


# Can the Multi-Theory Model (MTM) of Health Behavior Change Explain the Intent for People to Practice Meditation?

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## Abstract

Meditation is gaining popularity as adjuvant therapy for many chronic ailments, mental well-being, and spiritual growth. Behavioral theories have been underutilized in understanding meditation behavior. This study aimed to test if a fourth-generation multi-theory model (MTM) could explain the intent for starting and maintaining meditation behavior in a sample of US adults. A face and content valid 48-item instrument based on MTM was administered in a cross-sectional design through an online survey (n = 330). Internal consistency (Cronbach's alpha > 0.70) and construct validation using structural equation modeling of the subscales were all acceptable. Hierarchical multiple regression revealed that, after controlling for demographic covariates, the MTM constructs of participatory dialogue ( $\beta = 0.153$ ;  $P = .002$ ) and behavioral confidence ( $\beta = 0.479$ ;  $P < .001$ ) were statistically significant in predicting intent for starting meditation behavior and accounted for 32.9% of the variance. Furthermore, after controlling for demographic covariates, the MTM constructs of emotional transformation ( $\beta = 0.390$ ;  $P < .001$ ) and changes in the social environment ( $\beta = 0.395$ ;  $P < .001$ ) were statistically significant and accounted for 52.9% of the variance in the intent for maintaining meditation behavior. Based on this study, it can be concluded that MTM offers a pragmatic framework to design, implement, and evaluate evidence-based (theory-based) meditation behavior change interventions.

## Keywords

multi-theory model (MTM), meditation

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## Introduction

Meditation is a practice for coping with chronic ailments, mental, and spiritual well-being has gained immense popularity in recent times. The use of the term meditation (*dhyana*) dates back to the origins of yoga in India and the first written records are described in Patanjali's *ashtangayoga*.<sup>1</sup> Its popularity, in the United States, began in the 1950s with Zen meditation, followed in the 1960s by transcendental meditation (TM) propagated by Maharishi Mahesh Yogi<sup>2</sup>; and in the 1970s the boost came from the work of Kabat-Zinn<sup>3</sup> with the introduction of mindfulness-based stress reduction (MBSR) performed in clinical settings. Today, there are several schools of meditation including mindfulness, TM, Kriya yoga, Kundalini yoga, Zen, Buddhist, and Vipassana.<sup>4</sup> One definition of meditation is that it is a process of becoming aware of one's thinking and choosing what to

think.<sup>5</sup> For this study, we have chosen this broad definition of meditation as any regular and purposeful practice on one's thought process performed for at least 20 min daily.

In the 1970s, there were a handful of studies conducted on meditation but Van Dam et al<sup>6</sup> noted that by 2015 there were

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close to 1200 peer-reviewed journal articles on the subject and over 32 000 news media articles with a continuing exponential trend. A search using the exclusive term “meditation” in the PubMed database today yields over 7000 articles. Lauricella<sup>7</sup> conducted a search of the print media between 1979 and 2014 and found that there has been a sociocultural shift in the United States that has facilitated meditation as part of “spiritual hygiene.”

The number of practitioners of meditation have been increasing in the United States. The 2012 National Health Interview Survey (NHIS) with 34 525 individuals reported that 3 types of meditation (mantra, mindfulness, and spiritual) were practiced by 6.6% of the sample in the past 12 months and 8.8% practiced it in their lifetime.<sup>8</sup> The study also found that people who practiced meditation were more likely to be in the ages 45 to 64 years, to be women, White, college-educated, and of higher income. The study looked closely at mindfulness meditation and found that the reasons meditators ascribed to its use were stress management (92%), mental well-being (91%), self-care orientation (81%), holistic nature (79%), wellness and prevention (74%), natural process (73%), and treatment of a specific health problem (30%). A recent analysis of the 2017 National Health Interview Survey reported 46 million adults in the United States to practice some form of meditation and found its use related to coping with a chronic ailment, counteracting the high cost of healthcare, being younger, female, and a sexual minority.<sup>9</sup>

The practice of meditation is inexpensive and training programs are widely available making it an attractive part of integrative medicine. The American Heart Association in a scientific statement suggests meditation as “a possible benefit on cardiovascular risk” with a caveat that more research is needed.<sup>10</sup> Meditation has also been found to be effective in relieving anxiety, depression, and stress,<sup>11,12</sup> in improving mood,<sup>13</sup> and memory,<sup>14</sup> in reducing chronic pain<sup>15</sup> including chronic neck pain,<sup>16</sup> and chronic low back pain,<sup>17</sup> possibly improving migraine headaches,<sup>18</sup> developing altruism,<sup>16</sup> and many other benefits.

However, there are also some critics of the usefulness and current scientific evidence regarding meditation.<sup>6</sup> The criticisms they level are regarding consensus on its definition, variation in measurability, ambiguity in levels of expertise among meditation practitioners, nonexhaustive types of meditation practices, methodological issues in research that include the construct validation of tools, variation in intervention methodologies, potential adverse effects of meditation, and unsubstantiated data in conjunction with neurosciences. One study indicated unpleasant meditation-related experiences in 25.6% of the sample of meditators they studied.<sup>19</sup> As science in this field evolves more clarity regarding these concerns will emerge. In the interim, meditation-related practices can be considered generally safe and effective in positively influencing coping with some chronic diseases, and in improving mental and spiritual health.

One of the gaps in the literature is that of the underutilization of the application of behavioral theories related to understanding regular meditation practice.<sup>20-22</sup> This makes it difficult to replicate programs, understand whether underlying antecedent constructs of behavior change are occurring, explain whether the intended dose is being given in interventions, and gauging

program efficiency and effectiveness. The initial, first-generation models in health behavior research (HBR) were knowledge transfer-based models based on knowledge, attitudes, practices (KAP) survey.<sup>23</sup> These were replaced with second-generation models that were skill-transfer-based. But both knowledge and skill acquisition did not lead to behavior change. Hence, third-generation theory-based behavior “acquisition” models became popular. Now, fourth-generation models that imbibe proven constructs from multiple theories to explain behavior “change” are emerging which can lead to the designing of precision interventions.<sup>23</sup> One such contemporary fourth-generation behavioral theory applicable in the context of studying meditation behavior is the multi-theory model (MTM) of health behavior change.<sup>24</sup> The MTM divides the behavior change into 2 components: (1) initiation or starting and (2) sustenance or maintenance. For initiation, there are 3 constructs (a) *participatory dialogue* in which the advantages outweigh the disadvantages are underscored derived from value-expectancy theories<sup>25</sup>; (b) *behavioral confidence* or assurance in one’s ability to perform the behavior derived from social cognitive theory<sup>26</sup> and theory of planned behavior<sup>27</sup>; and (c) *changes in the physical environment* derived from social-ecological models.<sup>28</sup> For sustenance also there are 3 constructs: (a) *emotional transformation* derived from emotional intelligence theory<sup>29</sup> in which feelings are converted into goals; (b) *practice for change* derived from Freirean praxis<sup>30</sup> in which active reflection is done; and (c) *changes in the social environment* in which social support is mobilized derived from social support theories.<sup>31</sup> This theory has been studied across behaviors (excluding meditation) and several target populations in cross-sectional designs<sup>32-34</sup> as well as in experimental designs.<sup>35-37</sup> Hence, the purpose of this study was to test if MTM can explain the intent for starting and maintaining meditation behavior in a quota sample of US adults from the general population.

## Materials and Methods

### Design

This study utilized a cross-sectional study design providing a snapshot in time. The chief advantage of this design is to obtain an adequate sample yielding quick results at a low cost. Based on MTM, 2 models were developed in this study. The first one was the initiation model that used independent variables: (1) *participatory dialogue* which is the difference between advantages of meditation behavior change and its potential disadvantages; (2) *behavioral confidence* which is the ability to perform meditation; and (3) *changes in the physical environment* which is the availability and accessibility to tangible resources for performing meditation. The dependent variable in this model was the intention to increase meditation behavior to 140 min in the upcoming week (20 min daily). The choice of intention as the outcome variable is supported from health behavior research based on theory of planned behavior,<sup>27</sup> reasoned action approach<sup>38</sup> and many other such theories that purport that intention precede behaviors. The

covariates used in this model were scores on the perceived stress scale (PSS-10),<sup>39</sup> gender, age, race/ethnicity, education level, and employment status (Figure 1).

The second one was the sustenance or maintenance model that included independent variables: (1) *emotional transformation* or the converting of feelings (particularly negative ones) toward the goal of performing meditation; (2) *practice for change* which was the active reflection and reflective action on the meditation behavior change; and (3) *changes in the social environment* which was the support from family, friends, and others. The dependent variable was the intention to increase meditation behavior to 140 min (20 min daily) from now on. The covariates used in this model were scores on the PSS-10,<sup>39</sup> gender, age, race/ethnicity, education level, and work status. Please see Figure 2.

### Population and Sample

The population for this sample consisted of US adults (over 18 years of age) registered in the national Qualtrics pool who provided informed consent. In calculating the sample size, G\*Power for regression was used.<sup>40</sup> To determine the sample size, the *P*-value was set at .05, power at 0.80, the effect size was considered to be medium at 0.10 (as is the case in social and behavioral science research),<sup>41</sup> and there were 9 predictors (3 independent variables and 6 covariates) in each model. These assumptions yielded a sample size of 166. Since MTM is a theory of behavior change we were interested in those individuals who meditated < 140 min weekly. Based on the 2010 US Census Bureau<sup>42</sup> data in which the total number of adults were about 234 million, and we found in the literature that 46 million people (20%) were practicing meditation,<sup>9</sup> it was safe to assume that if we got data from 208 individuals we could potentially meet our quota sample. In order to employ an adequate sample for the use of structural equation modeling for construct validation, a sample size of 300 was determined as the desired target.<sup>43</sup> The Qualtrics team sent out the questionnaire to its pool twice in order to maximize data collection.

### Instrumentation

The study utilized a self-designed instrument on MTM that was validated for face and content validity by a panel of 6 experts in 2 rounds. The validated PSS-10<sup>39</sup> was added to the instrument. The experts were all university faculties. The experts were familiar with instrumentation (*n* = 6), MTM (*n* = 5), and meditation (*n* = 3). The experts were provided with the instrument and operational definitions of all constructs. Between the first round and second round, 16 suggestions were received that improved the readability and improved the content validity by the addition of 2 items making the total to 48. The Flesch-Kincaid reading level of the final instrument was 7.0 (or seventh grade) and Flesch-Kincaid reading ease was 56.3. The recommendation for grade level for instruments for the general population is that they should be below the eighth-grade reading level and that criterion was met.<sup>44</sup> The instrument is attached as an Appendix.

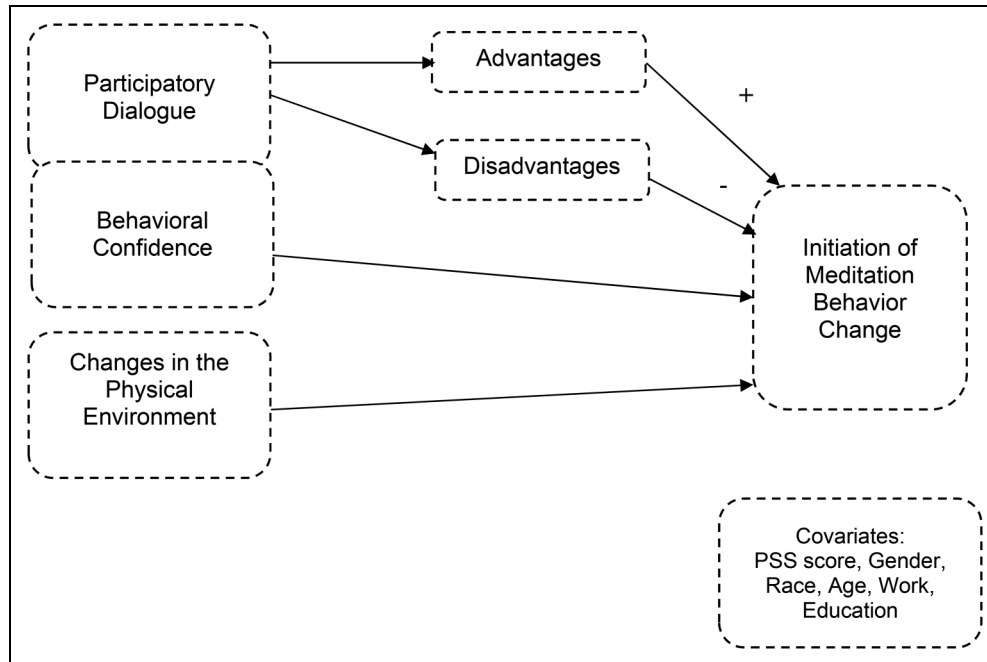
To summarize the 48 item instrument; items 1 to 7 were demographic questions including a question about present minutes of practicing meditation in the past week and items 8 to 17 pertained to perceived stress from PSS-10 on a rating scale of never (0) to very often (4) with a possible range of 0 to 40 units. Items 18 to 23 were about the construct of *advantages* (eg, on practicing meditation one could be healthy, be relaxed, etc) on a rating scale of never (0) to very often (4); and questions 24 to 29 were about the construct of *disadvantages* (eg, on practicing meditation one could be bored, wasting time, etc) on a rating scale of never (0) to very often (4). The score of the *participatory dialogue* construct was obtained from subtracting the summative score of disadvantages from the summative score of advantages and ranged from -24 to +24 units. Items 30 to 34 (eg, surety of performing meditation this week, this week without getting bored, etc) measured the construct of *behavioral confidence* on a rating scale of not at all sure (0) to completely sure (4) and a summative score yielded a possible range of 0 to 20 units. Likewise, summative scores for *changes in the physical environment* were obtained from items 35 to 37 (eg, access to a quiet place, eliminate distracting factors, etc); *emotional transformation* from items 38 to 40 (eg, directing emotions into goals, self-motivating, etc); *practice for change* from items 41 to 43 (eg, keeping a self-record, overcoming barriers, etc); and *changes in the social environment* from items 44 to 46 (eg, support from family, friends, etc) using a rating scale of not at all sure (0) to completely sure (4) yielded total scores of 0 to 12 units. Item 47 pertained to the intention to increase the practice of meditation to 140 min in the upcoming week rated on a scale of not at all likely (0) to completely likely (4). Final item 48 was about continuing the practice of meditation for 140 min weekly from now on rated on a scale of not at all likely (0) to completely likely (4). Construct validation was done using structural equation modeling.<sup>44</sup> Cronbach's alphas were calculated for internal consistency for all subscales and the entire scale and a level of > 0.70 was deemed acceptable.<sup>44</sup>

### Ethical Approval and Data collection

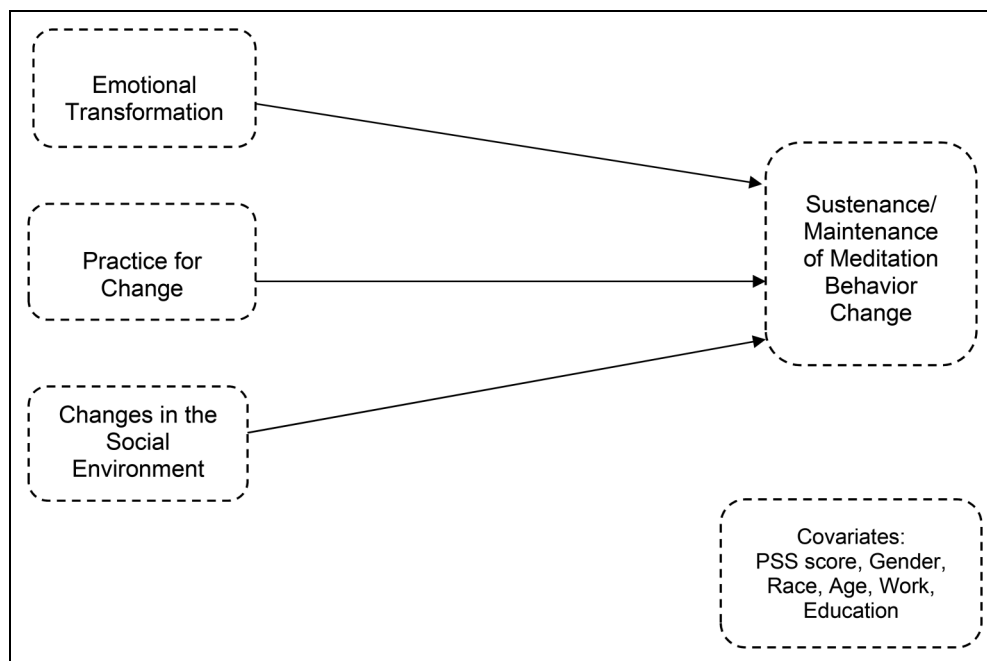
The study was approved as an exempt category #2i study by the University Institutional Review Board (IRB) (Protocol # 1637742-2). All data were collected electronically after obtaining informed consent by the Qualtrics team. Participants were compensated in accordance with their panel agreement (such as gift certificates, cash, Sky Miles, etc) from Qualtrics for completion of the survey. Complete data as an SPSS file were provided for analyses by Qualtrics.

### Data Analyses

All data were analyzed using IBM-SPSS, Version 26.0. For descriptive purposes, metric demographic and study variables were summarized using means and standard deviations while categorical variables were summarized using frequencies and percentages. For structural equation modeling for construct



**Figure 1.** Diagrammatic depiction of initiation model of multi-theory model (MTM) for explaining meditation behavior.



**Figure 2.** Diagrammatic depiction of sustenance model of multi-theory model (MTM) for explaining meditation behavior.

validation, chi-square ( $\chi^2$ ), comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) indices to assess the overall goodness of fit of the model were employed.<sup>45,46</sup> A non-significant chi-square ( $P > .05$ ) is desirable for the model to have a good fit. RMSEA values of  $\leq 0.06$  and CFI values approximating 1 indicate a good model fit.<sup>45</sup> For SRMR,

values  $< 0.10$  are acceptable, with values  $< 0.08$  as preferable. SRMR was included because it is the most sensitive to latent structures or miss-specified factor covariances.<sup>45</sup> For modeling initiation and sustenance, only participants who spent  $< 140$  min weekly on meditation and who indicated that they did not suffer from any medical condition including physical or mental disability that prevented them from performing

meditation were included. The perceived stress score, gender, age, race/ethnicity, education level, and employment status were used as covariates. To assess statistically significant associations between the aforementioned covariates and dependent variables (initiation and sustenance for practicing meditation behavior), Pearson product-moment correlations and one-way analysis of variance (ANOVA) were conducted. For model building, hierarchical regressions (initiation model and sustenance model) were employed in 2 blocks. In block one, only those covariates were entered which showed a statistically significant relationship with the dependent variable. Further, in the second block, MTM constructs were entered to assess their relationships with the dependent variable, after controlling for the effects of covariates. The significance level of .05 was set a priori.

## Results

A total of 330 respondents completed the survey. In our sample, only 64 (19.4%) respondents practiced meditation. From the total, 11 respondents (3.3%) indicated that they practiced more than 140 min of meditation per week and 12 (3.6%) indicated that they suffered from a medical condition including physical or mental disability that prevented them from performing meditation. Thus a total of 307 individuals were included in the final analysis. The socio-demographic characteristics of this sample are summarized in Table 1. It is evident from Table 1 that the sample consisted of mainly older adults (mean age =  $65.02 \pm 10.70$ ), White (92.8%), unemployed (71.3%), and having an undergraduate, master's, or professional degree

**Table 1.** Socio-Demographic Characteristics of the Participants (n = 307).

	Mean $\pm$ SD (median)	n (%)
<b>Age (years)</b>	$65.02 \pm 10.70$ 67.00	
<b>Gender</b>		
Male		165 (53.7%)
Female		141 (45.9%)
Other		1 (0.3%)
<b>Race/ethnicity</b>		
White or Caucasian American		285 (92.8%)
Black or African American		8 (2.6%)
Asian American		10 (3.3%)
Hispanic/Latinx American		3 (1.0%)
Other		1 (0.3%)
<b>Education level</b>		
High school		78 (25.4%)
Associate degree		41 (13.4%)
Undergraduate degree		104 (33.9%)
Masters		65 (21.2%)
Doctorate/professional degree		19 (6.2%)
<b>Work</b>		
Yes		88 (28.7%)
No		219 (71.3%)

(61.3%). The gender distribution was slightly higher for males (53.7%).

Table 2 presents the summary distribution of study variables and results of the internal consistency testing on the subscales. It is worth noting that all subscales and scales had very good internal consistency reliability and met the a priori criterion of  $\geq 0.70^{44}$  (Table 2). It is also evident that the median (0 units) and mean scores on initiation ( $0.57 \pm 1.00$  units) and sustenance (median 0 units, mean  $0.54 \pm 0.97$  units) (possible scores 0 to 4 units) were low. Also, noteworthy is the low mean scores on all MTM constructs, as well as, perceived stress.

## Construct Validation

Figures 3 and 4 depict the results of construct validation of the subscales using structural equation modeling. The path diagram for the initiation model shows the factor loading (standardized regression) for the latent variables and each of the observed variables (Figure 3). The coefficient of determination ( $R^2$ ) describing the magnitude of variance the latent variable accounts for in the observed variables is also shown. Latent covariances for the initiation model ranged from  $-0.13$  between initiation and disadvantages to  $0.62$  between initiation and behavioral confidence. Two of the indices:  $\chi^2$  (180, n = 321) = 894.576,  $P < .001$ , RMSEA = 0.11 (90% CI: 0.10-0.12) showed a poor fit. The other 2 indices: CFI = 0.916 and SRMR = 0.0581 showed a good fit of the model. The path diagram displays strong factor loadings (standardized values) for each item ranging from 0.52 to 0.97. The amount of variance ( $R^2$ ) attributable to each item ranges from 27% to 95%. All the items were significant ( $P < .001$ ).

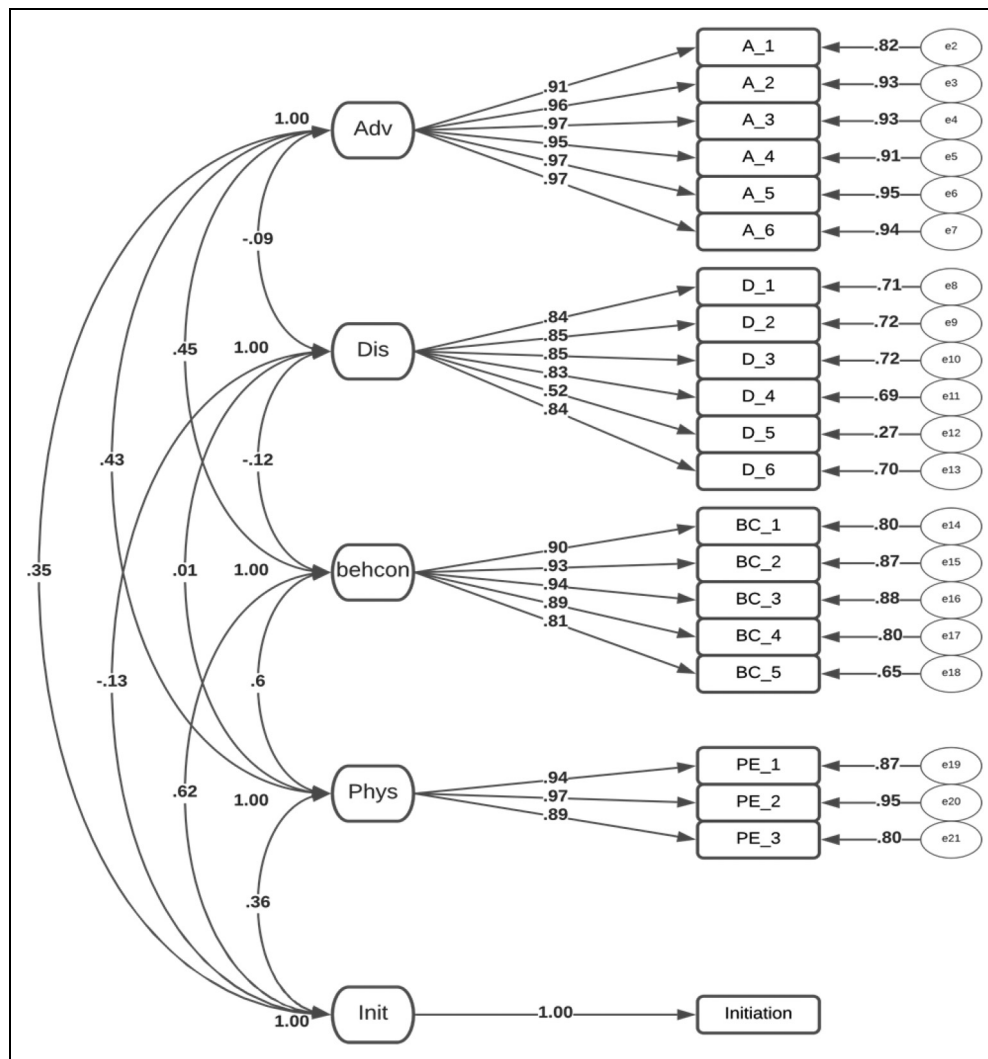
The path diagram for the sustenance model shows the factor loadings (standardized regression) for the latent variables and each of the observed variables (Figure 4). The coefficient of determination ( $R^2$ ) describing the magnitude of variance the latent variable accounts for in the observed variables is also displayed. Latent covariances for the sustenance model ranged from  $0.63$  between practice for change and changes in the social environment to  $0.93$  between emotional transformation and practice for change. Overall, 2 of the indices:  $\chi^2$  (30, n = 321) = 129.694,  $P < .001$ , RMSEA = 0.10 (90% CI: 0.08-0.12) showed a poor fit of the model, while the other 2 indices: CFI = 0.9972 and SRMR = 0.0252 showed a strong fit of the model. The path diagram displays strong factor loadings (standardized values) for each item ranging from 0.52 to 0.97. The amount of variance ( $R^2$ ) attributable to each item ranges from 57% to 92%. All the items were significant ( $P < .001$ ). Thus the subscales in both the models are constructed valid according to the specified cut-offs described above.

## Hierarchical Multiple Regression Modeling

Table 3 depicts the results of hierarchical multiple regression modeling with the dependent variable as the intention for the initiation of meditation behavior. The MTM constructs of

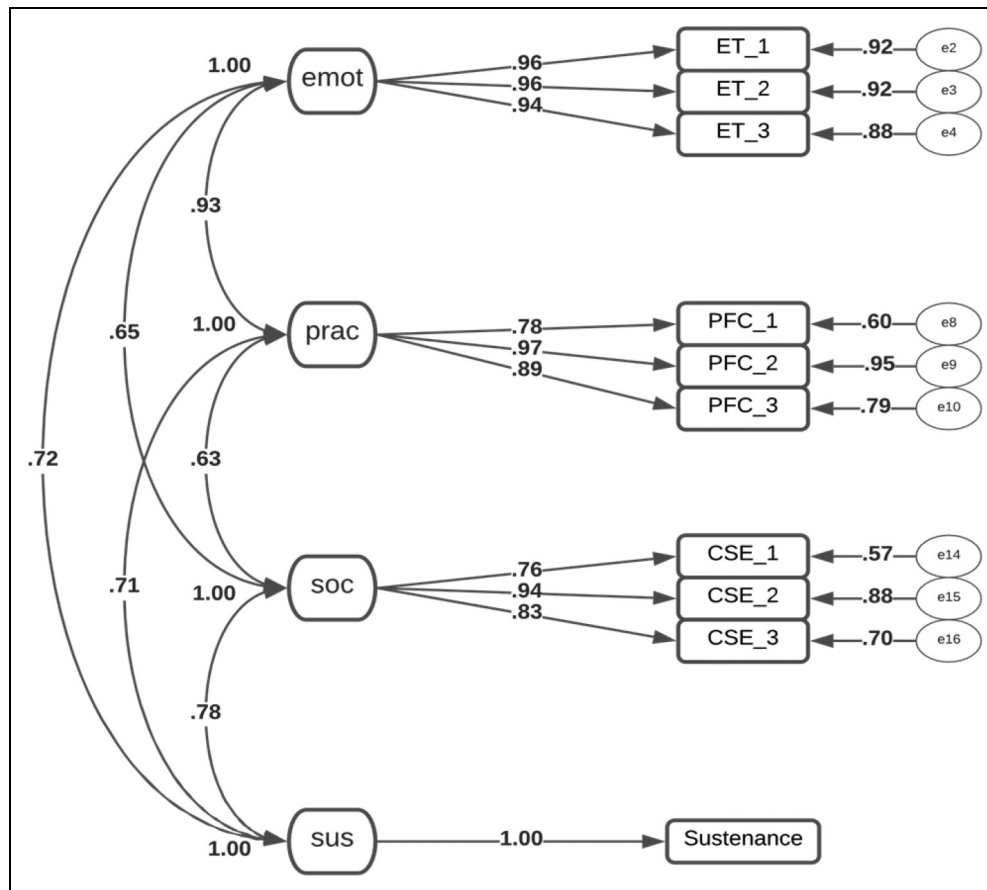
**Table 2.** Descriptive Statistics of Study Variables (n = 307).

Constructs	Possible range	Observed range	Mean (SD)	Median	Cronbach's alpha
Initiation	0-4	0-4	0.57 (1.00)	0.00	–
Participatory dialogue: advantages	0-24	0-24	12.48 (7.52)	12.00	0.98
Participatory dialogue: disadvantages	0-24	0-24	9.03 (6.16)	10.00	0.91
Participatory dialogue: advantages–disadvantages score	–24- + 24	–24- + 24	3.45 (9.96)	2.00	–
Behavioral confidence	0-20	0-20	4.82 (5.84)	2.00	0.94
Changes in physical environment	0-12	0-12	5.09 (4.32)	6.00	0.95
Entire initiation scale	–	–	–	–	0.90
Sustenance	0-4	0-4	0.54 (0.97)	0.00	–
Emotional transformation	0-12	0-12	2.79 (3.51)	1.00	0.96
Practice for change	0-12	0-12	3.30 (3.60)	3.00	0.91
Changes in social environment	0-12	0-12	1.59 (2.56)	0.00	0.86
Entire sustenance scale	–	–	–	–	0.94
Entire MTM scale	–	–	–	–	0.94
Perceived stress	0-40	0-35	10.36 (7.14)	9.00	0.86



**Figure 3.** Confirmatory factor analysis (CFA) for initiation model.

Abbreviations: adv, advantages; dis, disadvantages; behcon, behavioral confidence; phys, changes in physical environment; init, initiation. All item loadings are significant to  $P < .001$ .



**Figure 4.** Confirmatory factor analysis (CFA) for sustenance model.

Abbreviations: emot, emotional transformation; prac, practice for change; soc, changes in social environment; sus, sustenance. All item loadings are significant to  $P < .001$ .

*participatory dialogue* ( $\beta = 0.153$ ;  $P = .002$ ) and *behavioral confidence* ( $\beta = 0.479$ ;  $P < .001$ ) were statistically significant. Also, an inverse relationship with age ( $\beta = -0.194$ ;  $P < .001$ ) was statistically significant. Together these 3 constructs accounted for 39.5% of the variance in the intention for initiation of meditation and the 2 MTM constructs were responsible for 32.9% of that variance.

Table 4 depicts the results of hierarchical multiple regression modeling with the dependent variable as the intention for the sustenance of meditation behavior. The MTM constructs of *emotional transformation* ( $\beta = 0.390$ ;  $P < .001$ ) and *changes in the social environment* ( $\beta = 0.395$ ;  $P < .001$ ) were statistically significant. Also, statistically significant inverse relationships were found with age ( $\beta = -0.09$ ;  $P = .034$ ) and White race ( $\beta = -0.093$ ;  $P = .014$ ). Together these 4 constructs accounted for 60.4% of the variance in the intention for the sustenance of meditation behavior and the 2 MTM constructs were responsible for 52.9% of that variance.

## Discussion

The study aimed to assess whether MTM could explain the intent for starting and maintaining meditation behavior in a

quota sample of US adults drawn from the general population. It was found that the MTM constructs of *participatory dialogue* and *behavioral confidence* contributed to explaining 32.9% of the variance in the intent to start meditation behavior. Further, the MTM constructs of *emotional transformation* and *changes in the social environment* accounted for 52.9% of the variance in the intent to sustain meditation behavior. In behavioral and social sciences the magnitude of these explanatory variables is substantial.<sup>44</sup> Perceived stress was not found to be significantly linked to meditation behavior in this sample. The findings support that MTM can adequately explain the change in meditation behavior and MTM can be used in designing and evaluating interventions that promote meditation behavior in adults. Further, in our sample, 19.4% of respondents practiced meditation which is in line with national data.<sup>9</sup>

In looking at the initiation model of MTM, the construct of *behavioral confidence* was significant and had a large beta ( $\beta = 0.479$ ;  $P < .001$ ). Every unit increase in behavioral confidence resulted in a 0.479 unit increase in intention for the initiation of meditation behavior. However, the level of *behavioral confidence* in the participants was low (median 2; mean  $4.82 \pm 5.84$ ) on a possible minimum of 0 and a maximum of 20 units. It is expected that in the absence of an intervention the

**Table 3.** Hierarchical Multiple Regression Predicting Initiation for Practicing Meditation Behavior (n = 307).

	Unstandardized b	Coefficients Std. error	Standardized coefficients beta	P-value	95% confidence interval	R <sup>2</sup>	Adjusted R <sup>2</sup>
<b>Model 1</b>				< .001		0.076	0.066
Age	-0.018	0.006	-0.187	.004	-0.030--0.006		
Race/ethnicity	-0.356	0.222	-0.092	.110	-0.793-0.080		
Work	0.193	0.142	0.087	.175	-0.086-0.473		
<b>Model 2</b>				< .001		0.407	0.395
Age	-0.018	0.005	-0.194	< .001	-0.028--0.009		
Race/ethnicity	-0.307	0.179	-0.080	.087	-0.659-0.045		
Work	0.052	0.115	0.023	.651	-0.174-0.279		
Participatory dialogue: advantages-disadvantages score	0.015	0.005	0.153	.002	0.006-0.025		
Behavioral confidence	0.083	0.010	0.479	< .001	0.063-0.102		
Changes in physical environment	0.010	0.013	0.042	.439	-0.015-0.035		

Age (years); race/ethnicity (0 = other; 1 = White or Caucasian American; reference category = other); work (0 = no, 1 = yes; reference category = no).

**Table 4.** Hierarchical Multiple Regression Predicting Sustenance for Practicing Meditation Behavior (n = 307).

	Unstandardized b	Coefficients Std. error	Standardized coefficients beta	P-value	95% confidence interval	R <sup>2</sup>	Adjusted R <sup>2</sup>
<b>Model 1</b>				< .001		0.084	0.075
Age	-0.016	0.006	-0.180	.005	-0.028--0.005		
Race/ethnicity	-0.448	0.211	-0.120	.035	-0.864--0.032		
Work	0.200	0.135	0.093	.139	-0.066-0.465		
<b>Model 2</b>				< .001		0.612	0.604
Age	-0.008	0.004	-0.090	.034	-0.016--0.001		
Race/ethnicity	-0.345	0.140	-0.093	.014	-0.619--0.070		
Work	0.041	0.089	0.019	.647	-0.134-0.215		
Emotional transformation	0.107	0.019	0.390	< .001	0.069-0.145		
Practice for change	0.016	0.018	0.060	.376	-0.020-0.052		
Changes in social environment	0.149	0.017	0.395	< .001	0.116-0.183		

Age (years); race/ethnicity (0 = other; 1 = White or Caucasian American; reference category = other); work (0 = no, 1 = yes; reference category = no).

participants did not feel confident in their abilities to perform meditation. Further, meditation is not a cultural norm in Western society and thus perhaps the respondents were reluctant in their surety of performing this behavior. Further, the sample was mainly consisting of older adults who may have been set in their lifestyle. *Behavioral confidence* is a construct that is derived from the construct of self-efficacy<sup>47</sup> with the difference that the source of confidence can arise from other than merely the self and includes outside influences such as a powerful other, Almighty, a deity, and so on. Further, behavioral confidence is futuristic and not “here and now” unlike self-efficacy. Very few theory-based studies have been done with meditation behaviors that have utilized either self-efficacy or *behavioral confidence*. For example, in a study with a TM intervention, general self-efficacy was found to be a significant determinant.<sup>48</sup> In a related MTM study, in explaining yoga behaviors in predominantly Black college students also *behavioral confidence* was found to be statistically significant.<sup>49</sup>

Therefore, based on the findings of this study, it can be said that *behavioral confidence* has a potential for application in behavior change interventions geared toward promoting meditation.

The other significant construct in the initiation model was *participatory dialogue*. It is intuitive to understand that the more a person is convinced of the advantages of a behavior change the greater is the likelihood of his or her to get motivated to indulge in the behavior; and this was also the case for meditation behavior. Once again the mean value of this construct was low ( $3.45 \pm 9.96$ ; median 2 on a possible maximum of 24 units) thus underscoring the need for educational interventions that can emphasize the advantages of meditation behavior change. The construct of *changes in the physical environment* was not found to be significant in this study ( $P > .05$ ). The sample consisted of older adults, a majority of whom did not work, and so perhaps the importance of having a quiet, distraction-free, and secure place was not an issue for them.



In working with other populations such as college students or low socio-economic groups, this construct can be explored further. Further, the study found a significant inverse relationship with age ( $P < .001$ ). It can be assumed that as age increases the likelihood of behavior change decreases.<sup>50</sup> As explained earlier, the sample consisted of older adults and thus they may have been set in their ways accounting for this finding. It also underscores the need for targeting younger groups for developing meditation behavior change programs.

In examining the sustenance model, MTM constructs of *emotional transformation* and *changes in the social environment* were statistically significant and accounted for a substantial proportion of the variance (52.9%) ( $P < .001$ ). Identifying and directing emotions toward the goal of meditation or shifting the emphasis from limbic system activity to cerebral cortex activity is a salient aspect of meditation.<sup>5,51</sup> *Emotional transformation* is thus an important construct in promoting meditation behavior. Unfortunately, the mean score on *emotional transformation* was very low ( $2.79 \pm 3.51$ ; median 1) on a maximum possible of 12 units. While emotional regulation is a strong aspect of the Western culture and is mainly directed toward suppression and reappraisal,<sup>52,53</sup> it is often not channelized into meditation and self-improvement which can be a potentially beneficial application. Likewise, the mean score on *changes in the social environment* was also very low ( $1.59 \pm 2.56$ ; median 0) on a maximum possible of 12 units. This could be due to the sample being comprised of older adults who may not have strong social support. According to MTM, having a partner, spouse, coworker, peer, friend who also meditates is vital for the continuation of the practice of meditation and this should be tapped by future interventions.

The MTM construct of *practice for change* was not found to be significant in this sample ( $P > .05$ ). This construct refers to the thoughtful actions and thinking on actions which in itself is meditation as per our study. This finding is also contrary to a related MTM study done with predominantly Black college students about yoga behaviors that found *practice for change* to be a significant predictor.<sup>49</sup> Since a large majority of the sample was generally not inclined toward making meditation behavior change perhaps they thought that this construct was not important. Future probability-based studies drawing from multiple locations are necessary in order to explore this construct.

Additionally, the study found that for the sustenance of meditation behavior race and work status were not statistically significant ( $P > .05$ ). However, as age increased there was an inverse significant relationship with intent to maintain meditation behavior. This may be due to already established habits and the reluctance to change behavior after a certain age. Likewise, the study found that being White was inversely related to meditation behavior maintenance intent. This could be explained due to cultural norms in the West that do not support meditation.

### Implications for Practice

Meditation is gaining popularity in the United States and offers numerous benefits. However, very few behavioral theory

models have been used to assist in adoption and adherence to meditation behavior.<sup>48,49,54</sup> Based on this study, we found that the fourth-generation MTM is a useful approach in designing meditation programs that promote any kind of meditation. First, the potential participants of the programs should be motivated by underscoring the benefits of meditation over the potential disadvantages at a personal level (*participatory dialogue*). In order to build *behavioral confidence*, the participants of the meditation programs should be taught meditation in easy steps, should be encouraged to make it a part of everyday living (not just a chore), identify different sources of confidence, assisted with overcoming potential barriers in their practice, persuaded to meditate, focus on the hope for future change if facing immediate difficulties, and make efforts to reduce stress. While the construct of *changes in the physical environment* was not found to be statistically significant in this study it is imperative that a quiet, safe, and distraction-free place be available to meditate every day.

In order to help the potential participants in a meditation program to continue their practice for a sustained time, the participants should be taught how to channelize their emotions, especially the negative ones such as anger, hatred, jealousy, inferiority, or superiority complex, toward the goal of meditation (*emotional transformation*). Whenever one feels a negative emotion he or she should direct the focus toward the thinking or whatever technique he or she is familiar with through any school of meditation. In order to build *changes in the social environment*, social support whether natural or artificial through a partner, spouse, coworker, peer, friend, health worker, researcher, etc would go a long way in maintaining a meditation practice.<sup>55</sup> While the study did not find support for the construct of *practice for change*, and future studies need to examine this construct more carefully, in interventions, this can be built through journaling, use of apps that are gaining popularity, troubleshooting barriers, and continually revisiting and renewing one's resolve to practice meditation. The instrument developed in this study can be used for conducting descriptive studies with different subgroups of target populations as well as for efficacy testing of interventions.

### Strengths and Limitations of the Study

The study is among the few theory-based studies<sup>48,49</sup> that have been done on meditation behavior. Specifically, the study examined a new fourth-generation model that has the potential to improve both the beginning and adhering to meditation programs. The study has been able to generate a psychometrically sound instrument that can be used in further pilot interventions, efficacy trials, and effectiveness studies. However, the study did have some limitations. In this study, actual behavior was not measured but rather the intent of meditation; a substitute for actual behavior. Future studies can address this limitation. Also, our sample consisted of mainly older adults and the majority was White so the results have to be interpreted with caution for generalizability purposes across diverse

populations. The cross-sectional design<sup>56</sup> and use of self-reports<sup>57</sup> are also methodological limitations of our study.

## Conclusions

This was a cross-sectional study on meditation behavior that examined whether the fourth-generation MTM could explain meditation behavior in a quota sample of adults and found that indeed MTM was effective in explaining substantial variance in this behavior in this sample. A considerable number of people start the practice of meditation but drop out for a variety of reasons thus not benefiting from its practice. MTM offers a pragmatic framework to design, implement, and evaluate evidence-based (theory-based) meditation behavior change interventions. Future practitioners and researchers must utilize the tools and approaches discussed in this study to promote meditation behavior across different target groups.

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## Author Contributions (Roles)

**MS:** Conceptualization, study design, applied for IRB, supervised data collection, prepared the first draft, and approval of the final manuscript. **MA:** Data analysis and interpretation, provided critical comments, and approval of the final manuscript. **RL:** Provided critical comments, formatting, and approval of the final manuscript. **AK:** Data interpretation, Provided critical comments, and approval of the final manuscript. **VKN:** Data analysis and interpretation, provided critical comments, and approval of the final manuscript. **SM:** Data interpretation, provided critical comments, and approval of the final manuscript.

## Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


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## Ethical Approval

The study was approved as an exempt category #2i study by the University of Nevada, Institutional Review Board (IRB) (Protocol # 1637742-2).

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## Supplemental Material

Supplemental material for this article is available online.

## References

1. Woods JH. *The Yoga-Sutra of Patanjali*. Dover; 1927/2003.
2. Murphy M, Donovan S, Taylor E. The physical and psychological effects of meditation: a review of contemporary research with a comprehensive bibliography, 1931–1996. *Institute of Noetic Sciences*. 1997:1931-1996. (2 ed.).
3. Kabat-Zinn J. Full catastrophe living: the program of the stress reduction clinic at the University of Massachusetts Medical Center. Dell Publishing; 1990. p. 21–48.
4. Romas JA, Sharma M. *Practical Stress Management. A Comprehensive Workbook*. 7th ed. Academic Press; 2017.
5. Sharma M. *Introspective Meditations for Complete Contentment (Santosha)*. Health for All, Inc; 2018.
6. Van Dam NT, van Vugt MK, Vago DR, et al. Mind the hype: a critical evaluation and prescriptive agenda for research on mindfulness and meditation [published correction appears in *Perspect Psychol Sci*. 2020 Sep;15(5):1289–1290]. *Perspect Psychol Sci*. 2018;13(1):36-61. doi:10.1177/1745691617709589
7. Lauricella S. The ancient-turned-New concept of “spiritual hygiene”: an investigation of media coverage of meditation from 1979 to 2014. *J Relig Health*. 2016;55(5):1748-1762. doi:10.1007/s10943-016-0262-3
8. Burke A, Lam CN, Stussman B, Yang H. Prevalence and patterns of use of mantra, mindfulness and spiritual meditation among adults in the United States. *BMC Complement Altern Med*. 2017;17(1):316. doi:10.1186/s12906-017-1827-8. Published 2017 Jun 15.
9. Macinko J, Upchurch DM. Factors associated with the use of meditation, U.S. adults 2017. *J Altern Complement Med*. 2019;25(9):920-927. doi:10.1089/acm.2019.0206
10. Levine GN, Lange RA, Bairey-Merz CN, et al. Meditation and cardiovascular risk reduction: a scientific statement from the American heart association. *J Am Heart Assoc*. 2017;6(10):e002218. doi:10.1161/JAHA.117.002218. Published 2017 Sep 28.
11. Goyal M, Singh S, Sibinga EM, et al. Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA Intern Med*. 2014;174(3):357-368. doi:10.1001/jamainternmed.2013.13018
12. Saeed SA, Cunningham K, Bloch RM. Depression and anxiety disorders: benefits of exercise, yoga, and meditation. *Am Fam Physician*. 2019;99(10):620-627.
13. Pokorski M, Suchorzynska A. Psychobehavioral effects of meditation. In pulmonary disorders and therapy. *Adv Exp Med Biol*. 2018;1023:85-91. doi:10.1007/5584\_2017\_52
14. Basso JC, McHale A, Ende V, Oberlin DJ, Suzuki WA. Brief, daily meditation enhances attention, memory, mood, and emotional regulation in non-experienced meditators. *Behav Brain Res*. 2019;356:208-220. doi:10.1016/j.bbr.2018.08.023
15. Ball EF, Nur Shafina M, Sharizan E, Franklin G, Rogozińska E. Does mindfulness meditation improve chronic pain? A systematic review. *Curr Opin Obstet Gynecol*. 2017;29(6):359-366. doi:10.1097/GCO.0000000000000417

16. Edwards MK, Loprinzi PD. Comparative effects of meditation and exercise on physical and psychosocial health outcomes: a review of randomized controlled trials. *Postgrad Med.* 2018;130(2):222-228. doi:10.1080/00325481.2018.1409049
17. Zgierska AE, Burzinski CA, Cox J, et al. Mindfulness meditation and cognitive behavioral therapy intervention reduces pain severity and sensitivity in opioid-treated chronic low back pain: pilot findings from a randomized controlled trial. *Pain Med.* 2016;17(10):1865-1881. doi:10.1093/pm/pnw006
18. Wells RE, Burch R, Paulsen RH, Wayne PM, Houle TT, Loder E. Meditation for migraines: a pilot randomized controlled trial. *Headache.* 2014;54(9):1484-1495. doi:10.1111/head.12420
19. Schlosser M, Sparby T, Vörös S, Jones R, Marchant NL. Unpleasant meditation-related experiences in regular meditators: prevalence, predictors, and conceptual considerations. *PLoS One.* 2019;14(5):e0216643. doi:10.1371/journal.pone.0216643. Published 2019 May 9.
20. Bridges L, Sharma M. The efficacy of yoga as a form of treatment for depression. *J Evid Based Complementary Altern Med.* 2017;22(4):1017-1028. doi:10.1177/2156587217715927
21. Haider T, Sharma M, Branscum P. Yoga as an alternative and complementary therapy for cardiovascular disease: a systematic review. *J Evid Based Complementary Altern Med.* 2017;22(2):310-316. doi:10.1177/2156587215627390
22. Sharma M, Lingam VC, Nahar VK. A systematic review of yoga interventions as integrative treatment in breast cancer. *J Cancer Res Clin Oncol.* 2016;142(12):2523-2540. doi:10.1007/s00432-016-2269-2
23. Sharma M. *Theoretical Foundations of Health Education and Health Promotion.* 4th ed. Jones and Bartlett Learning; 2021.
24. Sharma M. Multi-theory model (MTM) for health behavior change. *WebmedCentral.* 2015;6(9):WMC004982. Behaviour. Available at: [http://www.webmedcentral.com/article\\_view/4982](http://www.webmedcentral.com/article_view/4982).
25. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. *Health Educ Q.* 1988;15(2):175-183. doi:10.1177/109019818801500203
26. Bandura A. *Social Foundations of Thought and Action.* Prentice-Hall; 1986.
27. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process.* 1991;50:179-211.
28. Sallis JF, Owen N. Ecological models of health behavior. In: Glanz K, Rimer BK, Viswanath K, eds. *Health Behavior and Health Education. Theory, Research, and Practice (5th ed.).* Jossey-Bass; 2015:43-64.
29. Goleman D. *Emotional Intelligence.* Bantam; 1995.
30. Freire P. *Pedagogy of the Oppressed.* Continuum; 1970.
31. House JS. *Work Stress and Social Support.* Addison-Wesley; 1981.
32. Dokun-Mowete CA, Sharma M, Beatty F. Using multitheory model to predict low-salt intake among Nigerian adults living with hypertension. *Int Q Community Health Educ.* 2019;39(4):245-255. doi:10.1177/0272684X18821308
33. Nahar VK, Sharma M, Catalano HP, Ickes MJ, Johnson P, Ford MA. Testing multi-theory model (MTM) in predicting initiation and sustenance of physical activity behavior among college students. *Health Promot Perspect.* 2016;6(2):58-65. doi:10.15171/hpp.2016.11. Published 2016 Jun 11.
34. Sharma M, Anyimukwu C, Kim RW, Nahar VK, Ford MA. Predictors of responsible drinking or abstinence among college students who binge drink: a multitheory model approach. *J Am Osteopath Assoc.* 2018;118(8):519-530. doi:10.7556/jaoa.2018.120
35. Bashirian S, Barati M, Sharma M, Abasi H, Karami M. Water pipe smoking reduction in the male adolescent students: an educational intervention using multi-theory model. *J Res Health Sci.* 2019;19(1):e00438. Published 2019 Feb 5.
36. Brown L, Sharma M, Leggett S, Sung JH, Bennett RL, Azevedo M. Efficacy testing of the SAVOR (sisters adding fruits and vegetables for optimal results) intervention among African American women: a randomized controlled trial. *Health Promot Perspect.* 2020;10(3):270-280. doi:10.34172/hpp.2020.41. Published 2020 Jul 12.
37. Hayes T, Sharma M, Shahbazi M, Sung JH, Bennett R, Reese-Smith J. The evaluation of a fourth-generation multi-theory model (MTM) based intervention to initiate and sustain physical activity. *Health Promot Perspect.* 2019;9(1):13-23. doi:10.15171/hpp.2019.02. Published 2019 Jan 23.
38. Fishbein M. An integrative model for behavioral prediction and its application to health promotion. In: DiClemente RJ, Crosby RA, Kegler MC, eds. *Emerging Theories in Health Promotion Practice and Research (2nd ed.).* Jossey-Bass; 2009:215-234.
39. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav.* 1983;24(4):385-396.
40. Faul F, Erdfelder E, Lang AG, Buchner A. G\*power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods.* 2007;39(2):175-191. doi:10.3758/bf03193146
41. Lipsey MW, Wilson DB. The efficacy of psychological, educational, and behavioral treatment. Confirmation from meta-analysis. *Am Psychol.* 1993;48(12):1181-1209. doi:10.1037//0003-066x.48.12.1181
42. United States Census Bureau. *Age and Sex Composition:2010.* 2010 Census briefs; 2011, Accessed February 28, 2020. <https://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf>. Accessed 2020 Nov 14.
43. Tabachnick BG, Fidell LS. *Using Multivariate Statistics.* 7th ed. Pearson; 2018.
44. Sharma M, Petosa RL. Measurement and evaluation for health educators. Jones and Bartlett; 2014. p. 73–102.
45. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal.* 1999;6(1):1-55. doi:10.1080/10705519909540118
46. Williams LJ, Vandenberg RJ, Edwards JR. 12 structural equation modeling in management research: a guide for improved analysis. *Academy of Management Annals.* 2009;3(1):543-604. doi:10.1080/19416520903065683
47. Bandura A. *Self-efficacy: The Exercise of Control.* W. H. Freeman; 1997.
48. Goldstein L, Nidich SI, Goodman R, Goodman D. The effect of transcendental meditation on self-efficacy, perceived stress, and quality of life in mothers in Uganda. *Health Care Women Int.* 2018;39(7):734-754. doi:10.1080/07399332.2018.1445254

49. Hayes T, Sharma M, Hernandez Morales VLA, Brown L, Di W. Using the multi-theory model (MTM) of health behavior change to explain yoga practice [published online ahead of print, 2020 Aug 20]. *Altern Ther Health Med*. 2020:AT6395.
50. Allan JL, McMinn D, Daly M. A bidirectional relationship between executive function and health behavior: evidence, implications, and future directions. *Front Neurosci*. 2016;10:386. doi:10.3389/fnins.2016.00386. Published 2016 Aug 23.
51. Ben-Zeev A. *The Subtlety of Emotions*. Massachusetts Institute of Technology; 2000.
52. Gross JJ. Emotion regulation: affective, cognitive, and social consequences. *Psychophysiology*. 2002;39(3):281-291. doi:10.1017/s0048577201393198
53. Valim CPRAT, Marques LM, Boggio PS. A positive emotional-based meditation but not mindfulness-based meditation improves emotion regulation. *Front Psychol*. 2019;10:647. doi:10.3389/fpsyg.2019.00647. Published 2019 Mar 28.
54. Erbe RG, Middlestadt SE, Lohrmann DK, Beckmeyer JJ. A salient belief elicitation examining adolescents' meditation beliefs using the reasoned action approach. *Health Promot Pract*. 2020;21(4):633-641. doi:10.1177/1524839918811803
55. Freedenberg VA, Hinds PS, Friedmann E. Mindfulness-based stress reduction and group support decrease stress in adolescents with cardiac diagnoses: a randomized two-group study. *Pediatr Cardiol*. 2017;38(7):1415-1425. doi:10.1007/s00246-017-1679-5
56. Cataldo R, Arancibia M, Stojanova J, Papuzinski C. General concepts in biostatistics and clinical epidemiology: observational studies with cross-sectional and ecological designs. Conceptos generales en bioestadística y epidemiología clínica: estudios observacionales con diseños transversal y ecológico. *Medwave*. 2019;19(8):e7698. doi:10.5867/medwave.2019.08.7698. Published 2019 Sep 25.
57. Baer R. Assessment of mindfulness by self-report. *Curr Opin Psychol*. 2019;28:42-48. doi:10.1016/j.copsyc.2018.10.015