

Make It or Break It: Effects of a Multi-Component Healthy Lifestyle Behavior Change Program

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ABSTRACT

Background: The percentage of U.S. adults who regularly engage in healthy lifestyle behaviors such as physical activity, fruit and vegetable consumption, and managing stress is below the recommended ideal, with only a small portion meeting national guidelines.

Aim: The purpose of this study was to test the effects of two digital healthy lifestyle behavior interventions entitled Make It or Break It (MIBI; a combination of text messaging, email, and app use) and MIBI+ (the interventions in MIBI plus the addition of a health coach) on healthy lifestyle beliefs and behaviors, perceived stress, health locus of control, and self-efficacy.



Methods: A randomized controlled trial with three groups of faculty, staff, and alumni ([1] an information-only control condition, [2] MIBI, and [3] MIBI+) was implemented using the transtheoretical model of behavior change. Participants completed pre- and post-program surveys using Qualtrics, assessing various health measures and demographic variables. Descriptive statistics, Cohen's D effect sizes, and repeated measures ANOVA models were used for data analysis, guided by an a priori power analysis.

Results: Increases were observed in self-reported healthy lifestyle behaviors of healthy eating, physical activity, and stress/mental wellbeing practices. Health locus of control predicted self-efficacy for completing the MIBI program and for making healthy behavior changes. Moderate to large effects were seen for the MIBI and MIBI+ groups for healthy lifestyle beliefs and behaviors, perceived stress, and health locus of control.

Conclusions: The e-intervention demonstrated successful behavior change for participants.

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BACKGROUND

According to the Centers for Disease Control and Prevention (CDC, 2022), modifiable behavioral factors, including tobacco use, poor nutrition, physical inactivity, and excessive alcohol use, account for the leading causes of disease and disability in the United States. Six in 10 adults have one chronic condition, and four in 10 have two or more. Chronic disease drives \$4.5 trillion in the nation's annual health care costs (CDC, 2022).

In 2020, only 24.2% of adults aged 18 years and over met the 2018 Physical Activity Guidelines for Americans for both aerobic and muscle-strengthening activities (Elgaddal et al., 2022; National Health Interview Survey, 2020). The percentage of adults who met both physical activity guidelines was higher among men (28.3%) than among women (20.4%) and decreased with age for both men and women. As one of the leading health indicators, physical activity is associated with reducing the risk of chronic diseases and improving the overall physical function and performance of an individual (Blackwell & Clarke, 2018).

Approximately 12% of adults meet the fruit consumption recommendations, and 10% meet the vegetable consumption recommendations (Lee et al., 2022). The prevalence of meeting fruit intake recommendations is highest among Hispanic adults (16.4%) and lowest among males (10.1%). Meeting vegetable intake recommendations is highest among adults aged ≥ 51 years (12.5%) and lowest among those living below or close to the poverty level (6.8%) (Lee et al., 2022).

Stress and mental well-being challenges are currently a global health epidemic (Moitra et al., 2023). Poor mental well-being impacts the likelihood of developing type two diabetes mellitus, insomnia, high cholesterol, migraines, obesity, coronary artery disease, hypertension, stroke, and various other quality of life issues (National Institute for Mental Health, 2021). Because of the strong association between physical and mental health, it is important to focus on improving mindfulness and positive coping skills to improve both mental and physical health.

The transtheoretical model stages of change (TTM-SOC) has been demonstrated to be effective at promoting healthy changes for well-being (Prochaska & Velicer, 1997). There are four core constructs of TTM: (1) stages of change, (2) the processes of change, (3) self-efficacy, and (4) decisional balance. The stages of change are pre-contemplation, contemplation, preparation, action, and maintenance. For each stage of change, different intervention strategies are most effective at moving the person to the next stage and, subsequently, through the model to maintenance, the ideal stage of behavior. In the pre-contemplation stage, people do not intend to act in the foreseeable future. In the contemplation stage, people intend to start healthy behaviors in the foreseeable future, defined as within the next 6 months. In preparation, people are ready to act within the next 30 days. In action, people have recently changed their behavior, defined as within the last 6 months. In maintenance, people have sustained their behavior change for more than 6 months. To progress through the stages of change, people apply cognitive, affective, and evaluative processes. Ten processes of change have been identified with some processes being more relevant to a specific stage of change than other processes; these processes result in strategies that help people make and maintain change:

- (1) Consciousness Raising, increasing awareness about the healthy behavior.
- (2) Dramatic Relief, emotional arousal about the health behavior, whether positive or negative arousal.
- (3) Self-Reevaluation, self-reappraisal to realize the healthy behavior is part of who they want to be.
- (4) Environmental Reevaluation, social reappraisal to realize how their unhealthy behavior affects others.
- (5) Social Liberation, environmental opportunities that exist to show society is supportive of the healthy behavior.
- (6) Self-Liberation, a commitment to change behavior based on the belief that achievement of the healthy behavior is possible.
- (7) Helping Relationships, finding supportive relationships that encourage the desired change.
- (8) Counter-Conditioning, substituting healthy behaviors and thoughts for unhealthy behaviors and thoughts.
- (9) Reinforcement Management, rewarding the positive behavior and reducing the rewards that come from negative behavior.
- (10) Stimulus Control, re-engineering the environment to have reminders and cues that support and encourage the healthy behavior and remove those that encourage the unhealthy behavior.

Self-efficacy is a belief in our own competence to successfully accomplish a task and produce a favorable outcome. Self-efficacy plays a major role in determining one's success. Individuals with high self-efficacy are more likely to put forth sufficient effort that leads to successful outcomes. The TTM integrates elements of Bandura's self-efficacy theory (Bandura 1977, 1982).

Decision-making was conceptualized by Janis and Mann (1977) as a decisional "balance sheet" of potential gains and losses. When people make decisions, they weigh the costs and benefits of their different choices. Two components of decisional balance, the pros and cons, have become core parts of the TTM. Used across a variety of healthy lifestyle behaviors, the TTM-SOC has been most used in physical activity and the adoption of fruit and vegetable interventions (Nakabayashi et al., 2020; Vela & Ortega, 2020).

Research has shown the benefits of using digital media and technology to create change in health behaviors (Evans et al., 2022). Strategies using digital technology have included a variety of platforms (e.g., text messaging, social media, apps) and program strategies (e.g., social media support groups and tailored coaching), all of which are potentially more effective with increased frequency, intensity, interactivity, and feedback (Nesi et al., 2020). Systematic review evidence shows these interventions increase or maintain the amount of time adults spend in physical activity with the greatest improvements seen among those who were less active before the intervention (Beleigoli, 2019). When using

digital health technologies, individuals who are obese or overweight also eat more fruits and vegetables and fewer unhealthy foods, consume fewer calories overall, and improve weight-related and clinical outcomes (Beleigoli, 2019).

Health and wellness coaching has been shown to be a successful method in promoting behavioral change related to healthy lifestyle adherence (Sinaise et al., 2023). Health and wellness coaching improves client health outcomes on a wide variety of topics, ranging from level of physical activity and fruit and vegetable consumption to stress management (Gawlik et al., 2023; Jeannotte et al., 2020; Kennel, 2018). The most useful behavior change techniques for coaching clients to implement include problem solving, self-monitoring for accountability, and setting realistic goals (Gawlik et al., 2023).

Contemporary research has shown that the most effective methods used by coaches to initiate change are the use of open-ended questions, respecting client autonomy by asking for permission before beginning something new, helping clients clarify long-term goals into more achievable and measurable objectives, and offering compliments and encouragement specific to the behavior change (Haynes et al., 2021; Sinaise et al., 2023). The method through which coaching is delivered is salient. Prior studies indicate that face-to-face or hybrid coaching is largely preferred to virtual coaching alone, though tailored virtual coaching has been found to be effective, especially in improving mental health outcomes (Gawlik et al., 2023; Jeannotte et al., 2020). The utilization of peer-administered coaching also has been examined and shown to be particularly helpful in the maintenance of healthy eating (Jones et al., 2020; Kennel, 2018).

The purpose of the current study was to test the effects of two healthy lifestyle behavior intervention that included a healthy lifestyle intervention app, text/email messaging, and the addition of virtual/telephonic health and wellness coaching on healthy lifestyle beliefs, healthy lifestyle behaviors, perceived stress, health locus of control, and self-efficacy among university faculty, staff, and alumni. The intervention was tested against an information-only control condition. To the investigators' knowledge, this was the first intervention study to test this combination of interventions on the outcome variables.

METHODS

Research Design

This study used a pre-test post-test randomized controlled trial to test the effects of this digital multi-component behavior change program with and without health coaching, entitled Make It or Break It. The three groups were (1) an information-only comparison group, (2) the Make It or Break It intervention (MIBI), and (3) the Make It or Break Intervention plus individual virtual/telephonic health coaching (MIBI+). The core MIBI program included the use of a healthy lifestyle behavior intervention app as well as email and text messages focused on healthy lifestyle beliefs, healthy lifestyle behaviors, perceived stress, health locus of control and self-efficacy. In the MIBI+ condition, participants received the intervention app and email/text messages similar to the core MIBI program with the addition of individual health and wellness coaching. For both the MIBI and MIBI+ conditions, content was tailored to address participant's primary goal of either (1) physical activity, (2) nutrition, or (3) stress/mental health. In contrast, those randomized to the information-only control condition received eight emails focused on general healthy lifestyle recommendations. Individuals in the MIBI and MIBI+ conditions were split into one of the three behavior groups within each condition based on their preference for behavioral topic. Participants were randomly sorted into groups using a computer program.

Sample

The study included 288 faculty, staff (regardless of their full-time equivalent or benefits status), and alumni at a large midwestern university. All participants provided informed consent to participate, and the study was approved by the Institutional Review Board. Participants from the main and regional campuses, as well as extension offices, were eligible to participate in the study.

Measurement / Instrumentation

Participants enrolled in the study were asked to complete pre- and post-program surveys and participate in the MIBI, MIBI+, or control components over eight weeks. The surveys were administered using a secure, online survey tool (Qualtrics).

Stage of Change

This is a single item assessed an individual's readiness to change a health behavior (Prochaska & DiClemente, 1984). As previously noted, the model is comprised of five stages that represent incremental increases in preparedness to change: pre-contemplation, contemplation, preparation, action, and maintenance. Construct validity for the Stage of Change tool is strong in the exercise domain. Between-stage differences were found for dependent variables ($p < .0001$) and for each dependent variable separately ($p < .01$) (Cardinal, 1997). Internal consistency using Cronbach alphas was high (.73 to .88) and test-retest was .80 to .94 in sedentary college students.

Healthy Lifestyle Behaviors

Healthy behaviors were measured with the Healthy Lifestyle Behaviors Scale (Melnik & Small, 2003). Participants responded to each of the 16 items (e.g., I exercised regularly; I talked about my worries or stressors, I made choices that lead to a healthy lifestyle) on a 5-point Likert scale that ranges from 1 (*strongly disagree*) to 5 (*strongly agree*). Face validity was established with 10 teens and adult parents and 8 health experts established content validity. Cronbach alphas with teens and adults in prior pilot studies have been .80 and above. The observed Cronbach's alpha in this study was .85. Construct validity has been supported through factor analysis from data obtained in previous studies.

Healthy Lifestyle Beliefs Scale (HLBS)

The HLBS is a 16-item instrument that was adapted from other Beliefs scales used in multiple prior studies (Melnik, 1994; Melnyk et al., 1997; Melnyk et al., 2006). This scale taps beliefs about various facets of maintaining a healthy lifestyle (e.g., I believe that I can be more active and I am sure that I will do what is best to lead a healthy life). Participants responded to each item on a Likert scale that ranges from 1 (*strongly disagree*) to 5 (*strongly agree*). Face validity was established with 10 teens and 10 adult parents. Content validity was established by eight specialists.

Cronbach alphas in preliminary studies have consistently been above .87. The observed Cronbach alpha in this study was .86. Construct validity of the scale was supported through factor analysis with over 400 high school adolescents.

Perceived Stress Scale (PSS)

The PSS-10 is the most widely used instrument for measuring the perception of stress in one's life. This 10-item instrument was designed to determine how unpredictable, overwhelming, and uncontrollable individuals find their lives. Participants respond to each item on a Likert scale that ranges from 0 (*never*) to 4 (*very often*) (Cohen et al., 1983). A Cronbach alpha of .91 was observed with this sample for the PSS.

Health Locus of Control

A measure of health locus of control was used to determine the extent to which participants believe their health is under the control of their own behavior (internal), random factors (chance), or experts such as physicians (powerful others). Among adults, external locus of control is associated with negative health outcomes, while internal locus of control is predictive of positive outcomes. An abbreviated 9-item version of the Multidimensional Health Locus of Control was used (Ross et al., 2015). A Cronbach's alpha of .68 was observed for the abbreviated Health Locus of Control scale.

Self-Efficacy

Self-efficacy refers to an individual's belief that they have the ability to complete a given behavior (Bandura et al., 1999). It assesses confidence in the ability to exert control over one's own motivation, behavior, and social environment. Self-efficacy was measured using two single-item measures of self-efficacy related to (1) ability to make health behavior change and (2) ability to complete the MIBI program. While the validity and reliability of these single-item measures is unknown, our methodology is consistent with prior research utilizing custom single-item measures of self-efficacy tailored to assess a specific behavior of relevance (Hoepfner et al., 2011; Di et al., 2023). For example, in prior research, a custom single-item measure showed excellent convergent validity with an established 20-item measure of self-efficacy as well as predictive validity in relationship to behavior over time (Hoepfner et al., 2011).

Demographic Variables

Demographic data were collected with a Qualtrics questionnaire at baseline. Examples of the items include age, gender, race/ethnicity, educational level, work unit type, hours worked per week, marital status, and college/Vice Presidential (VP) unit.

After a participant consented to the study and completed the pre-test survey, they were randomized to one of the three conditions. As noted previously, those in the MIBI and MIBI+ conditions were further split into one of the three behavior groups within each condition based on their preference for physical activity, nutrition, or stress/mental health.

Program Details

MIBI App and Text/Email Communications

For those in the MIBI and MIBI+ arms of the study, the core content of the intervention was delivered via the MIBI app, emails, and text messages. Participants interacted with the MIBI app to engage in the intervention content. They received one health-related email and two health-related text messages per week. Participants assigned to the MIBI-only or information-only condition were asked to not engage in any new health and wellness coaching programs inside or outside the university until the conclusion of the study.

The MIBI app was developed by a group of undergraduate capstone students in the college of engineering. The app was set up so that participants downloaded the app from their app store, registered using their email address and created a password of their choice.

All communication with participants via the group email and group text was anonymous. Individuals were bcc'd on emails and the text messaging service did not display any cellular phone numbers. The investigators used Remind, a free text messaging service that helps school districts and universities communicate quickly and efficiently. Messages are sent in real time to a class or a small group; these messages can also be scheduled ahead of time. With Remind, messages can be sent directly to any type of phone. Delivery receipts can be utilized to identify who is reading/receiving the messages. Remind guidelines, practices, and features have been designed to protect the safety and security of users and their personal information.

The intervention educational components for each healthy behavior followed the TTM's core constructs. Since participants identified in the preparation stage of change, consciousness raising, overcoming barriers, stimulus control, self-liberation, helping relationships, and reinforcement management constructs were used for each week of email and text messaging content. While email was not limited in characters, text messaging was limited to 140 characters. Thus, the investigators included more information, education, and content in the email messages as compared to the texts. The information-only group did not receive emails tailored to their stage of change. The emails were general education on health and wellness recommendations and information.

MIBI+ (MIBI Enhanced by Virtual/Telephonic Health and Wellness Coaching)

In the MIBI+ enhanced group, each participant was assigned a coach: a nurse practitioner student enrolled in the final semester of their graduate program. The student coaches were mentored and prepared to participate through didactic content and clinical experiences related to health and wellness coaching. Students were limited to working with seven participants, to align with preceptorship guidelines. For the 8-week intervention, the goal was to have four coaching sessions, approximately every other week. Sessions lasted approximately 30 minutes and were conducted telephonically using a secure digital platform or virtually using web conferencing. In each session, the student coach reviewed the participant's health and wellness goals, discussed barriers and strategies to reaching goals, and set a new goal for the next two weeks. Coaches were advised that the participant goals would address the healthy lifestyle behaviors of focus in the intervention.

The investigators were interested in the effects of the MIBI intervention components on a variety of health outcomes; however, they were specifically interested in individuals who identified themselves to be in the

contemplation and preparation stages of change for physical activity, healthy eating, and stress reduction. These individuals have a great capacity for behavior change, and they are often the people who need it the most. They are not adhering to one or more aspects of a healthy behavior, and this program had the potential to positively affect their health outcomes and healthy behaviors through evidence-based strategies and skills. Those individuals who identified in the other three stages of change were still able to participate if they desired. Their data was not used for analysis. If a potential participant identified as pre-contemplation, action, or maintenance for any of the three healthy behaviors, they received a message directly in the Qualtrics survey acknowledging their interest in the program: (1) if they were in the pre-contemplation stage of change, they will most likely not express interest in the program because, by definition, pre-contemplators are not interested in behavior change. They were asked to identify a possible topic but the likelihood of them engaging in it is not high; (2) if they identified as action or maintenance for a particular behavior, they were directed to change to one of the other two behaviors because they are already adhering to the first behavior they chose, and the program is not suited for people who are maintaining said behavior. Then, the person could participate in the study, albeit in an alternative behavior from their original chosen behavior.

Data Analysis

An a priori power analysis determined that a sample of 632 (1:3:3 for informational control, MIBI, and MIBI+) was needed for 80% power to detect a medium effect size with a two-sided significance level of 0.05 and a 75% all-cause attrition rate. Descriptive statistics were used for all variables to determine central tendency and dispersion, normality of distributions, pattern of mean scores over time, sample characteristics by groups. Cohen's D effect sizes were calculated on the baseline to post change for each scale and item, in addition to paired t-tests being run with each group. Repeated measures ANOVA models were used to determine if there a difference between the control, MIBI and MIBI+. Cohen's D effect sizes on the differences were also calculated for the scale sum scores and individual measures as the desired sample size were not obtained.

RESULTS

A total of 288 unique individuals participated in the study. An attrition rate of 78.1% ($n = 225$) was observed from baseline to post-intervention. Information control, MIBI, and MIBI+ had 25, 24, and 14 individuals complete both assessment timeframes, pre- and post-intervention, respectively. Participants selected a behavioral topic of physical activity, healthy eating, or stress/mental wellness as a focus across the control, MIBI and MIBI+ groups. A majority of respondents identified as female (87.3%), white (87.5%) and married (54%). The most common age group was 46 to 60 (41.3%) followed next by the 30 to 45 group (38.1%)

Among participants who completed both the baseline and post-intervention survey (21.9% of the sample), an increase in self-reported health behaviors was seen in the control, MIBI and MIBI+ (Table 1). Healthy Lifestyles Beliefs sum scores increased with a small effect in the control group and with a medium effect and statistical significance in the MIBI group ($p = .02$). Healthy Lifestyles Behaviors sum scores increased with large effects and statistical significance in all three groups. PSS-10 sum scores saw statistical significance and medium effects in both the control ($p = .01$) and MIBI+ ($p = .008$) groups with both sum scores seeing decreases. Health Locus of control

sum scores saw a small effect in the control and a large effect in the MIBI+, with statistical significance observed in the MIBI+ group.

Table 1*Scale Sum Score Summary Stats*

Group	n	Baseline		Post-Test		Paired Difference			Cohen's D
		Mean	SD	Mean	SD	Mean	SD	p-value	
Healthy Lifestyles Beliefs Sum Score									
Control	19	67.0	5.37	68.1	5.20	1.1	3.78	.24	0.28+
MIBI	19	64.2	7.45	66.9	8.11	2.8	5.07	.02*	0.55++
MIBI+	12	64.8	6.22	65.8	6.42	1.1	5.63	.51	0.19
Healthy Lifestyles Behavior Sum Score									
Control	20	58.0	8.39	63.2	9.95	5.2	6.53	.002*	0.80+++
MIBI	20	60.0	7.06	66.5	8.41	6.5	6.26	.0002*	1.04+++
MIBI+	10	56.7	8.51	64.5	6.62	7.8	4.66	.0005*	1.67+++
PSS-10 Sum Score									
Control	19	16.8	7.57	14.4	6.91	-2.4	3.61	.01*	-0.66++
MIBI	18	15.3	6.74	15.2	6.38	-0.1	5.03	.92	-0.02
MIBI+	13	14.9	5.57	12.9	5.78	-2.0	2.86	.008*	-0.70++
Health Locus of Control Sum Score									
Control	20	37.9	4.64	39.2	4.29	1.3	4.35	.19	0.30+
MIBI	19	40.3	5.72	40.1	5.54	-0.2	5.06	.89	-0.03
MIBI+	12	38.0	3.84	40.7	5.12	2.7	2.87	.008*	0.93+++

Note. + = small effect size; ++ = medium effect size; +++ = large effect size.

* $p < .05$

Table 2 shows effect sizes between control, MIBI and MIBI+ paired differences in each sum score. In the Healthy Lifestyle Beliefs sum score change from pre to post, MIBI saw a small positive effect over both MIBI+ and the control groups. In the Healthy Lifestyle Behavior sum score, MIBI+ saw a small effect over both the MIBI and control while MIBI also had a small effect over the control. In the PSS-10 sum score, MIBI had a small effect and medium effect over MIBI+ and the control group. In the Health Locus of Control, MIBI+ had a medium effect and a small effect over MIBI and control respectively. The control group had a small effect over MIBI.

Table 2*Effect Sizes of the Paired Difference Between Delivery Groups*

Comparison	Effect Size	Magnitude	Larger Effect
Healthy Lifestyles Beliefs Sum Score			
Control vs. MIBI+	-0.01	negligible	MIBI+
Control vs. MIBI	-0.39+	small	MIBI
MIBI+ vs. MIBI	-0.32+	small	MIBI
Healthy Lifestyles Behavior Sum Score			
Control vs. MIBI+	-0.43+	small	MIBI+
Control vs. MIBI	-0.20+	small	MIBI
MIBI+ vs. MIBI	0.22+	small	MIBI+
PSS-10 Sum Score			
Control vs. MIBI+	-0.11	negligible	MIBI+
Control vs. MIBI	-0.52++	moderate	MIBI
MIBI+ vs. MIBI	-0.44+	small	MIBI
Health Locus of Control Sum Score			
Control vs. MIBI+	-0.35+	small	MIBI+
Control vs. MIBI	0.31+	small	Control
MIBI+ vs. MIBI	0.65++	moderate	MIBI+

Note. + = small effect size; ++ = medium effect size; +++ = large effect size.

Table 3 shows the change in individual items that correspond to the activity participants selected as a focus for those enrolled in MIBI or MIBI+. Within those participating in healthy eating, improvements were seen in “I make healthy food choices” ($p = .0012$), “I eat fresh fruits and vegetable snacks every day” ($p = .0469$), “I eat low-fat foods in my diet.” ($p = .0330$), “I eat at least three meals a week with my friends” ($p = .0092$), “I eat broiled or baked foods instead of fried foods” ($p = .0102$), and “I eat five servings of fruits and vegetables per day” ($p = .0077$). Participants engaging in physical activity saw the items of “I participate in a minimum of 150 minutes of moderate physical activity per week.” ($p = 0.0335$), “I exercise on a regular basis” ($p = .0057$), and “I participate in a minimum of 75 minutes of vigorous physical activity per week.” ($p = .0310$) have significant increases after the program with medium to large effect sizes. Participants in the stress/mental wellbeing bucket saw “I do healthy things to cope/deal with my worries and stress.” ($p = .0147$) have a significant increase in addition to having a large effect size (1.37). Moderate and large effect sizes were seen for all items.

Table 3*Healthy Lifestyle Behavior Pre-Post Program Outcomes*

Health Topic	Item	n	Pre Mean (SD)	Post Mean (SD)	p-value	Cohen's D
Healthy Eating	I make healthy food choices	15	3.3 (0.9)	3.9 (0.7)	.0012*	0.72++
	I eat fresh fruits and vegetable snacks every day	12	2.8 (1.1)	3.5 (1.1)	.0469*	0.96+++
	I eat low-fat foods in my diet.	12	3.5 (1)	3.9 (0.8)	.0330*	0.99+++
	I eat at least three meals a week with my friends	12	3 (1.2)	3.5 (1.5)	.0092*	0.86+++
	I eat broiled or baked foods instead of fried foods	12	3.6 (1)	4.2 (0.8)	.0102*	0.68++
	I eat five servings of fruits and vegetables per day	12	2.1 (0.9)	3.8 (1.2)	.0077*	1.44+++
	Physical Activity	I participate in a minimum of 150 minutes of moderate physical activity per week	11	1.9 (0.5)	3 (1.3)	.0335*
I exercise on a regular basis		11	2.1 (0.9)	3.1 (1.2)	.0057*	0.94+++
I participate in a minimum of 75 minutes of vigorous physical activity per week		11	1.6 (0.5)	2.5 (1.2)	.0310*	0.77++
Mental Wellbeing	I do healthy things to cope/deal with my worries and stress.	8	3.3 (0.7)	4.1 (0.3)	.0147*	1.37+++

Note. + = small effect size; ++ = medium effect size; +++ = large effect size.

* $p < .05$

The self-efficacy items of “ability to make health behavior change” and “ability to complete the MIBI program” had a small (0.30) and medium effect (-0.53) respectively with the latter seeing a decrease from baseline to post-intervention (Table 4). Confidence in making a behavior change rose slightly from pre-to post regardless of being in the control, MIBI and MIBI+.

Table 4*Self-Efficacy Item Summary*

Self-Efficacy Item	Interval	n	Mean	SD	Effect Size
How confident are you that you will make behavior changes to benefit your health and well-being?	Pre	58	2.7	0.7	0.30+
	Post	58	2.9	0.7	
	Paired Difference	58	0.2	0.8	
How confident are you that you will complete the Make It or Break It program?	Pre	54	3.2	0.8	-0.53++
	Post	54	2.6	1.0	
	Paired Difference	54	-0.6	1.1	

Note. + = small effect size; ++ = medium effect size; +++ = large effect size.

Five of the nine Health Locus of Control items predicted self-efficacy for completing the MIBI program and for making healthy behavior changes (Table 5). Significant items include “If I take care of myself, I can avoid illness,” “I am directly responsible for my health,” “If I get sick, it is my own behavior which determines how soon I get well,” “Often I feel that no matter what I do, if I am going to get sick, I will get sick,” and “My good health is largely a matter of good fortune.”

Table 5*P-Values of Health Locus of Control Predictive Models on Self-Efficacy*

Health Locus Item	“How confident are you that you will make behavior changes to benefit your health and well-being?” p-value	“How confident are you that you will complete the Make It or Break It program?” p-value
If I take care of myself, I can avoid illness.	.0004*	.0038*
I am directly responsible for my health.	<.0001*	<.0001*
If I get sick, it is my own behavior which determines how soon I get well.	.0023*	.0157*
The type of care I receive from other people is what is responsible for how well I recover from an illness.	.6981	.3766
Following my provider’s orders to the letter is the best way for me to stay healthy.	.5349	.0931
Health professionals control my health.	.4129	.9432

Health Locus Item	“How confident are you that you will make behavior changes to benefit your health and well-being?” p-value	“How confident are you that you will complete the Make It or Break It program?” p-value
Often I feel that no matter what I do, if I am going to get sick, I will get sick.	.0149*	.3889
My good health is largely a matter of good fortune.	.0047*	.5443
Luck plays a big part in determining how soon I will recover from an illness.	.4244	.8858

* $p < .05$

Participants in the MIBI+ had the opportunity to complete a program evaluation of the health and wellness coaching. The majority (65.8%; $n = 25$) noted that they met with their student coaches seven times or more; the mean coaching dose was 6.34 sessions for each participant. A majority of participants (94%; $n = 32$) stated that they are engaging in one or more healthy lifestyle behaviors post-intervention as a result of the coaching support. Participants were asked to identify coaching strategies used during their telephonic/virtual sessions. The coaching students listened to their goals, beliefs, and motivators (100%; $n = 30$), and helped them identify barriers to achieving wellness (97%, $n = 29$). Participants found the most effective coaching strategy to be the work done to set specific goals (100%; $n = 21$). Participants strongly agreed that participating in the coaching through MIBI+ was a positive experience (90.6%; $n = 29$), an important component (68.8%; $n = 22$), and a program they would recommend to others (62.5%; $n = 20$).

DISCUSSION

The investigators successfully identified individuals at the preparation stage of change, per the TIM, for inclusion in this lifestyle intervention. Within each focus area, considerable changes in key metrics specific to the target healthy lifestyle areas were observed via self-report. Increases were observed in the self-reported health behaviors of healthy eating, physical activity, and stress/mental well-being practices. These results are similar to Vela & Ortega (2020) and Nakabayashi et al. (2020). Over half of the health locus of control items predicted self-efficacy for completing the MIBI program and for making healthy behavior changes. This is in line with a recent systematic review conducted by Dogonchi et al. (2022) and study conducted by Botha and Dahmann (2024). In both the review and study, the evidence demonstrates that those who firmly believe in internal health control were more likely to engage in health promoting behaviors.

There were positive outcomes observed for the intervention and control arms of the study, particularly for healthy lifestyle behaviors, as presented in Tables 1 and 3, and the PSS-10. Effects were large for the control group for both scales. There may be several reasons for the positive outcomes in any of the groups, and in particular for the information-only control group. The time of year the intervention took place, the new year, may have influenced motivation for behavior change, regardless of group. While the investigators asked the information-only control and MIBI groups to not hire a health and wellness coach, individuals may have hired a personal trainer, dietician, or mental

health counselor to help them with behavior change or managing stress/mental well-being. Choices such as these are outside of the investigator's control and may have influenced the results. In addition, participants who achieved their desired behavior change or participated until the end of the intervention may have been more inclined to respond to the post-intervention survey, therefore creating a respondent bias. This could affect outcomes for the intervention and control groups. Lastly, the information-only group received weekly emails, to keep the email dose the same among all groups. Although the emails contained general health-related information, it may have been enough to motivate participants, in addition to the time of year factor.

Regarding the health and wellness coaching, the evaluation data presented in this article is not generalizable. It is a process and outcomes evaluation of the evidence-based strategy of coaching in the MIBI intervention. Although at times there were greater effect sizes and statistically significant results for the MIBI arm, which did not include the coaching intervention, participant responses for coaching experiences were positive. The investigators were testing the effects of health and wellness coaching in a new and novel intervention approach. Extraneous factors may have influenced the results, as noted previously. Regardless, the coaching evaluation feedback is important information to share with the field because coaching is growing in popularity and many organizations and clinicians implement the service as a part of their wellness initiative or healthcare practice (Gordon et al., 2017).

Limitations

The sample was predominately highly educated, middle-aged, white women. The study did not use a random sample, and more diversity in the sample is warranted to generalize results. Survey responses were self-reported, posing a response bias. In addition, sample attrition was less than ideal. While all 288 participants completed the baseline survey, only 63 (21.7%) completed the post-survey, limiting statistical analysis and interpretation. While the reasons why participants dropped out of the study are unknown, the investigators surmise behavior change is difficult for adults, and while the median time to adopt and adhere to a behavior change is 66 days, many individuals drop out of behavior change interventions (Lally et al., 2010). In addition, there was no incentive to drive motivation and adherence. Because of this, the post-test sample size was small, and it was difficult to determine intervention effects. *p*-values should be interpreted with caution, because of the small samples.

The email and text message aspects of the intervention were easy to put together and straightforward in terms of the technology. The telephonic health coaching sessions were scheduled and monitored via the student coaches with no significant challenges. The MIBI app did present several user challenges. Feedback from participants stated the app was not always user-friendly, clunky, and individuals had difficulty logging in and tracking behavior. It was an app developed by engineering students and tested in the current intervention; therefore, additional updates and work is needed to improve the app interface.

There are several threats to internal validity in the present intervention, including history and events occurring outside of the program or between measures. Any number of events can impact participants. New Year's tends to be a time when individuals are highly motivated to change an aspect of their health, but long-term adherence is difficult, as noted above. Having an accountability partner can be helpful, such as a trainer or coach, and may impact the results of this study and is considered an event outside of the intervention. In addition, for many in the northern hemisphere, the time of year is winter, and there is a chance participants may have gotten sick, or family and social obligations outside of the investigator's control impacted participation and hence the results. Repeated testing is also a threat, as

participants may be conditioned to know that they are being tested. Survey administration spacing was accounted for at baseline and 8 weeks later immediately post-intervention. Lastly, the threat of participant maturation, or change during the intervention, is expected over the duration of the study.

CONCLUSIONS

For subsequent research studies in the field of behavior change, incentives are needed to keep participants involved in the program and complete the post-intervention survey. The current investigation was novel, so the impact of health coaching and wellness-related apps on behavior change and health outcomes needs to be further researched. Particular attention needs to be considered to the time of year an intervention such as this is implemented, as well as the information-only dosage the control group receives. These factors may have impacted results.

Health promotion and wellness professionals need to consider how program participants prefer to receive information, to effectively reach the intended audiences, in order to enhance engagement. There are various ways to reach individuals and offering a menu of options can be helpful to the end user. Additionally, there is something to be said about the personal connection (telephonic health coaching) versus electronic media to aid in behavior change. Providing opportunities to interact with a person can instill a sense of accountability and connection that artificial intelligence cannot. The comments provided to the investigators about the health coaching aspect of the intervention provides positive evidence that a personal touch can make a big difference. Wellness professionals need to provide multiple ways for program participants engage to further improve population and individual health outcomes.

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