THE IMPACT OF MINDFULNESS AND FOOD CULTURE ON EATING REGULATION AND THE MEDIATING ROLE OF LIFESTYLE HABITS

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Abstract
Eating regulation is a primary mechanism in effecting health behaviour changes. The study identified the roles of mindfulness as a psychological factor, along with behavioural factors like lifestyle habits and food culture as an environmental factor, comprehensively in their impact on eating regulation. A cross-sectional survey collected data from 683 adults using a structured questionnaire. A reliable and valid scale was developed to measure food culture. Univariate and multivariate statistical techniques were used. Mindfulness and lifestyle habits have a significant and positive relationship with eating regulation. Food culture attenuated eating regulation. Lifestyle habits significantly mediated the relationship between mindfulness and eating regulation. The findings of this study will be helpful to healthcare professionals and dietary advisors. In the context of the COVID 19 pandemic, prevention of obesity through eating regulation is the need of the hour, and this study shows that adopting lifestyle habit changes can help achieve this goal. The introduction of food culture as an antecedent of eating regulation and the development of a scale to measure food culture significantly contributes to the body of literature. The mediating role of lifestyle habits in achieving eating regulation has been established.

Key words: *Eating regulation, food culture, self-regulation, mindfulness, lifestyle habits*

JEL Classification: *Z000, I120*

I. INTRODUCTION

Obesity is a significant risk factor for maintaining overall health and preventing lifestyle diseases across all age groups. The COVID-19 pandemic has led to indirect health consequences. There has been a reduction of physical activity due to working from home and the anxiety of spending time outdoors. Recent research points to an increased interest in boosting immunity to prevent diseases like COVID 19 (Jaeger et al., 2021). The adoption of obesity-related lifestyle behaviours, such as unhealthy eating patterns or lack of physical activity, is associated with increased risks of developing lifestyle diseases (Mc Tiernan et al., 2019). Adherence to a healthy lifestyle, including moderate-to-high physical activity and a healthy diet, was associated with a 60% reduction in the risk of diabetes (Herzog et al., 2021). Higher eating self-regulatory skills were related to decreased weight and a lower likelihood of gaining a substantial amount of weight among overweight individuals (Kliemann et al., 2018). Disordered eating has been positively associated with perceived weight loss difficulty. Good health, therefore, is likely to be an outcome of regulated eating habits along with the lifestyle that promotes overall well-being. The role of eating regulation in achieving good health by boosting immunity is essential. This research is directed towards understanding the antecedents of eating regulation and the role of lifestyle habits as a primary influencer. Knowledge of personal psychological factors contributes to better predicting a level of functioning, clinical course, and treatment outcome in improving eating behavior (Farstad, McGeown & Ranson, 2016). If a psychological factor matters for physical health, it could be because it influences the kinds of health behaviours a person engages (Scheier & Carver, 2018). A dual strategy of targeting behaviour and the underlying habits may effectively improve eating intake, and self-regulation is likely to be sustainable only in an environment that facilitates healthy eating behaviour (Naughton, M. McCarthy & S. McCarthy, 2015).

The ecology of eating is an essential aspect of health and weight control. Researchers wishing to understand eating behaviour would be well advised to pay attention to the environment that cultures have created (Rozin et al., 2003). The extant literature suggests that psychosocial factors, lifestyle, and a motivating culture are needed for an individual to achieve self-regulation in eating. We, therefore, endeavour to research whether, in a particularly luring Indian food culture, an individual with psychological attributes like mindfulness can self-regulate eating behaviour. Individuals may have food-related preferences and exhibit behaviours specific to a particular culture. The differentiating contribution of this research is the introduction of food culture. Accordingly, the study includes psychological, behavioural, and environmental factors to explain the antecedents of eating regulation.

II. Literature Review and Hypothesis Development

Self-regulation

Self-regulation is described as a system of conscious personal management that involves the process of guiding one's thoughts, behaviour, and feelings toward a particular goal. Human functioning is regulated by the interplay of self-generated and external sources of influence (Ryan & Deci, 2000). The Social cognitive theory of self-regulation (Bandura, 1991) could explain how individuals set different goals for themselves concerning their eating habits. Understanding that achieving good health is not static but a dynamic concern, there is a need to research the facilitators of eating regulation, particularly in a culture that entices an individual at too many festivals and events. We found scarce research incorporating the role of culture in eating regulation and therefore included it in our study.

Mindfulness

Mindfulness stabilizes attention, which is conducive to purposeful behaviour. Problems of the mind can cause health problems due to overeating, and mindfulness reduces the influence of such habits. Mindfulness includes bringing one's complete attention to the experiences occurring in the present moment in a non-judgmental or accepting way (Brown & Ryan, 2003). Mindfulness facilitates behavioural control with adaptive ends and promotes behavioural regulation that optimizes well-being (Brown, Ryan & Creswell, 2007).

Mindfulness could be the prime enabler for self-regulation, especially in Indian culture ridden with over-indulgence in food at every social occasion. Thus, this research posits that mindfulness is one of the essential antecedents of eating regulation. There is ample literature with mindfulness studies in samples of overweight individuals and those with disordered or emotional eating habits. However, there is little research to demonstrate the pre-emptive impact of mindfulness on regular individuals, not classified as binge eaters. We view mindfulness as a preventive factor that can be used to improve eating behaviour before it develops into a stage of problematic eating behaviour requiring intervention and hence include it in our research on regular individuals. We hypothesize that:

Hypothesis 1: Mindfulness is significantly and positively related to eating regulation.

Food culture

Anthropologists have long recognized the significance of food in defining cultural differences, particularly the selection, preparation, and serving of food as a socially organized behaviour (Levi-Strauss, 1966). Food is not only a means to satisfy appetite; but also to express honour, affection, and concern for another (Stone, 1983). A study on Nepali Migrants in Australia reported that perceived dietary restriction requirements created social and emotional discomfort to patients, as they perceived the food culture as a barrier to effective diet management. Meals high in carbohydrates, limited food choices, food preparation methods, and food practices during social events were identified as barriers (Sapkota et al., 2017). Scholarship on the anthropology of food recognizes that dietary choice is a marker of ethnic identity through cuisine characterized by "particular flavour and food type, recipes that combine food elements in particular ways, meal formats that aggregate the dishes in predictable manners and meal cycles that alternate meal formats into ordinary and festival meals" (Messer, 1984). People from virtually all cultures use food during celebrations. Social functions were highlighted as barriers to managing lifestyle disease because there is too much temptation, added to a lack of healthier or more appropriate food choices (Hushie, 2019). Hence, Eastern cultures with multiple collective celebrations are likely to create an environment that destabilizes eating regulation. We posit that culture could also subvert the attempts at eating regulation.

In India, food is a significant part of many cultural activities. The studies have thus shown positive and negative influences of culture on eating regulation. The underlying causes of excess energy intake are multifactorial, and the role of food culture in obesity risk in different nations is poorly understood in this context (Dao et al., 2021).

India has a 7.8% of the population affected by diabetes (WHO, 2016), and its burgeoning population seems to still overindulge in food at every social impulse. There seems to be a dire necessity of researching eating regulation impacted by culture and a collectivist lifestyle in India. To facilitate this, we designed a scale to measure food culture with reference

to the Asian- Indian way of life and tested the following hypothesis:

Hypothesis 2: Food culture has a significant negative relationship with eating regulation.

Lifestyle habits

Health behaviours are not isolated phenomena but comprise routines and habits that make up a lifestyle (Bourdieu, 1984). Healthy lifestyles are broad orientations that organize patterns of behaviours derived from knowledge and norms about what constitutes healthy, stress-relieving, or pleasurable behaviours. Research has highlighted the potential importance of healthy lifestyles in understanding how and why there are patterns of behaviours that promote or endanger health (Cockerham, 2005). There is an indication that mental health can adversely impact eating behaviours. The importance of the timing of daily activities in weight regulation and the need to consider the timing of energy intake, physical activity, and sleep has been underscored in the design and evaluation of weight-loss interventions (Thomas et al., 2021). There were associations between short sleep duration, high total energy intake, and low-quality diet. Short sleepers often display irregular eating behaviours and take their main meal late in the day (Vernia et al., 2021). Thus, a study on self-regulation of eating habits cannot be complete without acknowledging the role of lifestyle habits. We examined lifestyle habits compositely by using a measure containing three dimensions for lifestyle habits: organized physical exercise, daily routine, and social and mental balance.

This paper studies the relationship of antecedents such as mindfulness, food culture, and lifestyle habits with eating regulation. Further, given the individual attributes of mindfulness in a non-conducive Indian culture, we probe whether lifestyle would mediate the impact of mindfulness with eating regulation. Given this background, we proposed the following hypotheses:

Hypothesis 3: Lifestyle habits are significantly and positively related to eating regulation

Hypothesis 4: Lifestyle habits mediate the relationship between mindfulness and eating regulation.

Given the absence of a valid and reliable scale to test food culture, the study aimed to develop a scale to measure food culture. This research assimilates mindfulness, lifestyle habits, and food culture to promote eating regulation, as prior literature seemed much disparate, researching these factors individually and not comprehensively.

III. RESEARCH METHODOLOGY

Study design, participants and procedure

800 participants participated in an online survey that assessed mindfulness, lifestyle habits, food culture, eating regulation, and demographics. The inclusion criteria for participation were a minimum age of 18 years having access to the internet. Informed consent was taken from all respondents to answer the survey. 715 responses were received, indicating a response rate of 89%. In the final sample, 683 responses were considered valid. 33 responses were deleted (32 due to having more than 5% answers with missing values, and one respondent seemed unengaged, as evidenced by giving the same response for every single item.) Convenience sampling was used to collect responses, and the sample size was estimated using Cochran's sample size formula for a large population whose degree of variability is unknown and assuming the maximum variability. At a 95% confidence level, the sample size required was 400 participants. The data was collected from October 2019 to March 2020.

Participants reported demographic characteristics, including gender, age, level of education, and occupation shown in Table 1.

Table 1. Socio-demographic characteristics of the study sample (683 respondents)

Category of respondents		Number of respondents	Percentage of the sample
Gender	Male	266	39%
	Female	415	61%
Age(years)	18-29	302	44%
	30-59	311	46%
	60 and above	70	10%
Highest level of education	High school	98	14%
	Bachelor's degree	345	51%
	Postgraduate degree	240	35%
Occupation	Employed full time	262	38%
	Homemaker/ retired/student	186	27%
	Professional	155	23%
	Entrepreneur	80	12%

Eating Regulation

Eating regulation was assessed using the valid and reliable 5-item Self-Regulation of Eating Behaviour Questionnaire (SREBQ) (Kliemann et al., 2018). (e.g., “If I am not eating the way I intend to, I make changes”). On a five-point scale, response options ranged from 1 (never) to 5 (always). The SREBQ demonstrated good internal reliability (Cronbach's alpha = 0.75).

Mindfulness

The Mindfulness Attention Awareness Scale called 'MAAS' (Brown & Ryan, 2003) used for this study taps a unique quality of consciousness related to various self-regulation and well-being constructs. Participants were asked to indicate how often they have each experience (e.g., "I rush through activities without being really attentive to them") on a five-point scale, ranging from never to always. Higher scores implied that the individual demonstrated lower levels of mindfulness. The MAAS showed high internal consistency (Cronbach's alpha = 0.86).

Food culture

The construct was identified after exploratory interviews with Indian adults, as most of them attributed eating-related practices with prevalent food culture. The target population for the exploratory study was adults >=18 years of age. An attempt was made to include participants from different age groups, education levels, occupations, family sizes, and cultural backgrounds. We conducted face to face interviews at a convenient venue to participants and recruited respondents until thematic saturation was reached (Mason, 2010). The interview was semi-structured, based on a broad theme of healthy eating. The interviews unearthed factors that affect healthy eating, among which lifestyle habits and culture emerged as significant themes. Lifestyle habits as a factor affecting eating practices was concurrent with prior literature. We focussed on the emergent construct of food culture and followed standard procedures in scale development (Pervan, Bove & Johnson, 2009). The procedures included construct domain specification, item pool reliability, validity, development, and validation of factor analysis as elaborated below.

Construct domain specification

Construct domain was specified with the exploratory interviews using questions about food practices influenced by one's culture. The responses from exploratory interviews were compiled, and a pool of items pertaining to food culture was generated to clarify the concept and assess food culture. The items identified had a descriptive representation of practices related to food culture, leading to the operational definition. Food culture is defined as representing an individual's food habits owing to belonging to a particular culture or community.

Reliability and validity

Inter-rater reliability was done with the help of six reviewers (three members from academia, two diet consultants, and one nutritionist). A Fleiss Kappa coefficient of 0.68 indicated a substantial agreement (Landis & Koch, 1977). As part of content validity, the experts rated the statements for relevance, clarity, and simplicity, following which four statements were retained, and one item was dropped, as it was not specific and could cause multicollinearity problems.

Exploratory factor analysis was performed with the four items using IBM SPSS to identify factors further to assess food culture. The Kaiser-Meyer-Olkin (KMO) coefficient was 0.822, demonstrating the appropriateness of data for factor analysis (Beavers et al., 2013). Bartlett's test of sphericity indicated sufficient correlations required for factor analysis. Principal component analysis was used, and one component was extracted. The cumulative variance extracted was 67.27%. Convergent Validity tests reveal that the Average variance extracted was 0.672. Cronbach's alpha for item reliability was 0.878. Composite reliability was 3.18. After conducting the factor analysis, four statements with factor loadings above 0.50 (Hair et al. 2014) loaded onto a single factor. The statements retained for measuring food culture are shown in table 2. A five-point Likert scale from strongly agree to strongly disagree was used for receiving responses.

Table 2. Food culture questionnaire

1	Fasting is one of the observances in my culture.
2	A wide variety of food is served during festivals and celebrations in my culture.
3	It is considered rude when guests refuse to eat food served to them in my culture.
4	Many sweets and fried foods are served during festivals and celebrations in my culture.

Lifestyle habits

Lifestyle habits are defined as routine activities leading to an individual's physical, mental, and social well-being. We used items from "The Healthy Lifestyle and Personal Control Questionnaire" (Darviri et al., 2014). Participants were asked to indicate how often they followed certain practices related to their lifestyle (e.g., "I feel that I have a good balance of time between work, personal life and leisure"). Items were ranked on a five-point scale ranging from never to always. The scale demonstrated good internal consistency (Cronbach's alpha= 0.89).

IV. RESULTS

We used a univariate regression model (Table 3) to test the independent relationship between the single predictors of mindfulness, food culture, and lifestyle with eating regulation.

Table 3. The recommended fonts

Single predictor Models					Model 1 Adjusted R2=0.283		
	β	S.E.	*p-value*	Adjusted R^2	β	S.E.	*p-value*
Mindfulness	0.193	0.041	0.000	0.030	0.051	0.036	0.163
Food culture	-0.159	0.100	0.111	0.002	-0.184	0.085	0.030
Lifestyle habits	0.258	0.016	0.000	0.275	0.253	0.017	0.000

S.E. = Standard Error

Model 1 used a multivariate regression, where all predictor variables were comprehensively tested. Model 1 represents the primary analysis where we included mindfulness, food culture, and lifestyle habits simultaneously as predictors of eating regulation.

We used multiple regression to test for mediation (Baron & Kenny, 1986). Here, we first estimated the direct effect between the predictor mindfulness and the mediator, followed by the mediator as a predictor with eating regulation. We then tested the indirect effect for statistical significance to interpret mediation. Since we found significant indirect effects for lifestyle habits as a mediator, we conducted a path analysis to affirm the mediation. See table 4.

Table 4. Path estimates of lifestyle habits with eating regulation

Path	β	S.E.	*p*-value
Mindfulness---> Lifestyle habits	0.251	0.081	0.000
Lifestyle habits ---> Eating regulation	0.525	0.016	0.000
Mindfulness ---> Eating regulation	0.054	0.036	0.000

As single predictors, mindfulness and lifestyle habits were significant predictors of eating regulation, but food culture was not a significant predictor (see table 3). Model 2, which included all predictors, had an R2 of 0.283. An interesting finding of Model 2 was that mindfulness became insignificant as a predictor when food culture and lifestyle habits were regressed together with mindfulness.

Food culture, which was individually not significant in the single predictor model, became a significant negative predictor of eating regulation in model 2. This research has found that along with other factors; food culture needs to be included as a factor predicting eating regulation. In the presence of other predictors, a non-conducive food culture will diminish eating regulation.

V. Discussion

Prior studies have hypothesized that "mindless eating" explains the poor long-term success of most weight-loss interventions and stressed the need to understand the "whys" behind food intake volume (Wansink, Just and Payne, 2009). Our results contribute to holistically understanding these "whys" by establishing that a psychological variable like mindfulness affects eating regulation but is mediated by lifestyle habits. Researchers have established that individuals with no eating disorders exhibited higher levels of mindfulness and were less likely to engage in poor eating behaviours (Warren, Smith & Ashwell, 2017). Our study has made an enriching contribution by adding that lifestyle habits mediate the relationship between mindfulness and eating regulation. We assert that mindful individuals have better eating regulation when supportive lifestyle habits are practised. Even individuals with low mindfulness can aim at eating regulation by maintaining good lifestyle habits. Hence the lack of mindfulness can be partially compensated by health-promoting lifestyle habits that aid in eating regulation. This research has accentuated the need for composite studies on the predictors of eating regulation by the inclusion of various psychological variables together with lifestyle habits.

Previous research has highlighted that improving social relationships are likely to be important in promoting healthy dietary behaviours (Conklin et al., 2014). We confirm through our study that a good social and mental balance, which is one aspect of lifestyle habits, can enhance the impact of mindfulness on eating regulation. This balance is reflected in sharing one's problems with others, concentrating on positive thoughts, and balancing time between work, personal life, and leisure.

Drawing from cues in prior literature, we examined the role of food culture in its impact on eating regulation. To our knowledge, this is the first study to establish the impact of food culture on eating regulation. A significant contribution of this research is the development and validation of a scale to measure food culture. The inclusion of food culture promotes understanding instances in which eating regulation may be obstructed or encouraged by cultural norms. It has opened vistas for further studies related to the variety of cultural norms relating to food practices.

VI. Practical Implications

Eating regulation can help reduce weight and thus prevent chronic illness in a developing country like India. Previous studies have shown that among treatment-seeking persons with overweight and obesity, self-regulation was a consistent predictor of weight control (Teixeira et al., 2015). The social usefulness of self-regulation for health promotion will be a major factor in its evaluation. In countries like England, Denmark, and China, self-management

programs have raised self-regulatory efficacy, fostered health-promoting behaviour, improved health status, and reduced hospitalizations (Bandura, 2005). The role of healthy eating in the context of a developing nation has been highlighted in a recent study on health policies (Ferrari, 2018). Our research shows that health-promoting lifestyle habits such as keeping a schedule for routine activities will enable individuals who are low on mindfulness to improve their eating regulation. Lifestyle modifications like regularising sleep patterns and maintaining a good social and mental balance are habits that can be targeted. Health interventions tend to target medicine as a remedy to disease.

On the other hand, the cost of such interventions can be reduced and even prevented by maintaining good lifestyle habits. We assert that establishing daily routines will help individuals adhere to meal timings in an organized manner and not resort to making hasty decisions with their food choices. Rushed schedules may force individuals to choose quick meals, which could be unhealthy. Understanding that culture impacts eating regulation can perhaps be the first step to avert or reduce the adverse impact of cultural norms by offering healthy food options at celebrations and encouraging practices like fasting, particularly in the context of Eastern cultures.

VII. Limitations and Future Research

The study design is cross-sectional and has some limitations that must be noted for considering broader implications. Data was collected via self-report, which may affect the accuracy of the results. Lifestyle habits and culture could be much more varied and complex than captured in our results.

For this study, only mindfulness was examined as a psychological factor affecting eating regulation. Other factors could also be researched to analyse their impact on eating regulation. Further research is needed to examine the mechanism of mindfulness in eating regulation among individuals who practice mindfulness through yoga and other intervention programs. These results provide the rationale for future research to refine different strategies based on the individual and target behaviour. In the future, a longitudinal design could be applied to assess the outcomes of various lifestyle habits and interventions to influence eating regulation.

The scale developed for food culture is uni-dimensional. There could be further improvements to this measure, with varied cultural perspectives and their impact on food habits. We believe that future research could delve deeper into cultural aspects that encourage or restrict the intake of certain foods to assess their impact on eating behaviour and nutrition. The study acknowledges that food culture may differ among countries, and thus, the results may also vary. Further, we believe that it is customary in cultures such as India to consume foods with medicinal value. Long-term adherence to such practices and their impact on health can be explored in future research.

VIII. Conclusion

This study has advanced the ongoing research in eating regulation by highlighting the unique effects through which lifestyle habits may influence the pathway to eating regulation. We assert that among the dimensions of lifestyle habits, establishing daily routines and having social and mental balance can lead to improved eating regulation in presence of mindfulness or can help sustain eating regulation even with low mindfulness. We believe that these habits aid an individual in avoiding stressful situations which can impair eating regulation. The role of lifestyle habits is established as a critical component of interventions that target improvement in eating regulation. We find support to state that practices such as frequent celebrations with an abundance of high sugar, high-fat foods and observing food-specific cultural norms can impact eating regulation negatively. The study endorses the use of culture as a determining factor in achieving eating regulation. The focal contribution of this research thus emphasizes that a combination of factors including mindfulness, food culture, and lifestyle habits compositely influence eating regulation.

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