if you can bring to mind... It could be a relative, a close friend... some with not too complicated a relationship

<pause **00:10** pause> . . .

(01:50)

Just a general sense, that when you think of them you feel happy... Can pick a child ... Or you can always choose a pet... A dog or a cat... A creature it's fairly easy to feel love for ... So let them come to mind

<pause **00:20** pause> . . .

(02:30)

Have them-- have a sense of them being in front of you ... You can feel them, sense them, see them... Just observe your experience . . . whatever it is . . .

<pause **00:20** pause> . . .

(03:10)

And as you imagine them... Notice how you're feeling inside... Maybe you feel some warmth... Or there's some heat to your face...

<pause **00:10** pause> . . .

A smile, sense of expansiveness.... This is kindness... This is a natural feeling that's accessible to all of us at any moment

<pause **00:10** pause> . . .

(03:50)

So now having this loved one in front of you ... Begin to wish them well

<pause **00:10** pause> . . .

(04:10)

May you be safe and protected from danger...

May you be happy and peaceful...

May you be healthy and strong...
May you have ease and wellbeing...
And as I say these words, you can use my words or your own words
May you be safe...
May you be happy and peaceful...
May you be healthy and strong...
May you have ease and wellbeing...
<pause 00:20 pause> . . .

(05:10)

And have a sense of letting this kindness come from you... And begin to touch this loved one ...Reaching out ...You might think in images... You might have a sense of colour or light... You might just have a feeling ...The words may continue to bring on more of this feeling
<pause 00:20 pause> . . .

(05:50)

And I encourage you to say whatever feels meaningful to you...
May you be free from stress and anxiety...
May you be free from all fear ...
<pause 00:20 pause> . . .

(06:20)

...And so as you're sending out these words and these feelings of kindness... Also check into yourself and see how you're feeling inside...
<pause 00:20 pause> . . .

(06:50)

And now imagine that this loved one turns around... And begins to send it back to you ...So see if you can receive the kindness
<pause 00:20 pause> . . .

(07:30)

Take it in...And they're wishing you well:
May you be happy ...
May you be peaceful and at ease ...
May you be safe and protected from all danger...
May you have joy, well being...
Letting yourself take it in:
May you be happy ...
May you be peaceful and at ease ...
May you be safe and protected from all danger...
May you have joy and well being...
<pause 00:20 pause> . . .

(08:20)

Now if you're not feeling anything at this point ...Or before in the practice... It's not a problem... This is a practice that plants seeds... And if you're feeling something else other than kindness...Just check into that ...
<pause 00:20 pause> . . .

(09:00)

What is it I'm feeling...There may be something to learn here

<pause 00:10 pause> ...

(09:20)

Now if it's possible and it's not always easy to do this...But see if you can send kindness to yourself ... You can imagine it coming down your body from your heart ... You can just have a sense of it

<pause 00:20 pause> ...

(09:50)

May I be safe and protected from danger ...

May I be healthy and strong...

May I be happy and peaceful...

May I accept myself just as I am...

May I be safe and protected from danger ...

May I be healthy and strong...

May I be happy and peaceful...

May I accept myself just as I am...

<pause 00:30 pause> ...

(10:50)

And as you ask yourself the question "what do I need to be happy?" ... See what arises... And offer that to yourself... May I have meaningful work... A joyful life... Close friends and family

<pause 00:20 pause> ...

(11:35)

And now checking into yourself ... And noticing what it is you feel as you do this

<pause 00:20 pause> ...

(12:10)

And now let yourself bring to mind one person... Or a group of people that you wish to send the kindness to... Imagine them in front of you... Sense them, feel them

<pause 00:10 pause> ...

(12:40)

May you be happy and peaceful

May you be free from all stress and anxiety and fear

May you have joy and happiness

May you be happy and peaceful

May you be free from all stress and anxiety and fear ... Worry ... Grief

May you have joy and happiness ... Wellbeing

(13:10)

And now let this kindness expand out... Spreading... Touching anyone that you want to touch right now... In all directions... People you know, people you don't know... People you have difficulty with... People you love

<pause 00:20 pause> ...

(13:50)

Just imagine expanding and touching ... And each person or animal ... Whoever is touched by this kindness ... Each person is changed... You can imagine that

<pause 00:20 pause> ...

(14:30)

So may everyone everywhere be happy and peaceful and at ease ...May we all experience great joy

<pause 00:15 pause> . . .

(14:55) Now when you are ready . . . slowly and gently . . . open your eyes . . . <pause> . . .

Mindfulness Induction Adapted

Adapted from Arch and Craske, 2006, which was in turn adapted from Segal, Williams, and Teasdale, 2002

Hafenbrack, Andrew C., Kinias, Zoe, & Barsade, Sigal G. (2014). Debiassing the mind through meditation: Mindfulness and the sunk-cost bias. *Psychological Science*, 25(2): 369-376.

(00:00) Now we're going to do a focused-breathing exercise for 15 minutes . . . You may not have done this type of focus-breathing before and that is not a problem in doing this exercise . . .

(00:15) Focusing on your breathing may feel a little bit unfamiliar and that is completely normal . . . Please do not judge yourself . . .

(00:25) If you find yourself getting distracted . . . that is fine . . . just return to the breath . . . There is no right or wrong way to do this . . . Feel free to relax and take in the experience.

(00:40) First . . . settle into a comfortable sitting position . . . sitting with your back straight against the back of the chair . . . your legs uncrossed . . . your feet flat on the floor . . . and your hands in your lap . . . **<pause 00:10 pause>** . . .

(01:00) Now gently close your eyes . . . Ask yourself . . . "What is my experience right now? . . . **<pause>** . . . What am I thinking about? . . . **<pause>** . . . What am I feeling emotionally? . . . **<pause>** . . . What sensations are present in my body?" . . . **<pause>** . . .

(01:30) Just observe your experience . . . whatever it is . . . **<pause 00:25 pause>** . . .

(02:00) Bringing your awareness to your body . . . focus your attention . . . on the sensations of touch or pressure . . . where your body makes contact with the chair . . . Spend a moment or two . . . exploring these sensations . . . **<pause 00:20 pause>** . . .

(02:35) Now bring your attention . . . to the changing physical sensations . . . in your lower abdomen . . . as the breath moves . . . in and out of your body . . .

(02:45) To help you pay attention to your breathing . . . place your hand on your lower abdomen . . . and become aware of the changing sensations . . . where your hand makes contact with your abdomen . . . **<pause 00:10 pause>** . . .

(03:10) When you've "tuned in" to the physical sensations in this area . . . you can remove your hand if you like . . . and continue to focus . . . on the sensations in your abdomen . . . **<pause 00:20 pause>** . . .

(03:45) Focus your awareness . . . on the sensations of slight stretching . . . as the abdomen rises with each in-breath and of gentle deflation . . . as it falls with each out-breath . . . **<pause 00:30 pause>** . . .

(04:30) Pay attention as best you can . . . to the changing physical sensations in the lower abdomen . . . **<pause>** . . . all the way through . . . as the breath enters your body on the in-breath . . . and all the way through . . . as the breath leaves your body on the out-breath . . . **<pause 00:30 pause>** . . .

(05:20) Perhaps also noticing . . . the slight pause at the end of the in-breath . . . and the slight pause . . . between the end of one out-breath . . . and the beginning of the next in-breath . . . <pause 00:30 pause> . . .

(06:05) Focusing . . . on the actual sensations . . . of breath entering . . . and breath leaving . . . the body . . . <pause 00:30 pause> . . .

(06:40) There is no need to think about the breath . . . just experience the sensations of it . . . <pause 00:15 pause> And there is no need to try to control the breathing . . . in any way . . . simply let the breath be natural . . . <pause 00:30 pause> . . .

(07:40) As best you can . . . also bring this sense of allowing to the rest of your experience . . . There is nothing to be fixed . . . no particular state to be achieved . . . <pause> . . . As best you can . . . simply allow your experience to be your experience . . . without needing to change it . . . in any way . . . <pause 00:30 pause> . . .

(08:25) Sooner or later . . . your mind will wander away . . . from the focus on the breath . . . in the lower abdomen . . . <pause> . . . to thoughts . . . feelings . . . daydreams . . . <pause> . . . drifting along . . . whatever . . . <pause> This is perfectly OK . . . it's simply what minds do . . . <pause 00:10 pause> . . .

(08:55) When you notice . . . that your awareness is no longer on the breath . . . <pause> . . . acknowledge gently and briefly . . . where the mind has been . . . <pause> . . . Then . . . gently bring your awareness back . . . to the changing physical sensations . . . in the lower abdomen . . . <pause> . . . renewing your intention . . . to pay attention . . . to the breath coming in . . . and breath going out . . . <pause 00:30 pause> . . .

(09:55) Whenever you notice that the mind has wandered . . . and this may happen over and over again . . . <pause> . . . congratulate yourself each time . . . on reconnecting with your experience in the moment . . . <pause> . . . gently escorting the attention . . . back to the breath . . . <pause> . . . and simply continue in noticing . . . the physical sensations . . . that come with each in-breath . . . and out-breath . . . <pause 00:30 pause> . . .

(10:55) Now simply continue with this . . . perhaps reminding yourself from time to time . . . that the intention . . . is simply to be aware of your experience in each moment . . . as best you can . . . <pause> . . . using the breath as an anchor . . . to gently reconnect with the here and now . . .

(11:15) Focusing . . . on the actual sensations . . . of breath entering . . . and breath leaving . . . the body . . . <pause 00:30 pause> . . .

(11:50) There is no need to think about the breath . . . just experience the sensations of it . . . <pause> . . . And there is no need to try to control the breathing . . . in any way . . . simply let the breath be natural . . . <pause 00:30 pause> . . .

(12:30) Focus your awareness . . . on the sensations of slight stretching . . . as the abdomen rises with each in-breath and of gentle deflation . . . as it falls with each out-breath . . . <pause 00:30 pause> . . .

(13:15) Pay attention as best you can . . . to the changing physical sensations in the lower abdomen . . . <pause> . . . all the way through . . . as the breath enters your body on the in-

breath . . . and all the way through . . . as the breath leaves your body on the out-breath . . .
<pause 00:30 pause> . . .

(14:00) Sensing the breath . . . entering and leaving your body . . . <pause> . . . allowing your awareness of breath to expand to your whole body . . . <pause> . . . sensing your whole body breathing . . . <pause> . . . breathing into the space that surrounds you . . . <pause 00:30 pause> . . .

(14:55) Now when you are ready . . . slowly and gently . . . open your eyes . . . <pause> . . .

Mindlessness Induction

This script was used to make the mind wandering control recording in “Debiasing the mind through meditation: Mindfulness and the sunk-cost bias” (Hafenbrack, Kinias, & Barsade, 2014).

Arch, J.J., & Craske, M.G. (2006). Mechanisms of mindfulness: Emotion regulations following a focused breathing induction. *Behavior Research and Therapy*, 44, 1849-1858.

(00:00) Now we’re going to do an exercise for fifteen minutes . . .

(00:04) First . . . settle into a comfortable sitting position . . . **<pause 00:04 pause>** . . .

(00:12) Now simply think about whatever comes to mind . . . Let your mind wander freely . . . without trying to focus . . . on anything in particular . . . Just let your mind roam . . . as it normally would . . . **<pause 2:00 pause>**

(2:24) Now simply continue . . . with letting your mind wander . . . and think about whatever you want . . . I’ll let you know . . . when it’s time to move on to something else . . . **<pause 3:00 pause>**

(3:30) Allow your thoughts to wander . . . wherever they may go . . . **<pause pause >**

(4:30) Now simply continue . . . with letting your mind wander . . . and think about whatever you want . . . go ahead and follow whatever thoughts come to mind

(5:34) Continue letting your mind wander . . . letting your thoughts go wherever they take you . . . **<pause pause >**

(6:30) Allow your thoughts to wander . . . wherever they may go . . . **<pause pause >**

(7:30) Now simply continue . . . with letting your mind wander . . . and think about whatever you want . . . go ahead and follow whatever thoughts come to mind

(8:40) Allow your thoughts to wander . . . wherever they may go . . . **<pause pause >**

(9:35) Now simply continue . . . with letting your mind wander . . . and think about whatever you want . . . I’ll let you know . . . when it’s time to move on to something else . . . **<pause 3:00 pause>**

(10:30) Allow your thoughts to wander . . . wherever they may go . . . **<pause pause >**

(11:44) Remember to just continue . . . letting your mind wander . . . and follow wherever it takes you . . . Just think about whatever comes to your mind . . . I’ll let you know . . . when it’s time to move on to something else. **<pause pause>**

(12:45) Now simply continue . . . with letting your mind wander . . . and think about whatever you want . . . I’ll let you know . . . when it’s time to move on to something else . . . **<pause 3:00 pause>**

(13:30) Allow your thoughts to wander . . . wherever they may go . . . <pause pause >

(14:20) Now simply continue . . . with letting your mind wander . . . and think about whatever you want . . . go ahead and follow whatever thoughts come to mind

(14:56) Now we will move on to the next part of the study.