ISSN:2277-6907,
RNI NO.CHHHIN/2012/46660,
https://doi.org/10.56011/mind-mri-122-20234

Mind and Society
Vol. 12, No. 2, June 2023, 35-43

Positive-Negative Affectivity and Decision Making Among Mindfulness Meditators and Non-Meditators

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Mindfulness has gained significant attention in recent years due to its potential benefits for cognitive and emotional processes. However, how mindfulness interplays with affect to exert its effect on decision-making remains relatively less explored. The present study examined and compared the performance of both mindfulness meditators and non-meditators on decision-making tasks under different affective states. A total of 100 participants (50 mindfulness meditators and 50 non-meditators) responded to the Five Facet Mindfulness Questionnaire (FFMQ) and performed the Iowa Gambling Task (IGT). Both groups were further divided into positive affect and negative affect conditions. The International Affective Picture System (IAPS) was used to induce positive and negative affective states among the participants. The baseline affective state of the participants was assessed using the Positive and Negative Affect Schedule (PANAS). Independent sample t-tests and a univariate ANOVA were computed to analyze the obtained data. Results showed that mindfulness meditators scored significantly higher on the total FFMQ as well as on its different facets. Furthermore, the results revealed a significant main effect of mindfulness and the affect group on IGT performance. The interaction between mindfulness and affective conditions was also found to be significant. Mindfulness meditators performed equally well on IGT under both positive and negative affect conditions, whereas non-meditators performed better only under positive affect conditions. The findings have practical implications, as they suggest that mindfulness meditation enhances decision-making by promoting effective emotion regulation and suppressing impulsive responses during decision-making in different domains of life.

Keywords: trait mindfulness, risk-taking, decision making, mindfulness meditators, non-meditators

Introduction

Research in the field of judgment and decision-making (JDM) has provided compelling evidence that people's judgments and decisions are significantly influenced by the emotions they experience during the decision-making process. This body of research demonstrates that individuals' responses to a given situation, such as their inclination to take risks or their preference for punitive versus lenient measures, can vary depending on their concurrent mood (Lerner &Tiedens, 2006).

Additionally, research has highlighted the role of anticipated emotions in decision-making. People often consider the potential emotional outcomes associated with different options when making decisions. For example, individuals may be more likely to choose a certain option if they anticipate positive emotions or rewards associated with it, while they may avoid another option if they anticipate negative emotions or losses (Loewenstein et al., 2001). This emphasizes the influence of emotions in guiding individuals' preferences and choices.

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Moreover, affect, or the experience of emotions, has been found to influence individuals' cognitive strategies during decision-making. The presence of affective states can determine whether

shown that individuals in positive affective states tend to engage in more heuristic-based decision-making, relying on simplified mental shortcuts or intuitive judgments (Bodenhausen et al., 1994; Schwarz, 2001). On the other hand, individuals in negative affective states are more likely to adopt systematic and analytical decision-making strategies, investing greater effort in cognitive processing and information integration (Forgas, 2003).

Previous studies show that people tend to regulate their emotional experience (Gross, 2002) by engaging in emotion regulation strategies. The impact of an emotional event is adjusted to better suit the social or personal context. Emotion regulation has been shown to moderate the intensity of emotional events and act accordingly. Another factor that has been shown to have a modulating effect on emotion experience is mindfulness (Nyklek, 2011).

The topic of mindfulness has garnered increasing attention as a potential source of positive health benefits (Brown & Ryan, 2003). Mindfulness, defined as the awareness that results from paying attention in a particular way—"on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 1994), has gained increasing interest within Western society. It has been studied as both a state or a momentary condition and a trait or a stable characteristic. In recent years, researchers have focused on exploring the potential benefits of dispositional mindfulness (DM), also known as trait mindfulness, for enhancing psychological health in the general population. Several studies have found a range of benefits associated with DM for various psychological health outcomes (Keng et al., 2011). Numerous studies have reported better psychological health among individuals with high trait mindfulness compared to those with low trait mindfulness (Arch & Craske, 2010; Baer et al., 2006; Bowlin& Baer, 2012).

The presumed benefits of mindfulness are also thought to be associated with multiple cognitive skills encompassed within the construct. These skills range from increased exposure to stress-eliciting stimuli to the development of cognitive abilities related to attention and cognitive control. Empirical evidence supports the notion that mindfulness is related to various cognitive skills beyond physical and psychological well-being (Moore, 2013; Zadkhosh, Zandi, &Ghorbannejad, 2019). Researchers have explored the relationship between mindfulness and specific cognitive abilities relevant to decision-making, shedding light on how mindfulness interacts with cognitive processes.

In addition to perceptual abilities, mindfulness has been linked to creative problem-solving skills. Ostafin and Kassman (2012) conducted a study exploring the relationship between mindfulness and creativity. They found that individuals with higher levels of mindfulness demonstrated greater creativity in problem-solving tasks. Mindfulness may enhance divergent thinking, allowing individuals to generate a wider range of novel and innovative solutions. This creativity-related aspect of mindfulness can have implications for decision-making, as individuals with higher levels of mindfulness may be more capable of generating and considering alternative options when faced with complex decisions.

Moreover, mindfulness has been linked to the ability to resist impulsivity and stop disadvantageous courses of action. Hafenbrack et al. (2014) found that individuals with higher levels of mindfulness demonstrated a greater ability to inhibit disadvantageous responses and adjust their behavior when necessary. This self-regulatory aspect of mind fulness can have implications for decision-making by enabling individuals to override impulsive or automatic responses, allowing for more deliberate and thoughtful choices.

Additionally, mindfulness has been associated with higher levels of grit, which refers to perseverance and passion for long-term goals. Raphiphatthana et al. (2018) explored the relationship between mindfulness and grit in a sample of university students. Their results indicated a positive correlation between mindfulness and grit, suggesting that individuals who are more mindful may also possess greater perseverance and resilience in pursuing their goals. This characteristic of mindfulness can influence decision-making by fostering a long-term perspective and enabling individuals to make choices that align with their overarching values and objectives.

As research continues to explore the relationship between mindfulness and dimensions beyond health, it becomes crucial to gain a precise understanding of the mechanisms through which mindfulness affects cognitive skills, including decision-making (Anicha, Ode, Moeller, & Robinson, 2012). The underlying processes that mediate the effects of mindfulness on

decision-making are still being investigated. It is plausible that mindfulness enhances cognitive control, attention regulation, and metacognitive awareness, leading to more deliberate and informed decision-making (Chiesa et al., 2011; Hölzel et al., 2011). Additionally, dispositional mindfulness or mindfulness practices have also been reported to modulate emotional reactivity (Linehan, Bohus, & Lynch, 2007; Arch &Craske, 2010) and reduce susceptibility to induced sad mood (Kuyken et al., 2010) and, therefore, are closely associated with adaptive emotion regulation. On the basis of such findings, it can be reasoned that the mindfulness and decision-making link observed in the studies (Liu, Liu, & Li, 2018; Williams & Grisham, 2012) is influenced by the mechanisms through which mindfulness and emotion are associated.

Present study

Mindfulness has primarily been associated with health benefits, psychological well-being, and enhanced cognitive functioning. Although most of the studies have been devoted to establishing said benefits, those pertaining to the mechanism through which mindfulness enhances cognitive skills are still very few. Therefore, the present study examined how mindfulness and affective states influence risk-taking and decision-making behavior. The trait of mindfulness among the participants was also assessed in the present study.

Method

Participants

Modern society is materialistic, money-oriented, and competitive, which leads individuals towards mental health-risk behaviors such as depression, anxiety, stress, restlessness, nervousness, anger, frustration, sleep disturbance, etc. Moreover, in modern society, cultural and racial hostility pervade everywhere. In this complex situation, maintaining the feeling of universal brotherhood within individuals has become difficult. In order to maintain the existence of the feeling of universal brotherhood, individuals should have sound mental health, which comes from behavioral peace and an inner journey. Through an inner journey, one can know and understand one's actual emotions and the meaning of life. Moreover, spiritual experiences and involvement in spiritual activities are also applicable to the elevation of mental health. Spiritual individuals try to find peace and mental harmony in their lives through spiritual involvement, experience contentment with life, connect themselves with transcendent reality beyond the realm of the physical world, and believe in a higher power. The Bhagavad Gita is also an encyclopedia of mental health education. It teaches the ways of mental health elevation through practice and detachment, mediation, self-realization, and faith in supreme power. Moreover, it says that one should perform one's own work without thinking about its result or about success or failure. Through this teaching, individuals can protect themselves from the grief and happiness that emerge from failure and success. It is also explained in the Gita that for better mental health, one should hear one's inner voice and apply this voice in his practical life. All these techniques may be helpful in improving mental health and happiness among individuals. Mentally healthy and happy individuals have a feeling of interconnectedness with the people of the whole universe, and they consider the whole universe a family. These feelings within individuals are essential antecedents to establishing universal brotherhood.

Design

In the present study, a 2 (Control/Mindfulness meditators) × 2 (Positive/Negative affect) experimental design was used. All the participants were divided into two groups based on their mindfulness meditation status. The non-meditator participants served as the control group. The dependent measure was the Net Gain index of the Iowa Gambling Task.

Material

Positive and Negative Affect Schedule

The PANAS (Watson and Clark, 1988) consists of 20-item questions used to assess the current mood state. Participants rated the extent to which each of the 20 adjectives described their current feelings on a 5-point scale ranging from 1 (very slightly or not at all) to 5 (extremely). Separate scores for the positive and negative effects were given. As originally reported, Cronbach's alphas of positive affect ranged from 0.86 to 0.9, and Cronbach's alphas of negative affect ranged from 0.84 to 0.87 (Watson &Clark, 1988).

Five-Facet Mindfulness Questionnaire

The Five-Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) is a 39-item self-report measure of mindfulness composed of five subscales: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. Participants responded to questions on a 5-point Likert-type scale, from 1 (never or very rarely true) to 5 (very often or always true).

International Affective Picture System (IAPS)

The International Affective Picture System (IAPS) is a widely used set of standardized images that are used in psychological research to induce desired affectivity (Ito, Cacioppo, & Lang, 1998; Jayaro et al., 2008). It was developed by a team of researchers at the University of Florida and consists of a large collection of photographs that have been rated on multiple dimensions of emotion (Lang, Bradley, & Cuthbert, 1997). The IAPS images cover a broad range of content, including scenes of people, animals, nature, and various objects. Each image is accompanied by ratings on dimensions such as valence (pleasantness or unpleasantness), arousal (intensity), and dominance (control or power). These ratings are obtained from a large sample of participants who rate each image according to their subjective emotional experience.

The IAPS images are used to investigate various aspects of emotional processing, such as emotional perception, memory, attention, and physiological responses. The standardized nature of the image set allows for the consistent and controlled presentation of emotional stimuli across different studies and laboratories. The IAPS has proven to be a valuable tool for studying emotion. It provides researchers with a standardized and validated set of visual stimuli to elicit and study emotional responses in experimental settings.

The Iowa Gambling Task(IGT)

The Iowa Gambling Task (IGT; Bechara, Damasio, Damasio, & Anderson, 1994) was used to test the decision-making abilities of the participants. The IGT was designed to approximate real-life decision-making under conditions of uncertainty. In the IGT, a participant is presented with four decks of cards, each of which contains cards that reward or punish the player by adding or subtracting points or amounts of money from his or her account. Two decks lead to net increases over the course of repeated play (the advantageous decks), while the other two lead to net losses (the disadvantageous decks). The player is instructed to maximize his or her winnings, which requires determining which decks will lead to long-term gains and which to long-term losses. The IGT replicates real-world decision-making by necessitating participants to combine rewards and losses, evaluate the advantages and risks of each potential choice, retain that information, and apply it to future decisions. A higher score indicates reasonable risk-taking and sound decision-making capabilities (Stiengrover et al., 2013). The Psychological Experiment Building Language (PEBL) version of the task (Muller & Piper, 2014) was used.

Procedure

All the selected participants were matched on various parameters, e.g., age, marital status, economic backgrounds, etc. Once the participants were seated comfortably, they were presented with a demographic data sheet, the Five Facet Mindfulness Questionnaire (FFMQ), and the Positive Affect and Negative Affect Schedule (PANAS). After establishing the affective state baseline, the participants were, as per their group status, shown either positive or negative stimuli (IAPS pictures) to induce the desired affect. After this, the Iowa Gambling Task (IGT) was carried out by these participants. All the participants were offered gratitude for their cooperation in the study.

Results

To analyze the obtained data, a t-test and an ANOVA were computed with IBM SPSS version 19. The significance of the difference between the control and meditator groups on trait mindfulness and its different dimensions was analyzed by computing an independent sample t-test. The results are presented in Table 1.

Table 1

Significance of difference between control and meditators groups on trait mindfulness

variables	Control (n=50)		Meditators (n=50)		t	P
	M	SD	M	SD		
FFMQ Total	128.36	16.642	142.940	4.022	6.021	.000
Observing	30.36	5.126	33.96	2.407	4.495	.000
Describing	27.52	3.683	28.76	2.191	2.046	.043
Act With Awareness	20.76	3.408	24.94	1.942	7.535	.000
Non Judgment	23.18	3.963	25.86	2.148	4.205	.000
Reactivty	26.54	3.808	29.24	1.685	4.585	.000

FFMQ = Five-Facet Mindfulness Questionnaire

Table 1 presents the mean, SD, and significance of the difference between the groups (control and meditators) on trait mindfulness and its different dimensions. The result shows that the meditators group scored significantly higher on total trait mindfulness and its different dimensions as compared to the Control group.

The significance of the difference between the control and meditator groups, in terms of their baseline scores, on the positive and negative affectivity dimensions of PANAS was also analyzed using an independent t-test. The results are presented in Table 2.

Table 2

Significance of difference between control and meditators on baseline positive and negative affectivity (PANAS)

Affectivity	Control		Meditators		t	p
	Mean	SD	Mean	SD		
Positive	32.24	4.373	33.50	4.017	1.500	.137
Negative	22.58	4.257	21.38	3.428	1.552	.124

Table 2 reveals that the control and meditation groups did not differ significantly in terms of their mean scores on either the positive or negative affect dimensions of PANAS. It shows that both groups were evenly matched on their baseline affect levels prior to the presentation of IAPS pictures to induce positive and negative affect.

The Univariate ANOVA was computed to examine the effect of group (control and meditator), affect condition (positive and negative), as well as their interaction effect on Iowa Gambling Task performance. The results are presented in the following tables:

Table 3

Main effect of group (control and meditators) on Iowa Gambling Task(IGT) performance

Control (n=50)		Meditators (n=50)		F(1, 96)	p	η2
M	SD	M	SD			
683.60	343.149	938.90	281.554	20.008	.000	.172

Table 3 shows the results of the analysis of Variance with the Dependent variable, IGT. The result shows that the mindfulness meditators performed significantly better than the non-meditator control group on IGT, as the mean score of mindfulness meditators (M = 938.90) compared to the mean score of the control group (M = 683.60) is significantly higher ($F(1, 96) = 20.008$, $p < .001$; partial 2 =.172).

Table 4

Main effect of induced affect condition (positive and negative) on Iowa Gambling Task (IGT) performance

Positive (n=50)		Negative (n=50)		F(1, 96)	p	η2
M	SD	M	SD			
896.60	249.940	725.90	391.087	8.945	.004	.085

Table 4 shows that the participants' mean scores in the positive affect condition (M = 896.60) and negative affect condition (M = 725.90) on the IGT differed significantly ($F(1, 96) = 8.945$; $p = .004$; partial 2 =.085). The mean scores suggest that participants under positive affect conditions performed better than participants under negative affect conditions on the IGT.

Table 5
Interaction effect of group (control and meditators) and affect conditions (positive and negative affectivity) on Iowa Gambling Task (IGT) performance

	Control		Meditators				
Conditions	M	SD	M	SD	F(1, 96)	p	η2
Positive Affect	874.20	229.636	919.00	271.596	13.602	.000	.124
Negative Affect	493.00	334.673	958.80	295.396			

The result presented in Table 5 reveals the Interaction between group (meditators and non-meditators) and affect condition (positive and negative affect) to be significant ($F(1, 96) = 13.602$; $p < .001$; partial $2 = .124$). It indicates that control and meditators performed differently in one affective condition than in another. More specifically, in the positive affect condition, both groups performed equally well on the Iowa Gambling Task. However, their performance on the task in the negative affect condition was considerably different (Figure 1).

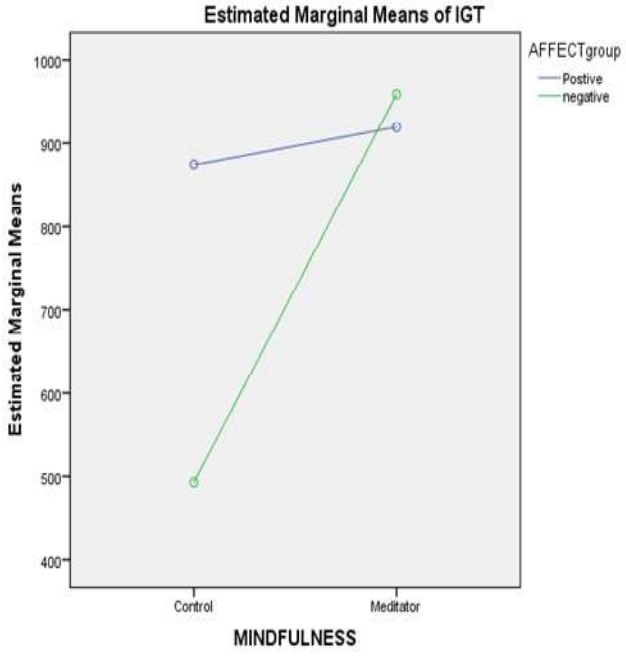

Figure 1: Interaction effect between the Control and the Meditators groups under Positive and Negative affect on Iowa Gambling Task (IGT)

Discussion

This study was conducted to examine the effect of affective state and mindfulness on decision-making using the Iowa Gambling Task (IGT). The result showed that mindfulness meditators performed better, as they scored significantly higher than their non-meditators counterparts on the IGT. The impact of mindfulness on decision-making shown in the present study suggests that mindfulness meditation promotes better decision-making. However, the finding does not ensure the impact of trait mindfulness on the observed better performance on decision-making tasks. Although it has been shown that mindfulness meditation enhances the trait of mindfulness (Kiken et al. 2015), the trait of mindfulness, being a trait, can vary remarkably among individuals who practice mindfulness meditation. Therefore, the study also assessed trait mindfulness among mindfulness meditators and non-meditators to examine whether or not the selected groups differed on the trait. The analysis revealed that the meditators scored significantly higher on different facets of mindfulness and had significantly greater total trait mindfulness than their non-meditators counterparts, suggesting that the observed significant difference between the groups on IGT performance was due to high trait mindfulness among the meditators. The findings of the study also revealed a significant effect of affect condition on decision-making task performance, as the participants under the positive affect condition performed significantly better on decision-making tasks than the participants under the negative affect condition. More importantly, a significant interaction effect of group (non-meditators and meditators) and affect condition (positive and negative) was also found in the present study. The non-meditator participants markedly differed in their performance in two affective

conditions. In other words, non-meditators performed remarkably better on decision-making tasks under positive affect conditions than non-meditators under negative affect conditions (Figure 1). However, the performance of mindfulness meditators on the decision-making task did not differ under positive and negative affect conditions. Their performance on the task remained consistent under both conditions.

The main effect of affective state observed in the present study is in line with the findings of previous studies. It is apparent from the works of numerous researchers that emotions and affect do have a high stake in the decision-making process (Betsch et al., 2003; Evans, 2008; Kahneman, 2003). Damasio (1994) has cogently argued that decision processes may rely heavily on affective signals. Therefore, it can be argued that behavioral measures of decision-making can be influenced by affective states. IGT has been reported to need "emotional" processing as well as "cognitive" processing (Brand et al., 2007). A low score on the task indicates riskier choice preferences and impulsive decision-making (Must et al., 2006; Tsanadis et al., 2005). Non-meditator participants under the negative affect condition were observed to cling to their preferred decks of short-term gains and incur heavy losses in the long run. Their tendency to take disproportionate risks and make impulsive decisions is reflected in their low score. This type of sunk-cost bias has been reported to be a significant effect of a negative affective state (Sun et al., 2015). The observed superiority of mindfulness meditators over their counterparts in terms of their performance on decision-making tasks is likely to be facilitated by their enhanced cognitive skills required for successful performance on IGT. Trait mindfulness has been found to be linked with some cognitive skills. Anicha et al. (2012) investigated the association between different facets of mindfulness and perceptual abilities. Using the Five Facet Mindfulness Questionnaire by Baer et al. (2006), the researchers found that the observing facet of mindfulness was associated with better performance in tasks involving visual working memory and temporal judgment. This suggests that individuals who exhibit higher levels of mindfulness, particularly in terms of their ability to observe and attend to their present experiences, may also possess enhanced perceptual abilities that can influence decision-making.

In addition to the main effects of mindfulness and affect on decision-making tasks, the interaction effect observed in the present study indicates the link between mindfulness and affect. These analyses demonstrate that mindfulness plays a critical role in influencing the impact of affectivity, particularly negative affectivity, on decision-making. The Iowa Gambling Task requires a player to assess the nature of the deck (long-term gain or loss) as quickly as possible to ascertain maximum winning. This, in turn, leads the player to optimize their risk-taking choices. The player also has to draw up a winning strategy to counterbalance losses accrued during the initial phase. The mindfulness meditators were seen to form this appropriate line of strategy rather quickly than the non-meditators, as indicated by their performance. In either of the affective states, the meditators group adopted a sound decision-making strategy and optimal risk-taking to maximize their score.

Mindfulness has been reported to be closely intertwined with emotion regulation. Studies have reported that mindfulness is closely associated with adaptive emotion regulation (Roemer, Williston, & Rollins, 2015), and higher mindfulness traits have been associated with enhancing positive affect and reducing negative affect (Mandal, Arya, & Pandey, 2012). Researchers have argued that mindfulness mediators are better at tolerating negative emotions and sensations (Eifert & Heffner, 2003) and need less time to recover from the impact of negative events (Kabat-Zinn, 1990). These findings suggest that the observed better performance of mindfulness meditators in both positive and negative affect conditions is facilitated, presumably, by the meditators' tendency to use adaptive emotion regulation strategies and their experience of enhanced positive affectivity and reduced negative affectivity. Such emotion regulatory and control mechanisms might have been instrumental in helping the meditators to overcome, or at the very least, mitigate, the negative affect and quickly form a sound decision-making strategy with optimum risk-taking to maximize their scores.

Conclusion

The present study showed that mindfulness promotes better decision-making strategies in the meditators, helping them to maximize their score and perform better than their non-meditator counterparts on the decision-making task. Although both the meditators and the non-meditators performed well on decision-making tasks under positive affect conditions, the meditators outperformed their counterparts in the

negative affect condition. This finding highlights the adverse effect of negative affect and the favorable effect of positive affect on decision-making task performance. However, meditators are better decision-makers under both positive and negative conditions. The interaction of mindfulness and affect supports the idea that mindfulness also promotes adaptive emotion regulation strategies and cognitive skills that are linked with the intended outcome of the decision-making process. The findings of the study can have real-life implications, as mindfulness meditation is likely to enhance decision-making abilities and balance out risk-taking behaviors.

Declaration of Conflict

The authors declare no conflict of interest.

Data availability statement

Data could be made available upon request to the corresponding author.

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Received: 03 June 2023
Revision Received : 09 June 2023
Accepted : 19 June 2023

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