

The Effect of Dispositional Mindfulness on the Cognitive Flexibility of Indian Adults

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ABSTRACT

Mindfulness, once a concept predominant in eastern philosophical practices, has recently received widespread attention in the western world. Academic interest in the underlying cognitive mechanisms of mindfulness has grown steadily over the past few decades, and aspects of cognition such as perception, attention, and flexibility of thought and communication have been focal points of research interest. Past studies have yielded mixed results concerning the relationship between mindfulness and cognitive flexibility, and have focused on meditative practices to induce situational mindfulness. This study aims to focus on a different aspect of the relationship, and explore the impact of mindfulness as a character trait on cognitive flexibility in two areas, social communication competence and changing of maladaptive thoughts. Results show clear differences in cognitive flexibility on both fronts, between individuals high on dispositional mindfulness and those low on it. However, the relationship may in part be influenced by variables such as general psychological health and personality traits such as neuroticism, extraversion, openness to experience, and conscientiousness. The study employed self-report measures of dispositional mindfulness and the two domains of cognitive flexibility, and further research employing neuropsychological measures is required to substantiate the relationship and consider other possible influencing variables.

Keywords: *Mindfulness, Cognition, Flexibility, Personality.*

Mindfulness as a concept has been a core tenet of several eastern spiritual systems such as Buddhism, for millennia. According to Kalupahana (1987), mindfulness can trace its roots back to contemplative Buddhist practices and philosophy, whereby it was posited to be a key ingredient of a good life. Mindful living is associated with the virtues of being less egoistic and more compassionate (Grossman, 2008) and is thus linked with less suffering and more happiness in life (Baer, 2007). Although the practice of mindfulness has been present in eastern philosophy for ages, it has gained renewed attention courtesy of the rediscovery of its virtues by the modern western world. Academic attention to mindfulness as a construct is fairly recent, and as such, there is ongoing debate regarding how to operationalize and define mindfulness as a psychological construct.

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Shapiro et. al. (2006) defines mindfulness as “a motivated intention to stay focused on meditation goals, a directed attention to what is actually happening within the self and its body, and an attitudinal manner that is caring and accepting.” This definition is in line with the assertion that mindfulness comprises chiefly of two skills, namely, observing and non-reactivity (Cardaciotto et. al., 2008). Kabat-Zinn (2005) says that mindfulness involves paying attention to present perceptions and experiences in a non-judgmental and non-reactive manner. Thus, the practice of mindfulness involves an element of staying grounded in the present moment and being aware of the external and internal sensations without attempting to control or change them. Thus, it fosters an attitude of openness and acceptance.

Mindfulness as a skill has been widely cultivated through the practice of meditation. Practitioners are often encouraged to inculcate key facets of the mindfulness construct. Baer et. al. (2006) has outlined the key facets as observing, describing, acting with awareness, non-judging, and non-reactivity. Although much research has been conducted to understand how meditative practice and mindfulness influence physical and psychological well-being, the exact cognitive mechanisms underlying the process are still not clear (Brown, Ryan & Creswell, 2007). It is believed that extended meditation training leads to structural and functional changes in the brain (Davidson et. al., 2003). Along the same line, Posner and Rothbart (2007) state that the key components of the mindfulness construct, particularly perceptual awareness and nonreactivity, appear closely related to the cortical networks respectively mediated by the parietal and frontal cortices. This leads to the inference that mindfulness may have significant connections to attention and cognition (Moore and Malinowski, 2009).

Evidence for cognitive mechanisms underlying the mindfulness construct was found by Cahn and Polich (2006), who said that cognitive, emotional, and neurophysiological changes result from extensive meditation practice, where meditation is conceptualized as a form of mental cognitive training. One cognitive mechanism, in particular, has been of interest in mindfulness research, that of cognitive flexibility. Cognitive flexibility is the human ability to adapt cognitive processing strategies to face new and unexpected conditions and is intrinsically linked to attentional processes (Cañas et. al., 2003). Kashdan and Rottenberg (2010) think that flexibility, before any other static concept, is crucial to mental well-being and healthy psychological functioning. A positive relationship between mindfulness and cognitive flexibility has been demonstrated in various studies, especially ones employing the Stroop test, which has been regarded as the gold standard in attention research since it yields large and statistically significant effects when administered (MacLeod, 1992). In line with this, Wenk-Sormaz (2005) found that engaging in meditative practice reduces Stroop interference. Moore and Malinowski (2009) also contended that attentional performance and cognitive flexibility are positively related to meditation practice and levels of mindfulness. In their study, meditators performed significantly better than non-meditators on all measures of attention and flexibility. Lee and Orsillo (2013) also reported a partial increase in cognitive flexibility through mindfulness interventions in individuals with Generalized Anxiety Disorder, which is characterized by cognitive rigidity and inflexible patterns of thinking.

However, the link between mindfulness and cognitive flexibility suffers from inconsistent findings across several studies. For example, Hartkamp and Thornton (2017) found no significant improvement in cognitive flexibility of the experimental group exposed to a meditation retreat, over and above the control group, who were exposed to no such practice.

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However, the meditation group did report greater subjective well-being than did the control group. Additionally, Chambers et. al. (2008) found that following a 10-day Vipassana retreat, the participants exhibited greater attentional control and scored higher on working memory tasks, but there was no significant improvement in cognitive flexibility. Such contradictory findings have prevented the establishment of a clear relationship between mindfulness and cognitive flexibility.

Existing research on mindfulness and cognitive flexibility suffer from another deficiency, that is, it has focused primarily on measuring the change in flexibility as a result of mindfulness-based interventions, in both clinical as well as non-clinical samples. This study focuses on a different aspect of the relationship and investigates how mindfulness as a character disposition may affect cognitive flexibility in a non-clinical sample of Indian adults. Research on mindfulness as a trait has been sparse, and the underlying cognitive mechanisms of this trait have not been well-investigated. Thus, this study is motivated by the need to look into whether individuals who differ on the trait of mindfulness also differ on cognitive flexibility in two areas, namely, communication competence and adaptability in social situations, and changing of maladaptive thoughts towards more productive avenues. Since mindfulness consists of paying attention to stimuli in the internal and external environment on a momentary basis, it is hypothesized that individuals possessing greater levels of mindfulness will exhibit a lesser degree of habitual thinking and greater cognitive flexibility.

METHODOLOGY

Participants

The participants for this study included a sample of Indian university students and early-career professionals ($N = 62$; 26 males, 36 females) of mean age 23.68 years ($\sigma = 1.836$). All the participants were college graduates, with 17 of them having completed postgraduate education as well. 23 participants reported being the only child, 23 of them reported being the first child, 15 reported being the second child and only 1 reported being the third child.

Procedure

The participants were individually interviewed over videoconferencing software in light of the need for physical distancing due to the pandemic. Their general biographical information (i.e., age, sex, education, annual income, and ordinal position of birth) and emotional responses to being interviewed were noted, and they were administered questionnaires to assess their levels of dispositional mindfulness as well as their cognitive flexibility in the spheres of social communication competence and ability to change maladaptive thoughts. For measuring dispositional mindfulness, the Mindfulness Attention Awareness Scale (Brown and Ryan, 2003) was administered. For measuring cognitive flexibility in social communication competence, the Cognitive Flexibility Scale (Martin and Rubin, 1995) was administered, alongside the Cognitive Flexibility Inventory (Dennis and Vander Wal, 2010) for measuring the cognitive flexibility in changing maladaptive thoughts. Additionally, to account for the effects of general mental well-being and personality structure as influencing factors in the relationship between the constructs under consideration, the 12-item General Health Questionnaire (Goldberg, 1978), and the NEO Five-Factor Inventory (Costa and McCrae, 1992) were also administered. A brief introduction to the measures employed is provided hereunder.

The Mindfulness Attention Awareness Scale

The trait Mindfulness Attention Awareness Scale (MAAS) is a 15-item scale designed to “assess a core characteristic of mindfulness, namely, a receptive state of mind in which attention, informed by a sensitive awareness of what is occurring in the present, simply observes what is taking place” (Brown and Ryan, 2003). A collection of statements is provided, which are to be rated from 1 to 6, 1 indicating that the participant almost always engages in the act that the statement describes, and 6 indicating that the participant almost never engages in the act. The statements are worded such that a response of 1 (almost always) indicates a low level of mindfulness, and a 6 (almost never) indicates a high level of mindfulness. A participant’s score on the scale is calculated by finding the mean of the scores on each item. A higher mean indicates greater dispositional mindfulness. Brown and Ryan (2003) reported that the MAAS has a strongly unidimensional factor structure. The MAAS has been validated on a cancer population by Carlson and Brown (2005), has shown theoretically-consistent relationships with brain activity (Cresswell et. al., 2007) and with treatment outcomes in mindfulness-based interventions (Michalak et. al., 2008).

The Cognitive Flexibility Scale

The Cognitive Flexibility Scale is a 12-item 6-point scale in Likert format. The scores range from 1, indicating that the participant strongly disagrees with the statement, to 6, indicating that the participant strongly agrees with it. However, four items, namely item numbers 2, 3, 5, and 10 are reverse-scored. A higher score on the positively-worded items indicates greater cognitive flexibility, and vice-versa. The total score for a participant is simply the sum of the individual scores for each item. Scores on cognitive flexibility were positively related to ratings of communication flexibility and negatively related to rated rigidity (Martin and Rubin, 1995). However, there was no significant difference between the sexes on scores of cognitive flexibility in social communication competence.

The Cognitive Flexibility Inventory

The Cognitive Flexibility Inventory is a 20-item Likert scale with 7 alternatives for each item, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Six items, namely item numbers 2, 4, 7, 9, 11, and 17, are reverse-scored. The total score for a participant is obtained by adding the scores for all the items. Dennis and Vander Wal (2009) outlined three facets of cognitive flexibility as measured by the CFI, namely the tendency to perceive difficult situations as controllable, the ability to perceive multiple alternative explanations for life occurrences and human behavior, and the ability to generate multiple alternative solutions to difficult situations. They also reported high test-retest validity, and good to excellent internal consistency. Furthermore, the CFI also has strong convergence construct validity through their associations with other measures of cognitive flexibility, depressive tendencies as well as coping. The creators of the inventory also stressed that the constructs measured by the CFS, namely awareness of communication alternatives, willingness to adapt to the situation, and self-efficacy in being flexible, also influenced the development of the CFI.

The General Health Questionnaire

The 12-item General Health Questionnaire is used to assess psychological well-being and has found application in a wide range of studies on various of distress for workers, as well as their predisposing conditions (Goldberg, 1978). The questionnaire consists of 12 statements describing how the participant has recently been feeling, which are rated on a scale of 0 to 3, 0 indicating least distress and 3 indicating most distress. Hence, a lower summated score on

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the questionnaire denotes greater psychological well-being. The GHQ-12 has been shown to have moderate to high test-retest reliability and construct validity (Goldberg, 1978).

The NEO Five-Factor Inventory

Neuroticism Extraversion Openness Five-Factor Inventory (NEO-FFI) is a shortened version of the empirically-validated NEO Personality Inventory-Revised, an implementation of the five-factor model (FFM) of personality (Costa and McCrae, 1989). For the NEO-FFI the internal consistencies reported in the manual were N = .79, E = .79, O = .80, A = .75, and C = .83. The NEO-FFI provides a concise measure of the five basic personality factors (i.e., Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness), with 12 items for each factor. Each of the items is measured on a Likert-based scale ranging from 0 (“Strongly Disagree”) to 4 (“Strongly Agree”). Nearly half (28 out of 60) of the items are reverse-worded. A higher summated score on any of the domains of personality indicates a greater weightage of that trait in the participant’s personality structure.

Following the collection of data from all 62 participants, their responses were sorted in terms of their calculated MAAS scores, from highest to lowest. To extract two clearly-differentiated groups with respect to their scores on the MAAS, the participants in the first quartile ($N_1 = 16$) were assigned to the high mindfulness group (HMG), and those in the third quartile ($N_2 = 16$) were assigned to the low mindfulness group (LMG). Thereafter, the differences in reported cognitive flexibility between the two groups were analyzed for significance.

RESULTS

After distinguishing two groups through their mean score on the MAAS, the high-mindfulness group ($M = 4.84, \sigma = .467$) and the low-mindfulness group ($M = 2.76, \sigma = .431$) were compared on their mean scores on the Cognitive Flexibility Scale (**Table 3**) and the Cognitive Flexibility Inventory (**Table 4**). It was found that on the CFS, the mean score for the HMG was 58.00 ($\sigma = 9.920$), while that for the LMG was 48.31 ($\sigma = 8.292$). A one-tailed independent samples t-test revealed a t-statistic of 2.997 ($df = 30, p = .0025$). Thus, there exists a significant difference between the HMG and the LMG with regard to scores on the CFS, at the .01 level of significance. Furthermore, the mean for the HMG on the CFI was found to be 111.13 ($\sigma = 16.978$), and that for the LMG was 89.75 ($\sigma = 12.525$). A one-tailed independent samples t-test revealed a significant difference at the .01 level with a t-statistic of 4.053 ($df = 30, p < .001$).

Table 1: Tests of Normality

Shapiro-Wilk			
	Statistic	df	Sig.
CFS	.966**	62	.088
CFI	.986**	62	.681

Levels of significance: * = $p > .05$; ** = $p > .01$

Table 2: Tests of Equality of Variance

Levene's Test		
	F	Sig.
CFS	1.211**	.280
CFI	.873**	.100

Levels of significance: * = $p > .05$; ** = $p > .01$

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Table 3: Independent samples t-test between HMG and LMG for scores on CFS

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
2.997**	30	.005	9.688	3.232	3.086	16.289

Levels of significance: * = $p < .05$; ** = $p < .01$

Table 4: Independent samples t-test between HMG and LMG for scores on CFI

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
4.053**	30	.000	21.375	5.274	10.603	32.147

Levels of significance: * = $p < .05$; ** = $p < .01$

The possible influence of variables such as general psychological health, and the Big 5 personality factors, were accounted for through one-tailed correlations between these variables and scores on the MAAS, CFS and CFI. Scores on the GHQ-12 showed a significant correlation with scores on the MAAS ($r = -.381, p = .001$), the CFS ($r = -.346, p = .003$), and the CFI ($r = -.267, p = .018$). The scores for neuroticism, as calculated from the NEO-FFI, were significantly correlated with scores on the MAAS ($r = -.494, p < .001$), the CFS ($r = -.639, p < .001$), and the CFI ($r = -.522, p < .001$). Also, scores for extraversion were significantly correlated with those on the CFS ($r = .446, p < .001$) and the CFI ($r = .290, p = .011$), but not significantly correlated with the MAAS scores ($r = .198, p = .062, ns$). Scores on openness to experience found significant correlation with the MAAS ($r = .217, p = .045$), the CFS ($r = .313, p = .007$), and the CFI ($r = .413, p < .001$). Furthermore, scores for agreeableness were not significantly correlated to scores on any of the scales, namely, the MAAS ($r = .163, p = .103, ns$), the CFS ($r = .171, p = .092, ns$), and the CFI ($r = .058, p = .326, ns$). Lastly, scores on conscientiousness were also significantly correlated with scores on the MAAS ($r = .267, p = .018$), the CFS ($r = .533, p < .001$), and the CFI ($r = .327, p = .005$).

Furthermore, with regard to sex, there was no significant difference between mean scores on the MAAS ($t = 1.680, df = 60, p = .098, ns$), the CFS ($t = .295, df = 60, p = .769, ns$), or the CFI ($t = -.078, df = 60, p = .938, ns$). Similarly, with regard to educational level, there was no significant difference between mean scores on the MAAS ($t = 1.670, df = 60, p = .100, ns$), the CFS ($t = .562, df = 60, p = .576, ns$), or the CFI ($t = .835, df = 60, p = .407, ns$). With regard to ordinal position in the family, there was no significant difference between mean scores on the MAAS ($F = 1.999, df = 61, p = .124, ns$) and the CFI ($F = 1.386, df = 61, p = .256, ns$) but there was a significant difference for the CFS ($F = 3.075, df = 61, p = .035$).

DISCUSSION

The study reveals several important connections between the variables under study, but at the same time, suffers from a few drawbacks. A discussion of both aspects is outlined hereunder.

Firstly, the hypothesis stated at the beginning of this study was that greater dispositional mindfulness would lead to increased cognitive flexibility in the spheres of social communication competence as well as changing maladaptive thoughts. The results of this study have borne out this hypothesis. The significant difference in cognitive flexibility in

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both areas between the HMG and LMG indicates that there is indeed an impact of dispositional mindfulness on cognitive flexibility in these areas. This corroborates Moore and Malinowski's (2009) finding that attentional performance and cognitive flexibility are significantly affected by levels of mindfulness. One possible reason may be that a higher level of mindfulness involves a keener sense of observation and being grounded in the present, which leads to greater clarity about the choices and alternatives that are available in a social or personal situation. Paulhus and Martin (1988) think that before reacting to any situation, people undergo a process of social cognition that makes them aware of their choices. A higher level of mindfulness may assist such cognition and hence enhance cognitive flexibility.

However, several relevant variables were identified that correlated strongly with the level of dispositional mindfulness as well as cognitive flexibility. General mental well-being, as expected, showed a strong negative relationship with both mindfulness and cognitive flexibility, indicating that it may be a mediating factor in the relationship between the two. In other words, less mindful individuals may be more prone to depressogenic or anxious thoughts and hence may exhibit increased cognitive rigidity. Furthermore, neuroticism was found to be negatively correlated with mindfulness as a trait as well as with cognitive flexibility. This is in tune with the findings of Murdock et al. (2013) and may suggest that individuals with higher neuroticism show weaker monitoring of thoughts, as evidenced by lesser levels of dispositional mindfulness. Murdock et al. (2013) also reports a strong positive relationship between openness to experience and cognitive flexibility, which is borne out by the current study. The high correlation between openness and mindfulness may indicate the presence of a receptive state of mind in high-mindfulness individuals, which may contribute to cognitive flexibility. Extraversion also shows positive relationships with both mindfulness and cognitive flexibility and may work as a mediator between the two. Agreeableness was not found to influence the relationship between the constructs in the study, but conscientiousness, being positively correlated with both dispositional mindfulness and cognitive flexibility, appears to be a significant factor.

Furthermore, the variables of age, gender, educational qualification, and ordinal position at birth show no influence on the relationship between mindfulness and flexibility. Hence, according to the current study, these variables can be ruled out as possible underlying influences that affect cognitive flexibility instead of it being a direct effect of dispositional mindfulness, as hypothesized.

It is instructive, however, to discuss the limitations of the study, to formulate a clearer picture of the direction future research in this area can take. Two primary issues arise in this regard. First, the current pandemic situation necessitated physical distancing and precluded the use of objective, neuropsychological measures of cognitive flexibility. Self-reported cognitive flexibility measures, although validated through several studies, have often not been consistent with such neuropsychological measures, which are still considered to be the best and most objective ways to measure the construct. Johnco et al. (2014) found significant differences between the scores on self-reported measures like CFS and CFI and neuropsychological measures and concluded that although reliable and valid, self-reported measures may be measuring different aspects of the construct than is measured by neuropsychological tests. Thus, the findings of the current study need to be substantiated using neuropsychological measures moving forward.

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Also, the influence of variables such as general psychological health and personality traits have been accounted for, but the picture remains incomplete without consideration of more relevant variables that may influence the relationship under study. A few such variables may include intelligence, socioeconomic level, family pattern, and problem-solving ability, among others. It will be interesting to see how these variables influence the relationship between mindfulness as a trait and cognitive flexibility and are a task for future research to tackle.

CONCLUSION

In conclusion, this study sheds light on the impact of dispositional mindfulness on cognitive flexibility, showing that individuals with higher levels of mindfulness exhibit greater flexibility in social communication and thought adaptability. However, this relationship may be influenced by several factors, which complicates the picture and requires further examination of this relationship using more objective, neuropsychological measures as well as involving other possible influencing variables, to gain a clearer understanding of it.

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Conflict of Interest

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