IMPROVEMENTS IN BMI AND DIETARY INTAKE THROUGH USE OF THE
STOPLIGHT DIET IN VETERANS

A thesis submitted in partial fulfillment of the requirements
For the degree of Master of Science in Family and Consumer Sciences

By

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May 2014
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ABSTRACT

IMPROVEMENTS IN BMI AND DIETARY INTAKE THROUGH USE OF THE STOPLIGHT DIET IN VETERANS

By

Amanda M. Salvestrini

Master of Science in Family and Consumer Sciences

Objective: To determine the effectiveness of the two ASPIRE programs – telephone-based and group-based - compared to the standard of care (MOVE) over a three-month period by evaluating changes in BMI and diet outcomes using the Stoplight Diet, and to describe the differences in data quality between these three modes of intervention.

Design: Randomized clinical trial, three-month period

Setting: Ann Arbor Department of Veterans Affairs (VA) Healthcare System (VAAAGHS) in Ann Arbor, Michigan

Participants: Sixty-three veterans (ages 29.8-87.0 years, 81% male, 93% Caucasian/Asian) with BMI indicating overweight or obese

Interventions: Telephone-Based Individual ASPIRE-VA (n=25), Group-Based ASPIRE-VA (n=18), and standard of care MOVE (n=20). The two ASPIRE-VA treatment groups received the same intervention through a different mode (telephone individual versus in-person group), while the MOVE group received in-person group education through the MOVE program. ASPIRE-VA is a small change approach to weight loss that incorporates dietary and lifestyle coaching via a lifestyle coach. MOVE is a nationwide program in the Veteran Healthcare Administration (VHA) that provides dietary education
Participants in all treatment groups were weighed and their dietary intake was quantified using the Stoplight Diet at study baseline (0-month) and 3-month intervals.

**Outcome Measures:** Change in BMI and dietary intake (using the Stoplight Diet)

**Statistical Analyses:** Descriptive statistics were used to characterize all variables in this study. Bivariate statistics (Chi-square and Student’s t-test) were calculated and used to evaluate the association between variables. Change scores for dietary intake were calculated and ANOVA was used to model the differences between group means and to better understand the differences produced by the three arms of the interventions.

**Results:** On average, there was a decrease in red foods and an increase in green foods consumed over the three-month period for ASPIRE-Telephone, ASPIRE-Group, and MOVE. For MOVE, the change in green foods differed by gender. For ASPIRE-Telephone, the change in yellow foods differed by employment status. For ASPIRE-Group, the change in red and green foods differed by gender. There was a decrease in BMI over the three-month period for all interventions, with the largest decrease seen in the Group-Based ASPIRE-VA arm.

**Conclusion:** Results suggest that ASPIRE-VA and MOVE promote weight loss through use of the Stoplight Diet.

**Key Words:** Stoplight Diet, Veterans, BMI, ASPIRE
INTRODUCTION

In 2010, the proportion of adults considered overweight or obese was 69.2 percent, which is defined as having a body mass index (BMI [kg/m^2]) greater than or equal to 25.0 kg/m^2 or 30.0 kg/m^2. As overweight and obesity rates have increased in the general population over the last 25 years, so has the prevalence of obesity in military veterans receiving care from the Veterans Health Administration (VHA), with an estimated 70 percent of veterans being overweight or obese. According to the United States Census Bureau, veterans account for 8.9±0.1% of the population, and veterans who are utilizing the VHA for healthcare have the highest rate of obesity, when compared with nonveterans and veterans receiving healthcare outside of the VHA.

With the rise in the prevalence of obesity, overweight and obese veterans have continued to develop higher rates of obesity-related comorbidities, including, but not limited to hypertension, heart disease, metabolic syndrome, and type II diabetes mellitus. The percentage of veterans who develop between two and four of these obesity-related comorbidities increases significantly as BMI increases, which indicates that obesity is a risk factor for new onset or progression of these diseases. Obesity, and thus obesity-related comorbidities, is caused by a number of factors. One of the more common and widely known causes of obesity is an energy imbalance: too many kilocalories consumed, too little kilocalories expended during physical activity, or a combination of both. In order for an individual to successfully achieve weight loss and decrease the risk of development or progression of these obesity-related comorbidities, behavioral and lifestyle modifications must occur. Nationwide, throughout the VHA, there are several weight management programs that promote behavioral and lifestyle
modification, including the Aspiring to Lifelong Health Program (ASPIRE)-VA and Managing Overweight and Obese Veterans Everywhere (MOVE).

**Research Question**

Are the behavioral change interventions (Telephone-Based Individual ASPIRE-VA, Group-Based ASPIRE-VA, and standard of care MOVE) effective in improving dietary intake and BMI over a three-month period in a population of free-living veterans?

**Objectives**

1. To determine the effectiveness of the two ASPIRE programs – telephone-based and group-based - compared to the standard of care (MOVE) over a three-month period by evaluating diet outcomes using the Stoplight Diet.

2. To determine the effectiveness of the two ASPIRE programs – telephone-based and group-based - compared to the standard of care (MOVE) over a three-month period by evaluating changes in BMI.

3. To describe the differences in data quality between the two ASPIRE programs – telephone-based and group-based - compared to the standard of care (MOVE).
METHODOLOGY

Data source

The present study uses data obtained from the ASPIRE-VA study to determine whether or not the “Stoplight Diet” is an effective tool to aid in improving BMI. The effectiveness of each mode of intervention, telephone-based individual ASPIRE-VA and group-based ASPIRE-VA, compared to the standard of care, MOVE, was also investigated, to determine if either arm of the ASPIRE-VA study was more effective in improving BMI than MOVE. As described elsewhere, the International Review Board (IRB) at the Ann Arbor Department of Veterans Affairs (VA) Healthcare System (VAAAHS) in Ann Arbor, Michigan approved the current study (refer to supplemental document).

ASPIRE-VA was a 3-year, randomized clinical trial, conducted by the Center for Clinical Management Research (CCMR) at the VAAAHS. It focused on encouraging small dietary and lifestyle changes to promote long-term weight management. The purpose of the ASPIRE-VA study was to collect data on dietary intake from overweight and obese veterans using the “Stoplight Diet” and compare it to changes in weight and clinical health outcomes at five intervals over a 24-month period: Baseline (0-month), three-month, 12-month, 18-month, and 24-month. This study focuses on the baseline and three-month intervals only. MOVE is a nationwide VHA weight loss program focusing on in-person individual and group dietary and physical fitness education that is the standard of care for weight management within the VHA. This study follows veterans enrolled in MOVE for a three-month period.
The Stoplight Diet encourages substitution rather than elimination of foods, and eases the process of self-reporting dietary intake by clustering foods into three simple groups: red, yellow, and green.\textsuperscript{10-11} This diet aims to help individuals decrease caloric intake while increasing satiety by consuming more foods that are less calorically dense and higher in fiber (green foods), and consuming in moderation, foods that are high in total kilocalories and fat with little to no fiber, vitamins, or minerals (red foods).\textsuperscript{12-14,10} For the ASPIRE-VA study, the VA Stoplight Guide (refer to supplemental document) was developed, which provides detailed guidelines for categorizing how foods fit into each of the three categories: red, yellow, and green.

**Participants and Recruitment**

Veterans were recruited by referral from their primary care provider (PCP) to the MOVE program, at which time they were offered the opportunity to participate in the ASPIRE-VA study.\textsuperscript{10} Eligibility criteria, as described previously\textsuperscript{10} included being 18 years of age or older, having a BMI (kg/m\textsuperscript{2}) greater than 30 kg/m\textsuperscript{2} or greater than 25 kg/m\textsuperscript{2} with a concurrent weight-related condition (classified as obese or overweight, respectively), being able to communicate in English, having access to a telephone, and being competent when providing written informed consent to participate.\textsuperscript{10} Competency and informed consent are explained elsewhere\textsuperscript{10} and within the IRB protocols. Exclusion criteria included being concurrently enrolled in other research studies for weight loss or physical activity, being concurrently being treated for weight loss using medications, and pregnancy.\textsuperscript{10}
The ASPIRE-VA study had three arms in which patients were randomly assigned: (1) Telephone-based individual ASPIRE-VA to receive individual counseling via telephone with a lifestyle coach, who used motivational interviewing techniques to assist in setting and monitoring individual goals as well as assessing dietary intake \((n=25)\), (2) Group-based ASPIRE-VA to participate in group ASPIRE-VA classes held by lifestyle coaches who used motivational interviewing techniques to monitor goals and assess dietary intake as a group \((n=18)\), and (3) Standard of care, MOVE, to participate in group MOVE classes held by Registered Dietitians and other such professionals who used various motivational techniques to promote behavioral and lifestyle changes as well as monitor dietary intake \((n=20)\). ASPIRE-VA lifestyle coaches were given a script and teaching materials so that they could learn how to educate and provide positive feedback to study participants. The veterans who were assigned to either ASPIRE-VA arm received weekly feedback and guidance about how to fill out the food logs and use the Stoplight Diet Guide as a tool for changing dietary habits, whereas the MOVE patients did not receive formal instruction on how to fill out the food logs or how to use the Stoplight Diet as a weight loss tool. In order to monitor dietary changes over a period of time, all of the study participants, regardless of their involvement in ASPIRE-VA or MOVE, were instructed to complete one-week food logs at the five time intervals: baseline (0 months, prior to the start of the study), 3 months, 12 months, 18 months, and 24 months. The initial three months of the study included weekly follow-up, support, goal setting, and education, and will be the time interval analyzed in this study. An example of a completed food log can be found in the supplemental documents.
Sample Selection

The sample size of this study and these analyses is a subset of individuals which have had their dietary intake further analyzed. The original sample size of the ASPIRE-VA study was 481 veterans, with an expected 35% drop out rate. Of the original 481 veterans recruited, 325 (67.6%) veterans turned in at least one food log, from any of the five time intervals. Of the 325 veterans who turned in food logs, 112 turned in both baseline (0-month) and 3-month food logs, 80 of which were provided by the main study site for these analyses. Of the 80 veterans, a total of 63 provided completed baseline and 3-month food logs, defined as having completed at least 5.5 of the 7 days of both the baseline and 3-month food logs. These 63 veterans comprise the sample for the present study, and are divided amongst the intervention arms as follows: Telephone-Based ASPIRE-VA (n=25), Group-Based ASPIRE-VA (n=18), and standard of care MOVE (n=20). The other 17 veterans were excluded for the following reasons: (1) the food logs were incomplete (less than 5.5 days of the baseline and/or 3-month food log was completed), and/or (2) the documentation of their dietary intake was too vague to quantify (for example, “some pasta”). For either reason, the veteran is described as having “incomplete” food logs. A flow diagram depicting the number of eligible veterans for the trial is shown in Figure 1.
The present study population consisted of 63 veterans. The age of the participants was 57.99y+/−10.84y (29.799y–87.066y). There were 51 male (81%) and 12 female (19%) participants. There were 59 Caucasian/Asian (93.6%) and four African American (6.3%) participant(s). Of the 63 participants, 25 veterans were in telephone-based ASPIRE-VA, 18 in group-based ASPIRE-VA, and 20 in MOVE.

**Data Entry and Processing**
ASPIRE-VA study staff provided the food logs. Dietary intake from food logs was quantified using the VA Stoplight Guide, to determine the number of servings of “red”, “yellow”, and “green” foods that were eaten. The total was entered into an Excel spreadsheet, along with the number of days for which intake was recorded (between 5.5 and 7 days). Demographic information (age, gender, race), arm of study (MOVE, ASPIRE-VA group-based, ASPIRE-VA individual telephone-based), income range, education, disability status, level of employment, height, and weight at the baseline and 3-month intervals was copied from an original study document, onto the Excel spreadsheet, based on patient identification number. BMI was calculated using height and weight.

Data Analyses

Data analyses were conducted using Statistical Packages for the Social Sciences (SPSS), Version 22.0 for Windows (IBM Corp., Armonk, NY, released 2013). Variables used in data analyses will be described below.

The primary health outcome measured was change in weight (kg) and subsequently BMI (kg/m²). Changes in BMI were compared to changes in dietary intake over the same interval period, separated by arm of study (ASPIRE-VA telephone-based, ASPIRE-VA group-based, and MOVE). It is assumed that changes in BMI are associated with changes in dietary intake.

Dietary Data
Dietary data were collected using one-week food logs at study baseline (0-month) and at the three-month interval. Food logs were provided as part of the original data set that was offered by the ASPIRE-VA study staff at CCMR. The food logs represent dietary intake from one week prior to each assessment of clinical outcomes (weight). Dietary intake was quantified using the VA Stoplight Guide, and results were listed as totals of “red,” “yellow,” and “green”, foods eaten over the one-week period. Dietary data was analyzed by comparing the change in intake of red and green foods in the one-week foods logs to indicate a change in intake over the three-month period. Reduction in red foods or increase in green foods indicated an improvement in dietary intake. Change in intake of yellow food was also analyzed.

Variable Descriptions

**Dietary variables**

- **“Red” foods** are energy dense, high in kilocalories, fat (greater than 5 grams per serving), saturated fat, sodium, and/or refined sugars (greater than 25% kilocalories per serving), low in fiber, and/or are highly processed. Examples of red foods include a latte with whole milk, Snickers® candy bar, real mayonnaise, or cheeseburgers and pizza from fast food restaurants. The quantity of “red” foods was measured in total number of servings per one-week food log (linear, outcome).

- **“Yellow” foods** are moderate in kilocalories, fat (2 to 5 grams per serving), saturated fat, refined sugars (greater than 10 to 25% kilocalories per serving), sodium, and fiber, and have been through some processing. Examples of yellow foods include
baked beans, canned soup, jellybeans, and fruit juice. The quantity of “yellow” foods was measured in total number of servings per one-week food log (linear, outcome).

- **“Green” foods** are low in kilocalories, fat (less than 1 gram per serving), saturated fat, sodium, and refined sugars (less than 10% kilocalories per serving), high in fiber, and are less processed. Examples of green foods include fruits, vegetables, and low sodium vegetable broth. The quantity of “green” foods was measured in total number of servings per one-week food log (linear, outcome).

*Anthropometric Variables*

- **Weight**: measured using a seca© (Hamburg, Germany) scale (model number 703) with a stadiometer attached and measured in kilograms (kg) to the nearest 0.2kg. All weight measurements were taken twice, and the average was recorded (linear, predictor).

- **Height**: measured at baseline only using the built-in stadiometer on the digital standing scale and measured in inches (in). All measurements were taken twice, and the average was recorded (linear, predictor).

- **BMI**: calculated using height (in) and weight (kg) and expressed as kilograms per meters squared (kg/m²). Height was converted from inches to meters for this calculation (linear, outcome).
  - Categories of BMI from the standard definition are used as follows:
    - Underweight less than 18.5 kg/m², Normal 18.5-24.9 kg/m², Overweight 25.0-29.9 kg/m², Obesity Class I 30.0-34.9 kg/m², Obesity Class II 35.0-39.9
kg/m$^2$, Morbid Obesity Class III greater than or equal to 40.0 kg/m$^2$
(categorical, outcome). 16 (p400, 540)

**Conceptual Framework**

There are several techniques used to encourage behavioral and lifestyle modification, many of which the two programs compared in this study, ASPIRE-VA and MOVE, use to elicit change in participating veterans. The ASPIRE-VA approach incorporates behavioral choice therapy and problem-solving therapy, in addition to the Transtheoretical Model (Stages of Change), the Health Belief Model, and motivational interviewing. The above techniques work simultaneously to encourage small, gradual changes in dietary patterns and in clinical health outcomes, as shown in Figure 2 below.

Figure 2. Conceptual Framework for Achieving Behavioral and Lifestyle Modifications for ASPIRE-VA Through Use of The Transtheoretical Framework, Motivational Interviewing, and The Health Belief Model
The Transtheoretical Model is used to indicate readiness to change, which is expressed as a stage: precontemplation, contemplation, preparation, action, maintenance, or relapse.\(^{16}(p493)\) The stage of change that the study participants are presumed to be in is preparation or action, as they are willing to participate in the study, are open to being educated, and are preparing to or are already implementing behavioral changes. These behavioral changes include increasing intake of green foods and/or decreasing intake of red foods, with the goal to promote weight loss.

The Health Belief Model can be used to predict one’s likelihood to participate in health-related behaviors that will prevent or help to protect against disease, which provides a basis for how to approach educating the patient.\(^{17}(p97-100)\) The health-related behaviors in this study would be reduction in consumption of red foods, increase in consumption of green foods, and weight loss. This model describes the desire to change based on perceived severity of the diagnoses (for example, obesity), perceived
susceptibility of new diagnoses or progression of disease, perceived benefits of changing, perceived barriers that may affect ability to change, cues to action, and self-efficacy, or one’s belief in her/himself to achieve various outcomes or goals. 

Motivational interviewing is a style of interviewing, which aids in assessing current behaviors, giving constructive feedback, assessing motivation level that will tailor intervention approach, providing support, and encouraging self-efficacy. Motivational interviewing was used in the ASPIRE-VA study to provide positive feedback and suggestions to participants engaging in behavioral and lifestyle modification.

**Statistical Analyses**

Descriptive statistics including frequency distributions will be used to characterize all variables in this study. Bivariate statistics (Chi-square and Student’s t-test) will be calculated using SPSS to evaluate the association between variables. Change scores will be calculated to test for differences between the baseline and 3-month change scores for all three arms of the intervention. Assessment of “red,” “yellow,” and “green”, foods reported consumed will be utilized to assess changes in dietary habits due to the intervention. Primary analyses will be evaluated for increases in intake of green foods and reduction in intake of red foods over the three-month period. The change scores calculated for clinical health outcomes are for change in BMI over the three-month period. Analysis of variance (ANOVA) will be used to model the differences between group means and to better understand the differences produced by the three arms of the interventions.
RESULTS

Table 1 presents various characteristics of the 63 ASPIRE-VA and MOVE participants, including BMI, dietary intake at baseline and three-month intervals, gender, age, race, education level, income range, disability status, and level of employment.

These characteristics are divided and presented by intervention arm and as the total used for the current study and analyses.

Table 1. Body Mass Index, Dietary Intake, and Demographic Information for Veterans Enrolled in the ASPIRE-VA and MOVE Interventions.

<table>
<thead>
<tr>
<th></th>
<th>ASPIRE-Telephon e (n=25)</th>
<th>ASPIRE-Group (n=18)</th>
<th>MODE-Standard (n=20)</th>
<th>Total Sample (n=63)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>34.4±5.2 (25.2-51.0)</td>
<td>33.4±5.5 (23.7-50.9)</td>
<td>37.0±6.91 (29.2-51.1)</td>
<td>35.9±7.2 (25.4-50.3)</td>
</tr>
<tr>
<td>3-Month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BMI Category</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Normal</td>
<td>0 (0%)</td>
<td>1 (4%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Overweight</td>
<td>4 (16%)</td>
<td>5 (20%)</td>
<td>6 (33%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Obese, Class I</td>
<td>11 (44%)</td>
<td>12 (48%)</td>
<td>3 (17%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Obese, Class II</td>
<td>7 (28%)</td>
<td>4 (16%)</td>
<td>2 (11%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Obese, Morbid</td>
<td>3 (12%)</td>
<td>3 (12%)</td>
<td>7 (39%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td><strong>Dietary Intake</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- “Green” Foods (No. of servings)</td>
<td>14.3±9.5 (0-37.0)</td>
<td>23.9±17.7 (4.0-66.0)</td>
<td>12.0±8.4 (0-32.0)</td>
<td>23.4±11.3 (6.0-44.0)</td>
</tr>
<tr>
<td>- “Yellow” Foods (No. of servings)</td>
<td>58.0±20.8 (27.0-89.0)</td>
<td>56.1±25.5 (16.0-141.0)</td>
<td>58.5±16.7 (32.0-92.0)</td>
<td>58.6±21.4 (26.0-103.0)</td>
</tr>
<tr>
<td>- “Red” Foods (No. of servings)</td>
<td>56.8±23.8 (25.0-117.0)</td>
<td>43.2±23.4 (13.0-97.0)</td>
<td>57.1±23.2 (27.0-128.0)</td>
<td>31.4±19.7 (6.0-65.0)</td>
</tr>
<tr>
<td><strong>Number of Days Used (Days [d])</strong></td>
<td>6.8±5.5 (5.5-7.0)</td>
<td>6.7±5.5 (5.5-7.0)</td>
<td>6.9±2.2 (6.5-7.0)</td>
<td>6.9±2.2 (6.0-7.0)</td>
</tr>
<tr>
<td><strong>Age (years [y])</strong></td>
<td>59.0±9.4 (32.2-68.2)</td>
<td>35.7±10.7 (31.6-87.1)</td>
<td>57.4±12.9 (29.8-87.1)</td>
<td>57.9±10.8 (29.8-87.0)</td>
</tr>
<tr>
<td><strong>Gender (n, %)</strong></td>
<td>Male</td>
<td>21 (4)</td>
<td>14 (4)</td>
<td>16 (4)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td>Caucasian/Asian</td>
<td>23</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>African American</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
Body mass index was distributed differently across the arms at both the baseline and three-month intervals. The ASPIRE-Telephone and MOVE interventions had a larger proportion of veterans in the overweight, and obese 1-2 categories, whereas the ASPIRE-Group intervention had a larger proportion of veterans in the morbid obese category. There were four female veterans in each intervention. Each intervention had a similar proportion of men. Education level was similar across the arms, with more than half of the participants completing 6th-11th grade, high school, or some college, and fewer being college graduates. Income range and level of employment were evenly distributed across each intervention. There were a higher proportion of non-disabled veterans in ASPIRE-Telephone than in the other two interventions.

Of the 80 included and excluded veterans in this study, 67 were Caucasian, 12 were African American, and one was Asian. Of the 63 included veterans, 58 were Caucasian, four were African American, and one was Asian. There were no significant differences between changes in BMI and dietary intake as compared to race. Of the 80 veterans chosen to participate in this analysis, twelve were African American. Of the 17 excluded veterans, eight (47%) were African American. These eight veterans were excluded due to submission of incomplete food logs.
**Dietary variables**

Table 2 shows the results of the three interventions (Telephone-Based ASPIRE-VA, Group-Based ASPIRE-VA, and MOVE) and the effects on diet outcomes, controlling for gender, income, education, disability status, and level of employment. Table 3 and Figures 3-5 present the average dietary intake (red, yellow, and green foods) at baseline and three-month intervals, as well as the average change in dietary intake over the three-month period of the current study.

Table 2. Average Change in Red, Yellow and Green Food Intake for ASPIRE-Telephone, ASPIRE-Group, and MOVE Intervention Groups Controlling for Gender, Income, Education, Disability Status, and Employment.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Red Change</th>
<th>Yellow Change</th>
<th>Green Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>p-Value</td>
</tr>
<tr>
<td><strong>ASPIRE-Telephone</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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<td></td>
</tr>
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<td>Male</td>
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<td>26.4</td>
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</tr>
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<td>Yes</td>
<td>-15.9</td>
<td>25.0</td>
<td>-18.7</td>
</tr>
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</table>

Table 2 shows the results of the three interventions (Telephone-Based ASPIRE-VA, Group-Based ASPIRE-VA, and MOVE) and the effects on diet outcomes, controlling for gender, income, education, disability status, and level of employment. Table 3 and Figures 3-5 present the average dietary intake (red, yellow, and green foods) at baseline and three-month intervals, as well as the average change in dietary intake over the three-month period of the current study.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Red Change</th>
<th>Yellow Change</th>
<th>Green Change</th>
<th>MOVE, Standard</th>
</tr>
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<td>SD</td>
<td>p-Value</td>
<td>Mean</td>
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<tr>
<td>Gender</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Variable</td>
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<td>Yellow Change</td>
<td>Green Change</td>
<td>MOVE, Standard</td>
</tr>
<tr>
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<td>SD</td>
<td>p-Value</td>
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</tr>
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<td>13.9</td>
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<td>10.9</td>
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</tr>
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</tr>
<tr>
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<tr>
<td>Education</td>
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<td></td>
</tr>
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<td>6th – Some College</td>
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<td>19.6</td>
<td>-2.8</td>
<td>15.9</td>
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<tr>
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<td>13.0</td>
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<td>19.5</td>
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<tr>
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<td>12.1</td>
<td>-6.8</td>
<td>4.6</td>
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</table>
Table 3. Dietary Intake for All Interventions: Baseline, Three-Months, and Change in Intake Over Three-Month Interval.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>3-Months</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASPIRE-Telephone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>56.8</td>
<td>43.2</td>
<td>-13.6</td>
</tr>
<tr>
<td>Yellow</td>
<td>58</td>
<td>56.1</td>
<td>-1.9</td>
</tr>
<tr>
<td>Green</td>
<td>14.3</td>
<td>23.9</td>
<td>9.7</td>
</tr>
<tr>
<td><strong>ASPIRE-Group</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>57.1</td>
<td>31.4</td>
<td>-25.7</td>
</tr>
<tr>
<td>Yellow</td>
<td>58.5</td>
<td>58.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Green</td>
<td>12</td>
<td>23.4</td>
<td>11.3</td>
</tr>
<tr>
<td><strong>Standard, MOVE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>48.4</td>
<td>38.2</td>
<td>-10.3</td>
</tr>
<tr>
<td>Yellow</td>
<td>59.1</td>
<td>56.9</td>
<td>-2.2</td>
</tr>
<tr>
<td>Green</td>
<td>12.9</td>
<td>15.8</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Figure 3. ASPIRE-Telephone, Dietary Intake: Baseline, Three-Months, and Change in Intake Over Three-Month Interval.

Figure 4. ASPIRE-Group, Dietary Intake: Baseline, Three-Months, and Change in Intake Over Three-Month Interval.
Figure 5. Standard, MOVE. Dietary Intake: Baseline, Three-Months, and Change in Intake Over Three-Month Interval.

Changes in Dietary Intake

- “Red” foods
  - As described in Tables 1-3 and Figures 3-5, for all three interventions, there was a decrease in intake of red foods over the three-month period, with the largest decrease seen in the Group-Based ASPIRE-VA arm.
  - The average difference in changes in red foods over the three months of the intervention period differed by gender for the ASPIRE-Group intervention (p=0.04).

- “Yellow” foods
  - As described in Tables 1-3 and Figures 3-5, for all three interventions, there was a small change in intake of yellow foods (increase in intake for Group-Based ASPIRE-VA and decrease in intake for Telephone-Based ASPIRE-VA and MOVE).
The average difference in changes in yellow foods over the three months of the intervention period differed by employment status (part-time employment versus not employed) for the ASPIRE-Telephone intervention (p=0.01).

- “Green” foods
  - As described in Tables 1-3 and Figures 3-5, for all three interventions, there was an increase in intake of green foods over the three-month period, with the largest increase seen in the Group-Based ASPIRE-VA arm.
  - The average difference in changes in green foods over the three months of the intervention period differed by gender for the ASPIRE-Group intervention (p=<0.01).
  - The average difference in changes in green foods over the three months of the intervention period differed by gender for the Standard MOVE intervention (p=0.03).

**Anthropometric Variables**

Table 4 and Figures 6-8 present the average BMI at baseline and three-month intervals, as well as the average change in BMI over the three-month period.

<table>
<thead>
<tr>
<th></th>
<th>Baseline BMI</th>
<th>3-Month BMI</th>
<th>Change in BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPIRE-Telephone</td>
<td>34.4</td>
<td>33.4</td>
<td>-.99</td>
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<tr>
<td>ASPIRE-Group</td>
<td>37.0</td>
<td>35.9</td>
<td>-1.1</td>
</tr>
<tr>
<td>MOVE</td>
<td>34.7</td>
<td>34</td>
<td>-.7</td>
</tr>
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</table>
Figure 6. ASPIRE-Telephone, BMI: Baseline, Three-Months, and Change in BMI Over Three-Month Interval.

Figure 7. ASPIRE-Group, BMI: Baseline, Three-Months, and Change in BMI Over Three-Month Interval.

Figure 8. Standard, MOVE, BMI: Baseline, Three-Months, and Change in BMI Over Three-Month Interval.
Changes in BMI

- BMI (kg/m$^2$)
  - As described in Tables 1 and 4 and Figures 6-8, for all three interventions, there was a decrease in BMI over the three-month period, with the largest decrease seen in the Group-Based ASPIRE-VA arm.
  - As described in Tables 1 and 4, and Figures 6-8, at Baseline and three-months, the BMI of veterans in Group-Based ASPIRE-VA was higher and there was a higher percentage of morbidly obese veterans in Group-Based ASPIRE-VA than the other two interventions.

Data Quality

Analyses indicated that there were differences in data quality and response rate between the two ASPIRE programs – telephone-based and group-based – and the standard of care (MOVE). Of the 80 veterans who provided baseline and three-month food logs, 17 veterans were excluded due to incomplete and/or vague baseline and/or three-month food logs. Comparison of the three interventions indicated that Group-Based ASPIRE-VA had the highest percentage of logs excluded and the least veterans with completed food logs, as shown in Table 5.

Table 5. Number of Excluded Food Logs by Intervention.

<table>
<thead>
<tr>
<th></th>
<th>ASPIRE-VA Telephone-Based</th>
<th>ASPIRE-VA Group-Based</th>
<th>MOVE, Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomplete baseline and/or 3-month food logs (n=17)</td>
<td>3</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Percentage of the excluded food logs (n=17)</td>
<td>18%</td>
<td>53%</td>
<td>28%</td>
</tr>
<tr>
<td>Percentage of all of the food logs (n=80)</td>
<td>4%</td>
<td>11%</td>
<td>6%</td>
</tr>
</tbody>
</table>
By running Student’s t-tests, it was determined that there were no statistically significant differences in age, gender, race, and BMI between the excluded veterans (n=17) and the included veterans (n=63). The excluded veterans were slightly younger than the included veterans, as shown in Table 6. There were a higher proportion of African American veterans in the excluded group. The BMI of the excluded veterans was slightly higher than that of the included veterans, as shown in Table 6.

Table 6. Differences in Age and BMI between Included and Excluded Veterans.

<table>
<thead>
<tr>
<th></th>
<th>Included Veterans (n=63)</th>
<th>Excluded Veterans (n=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>57.99±10.84</td>
<td>55.36±9.78</td>
</tr>
<tr>
<td>BMI, Baseline (kg/m²)</td>
<td>35.23±5.44</td>
<td>36.58±9.35</td>
</tr>
</tbody>
</table>

Of the 63 veterans that were used for analysis in this study, those that returned food logs with the full 7 days recorded were 56 for baseline and 54 for 3-months. As described in Table 7 below, the interventions Group-Based ASPIRE-VA and MOVE had a higher percentage of food logs returned that had 7 days recorded at the baseline and 3-month intervals than the ASPIRE-VA Telephone-Based intervention. For the ASPIRE-VA Group-Based and MOVE interventions, at least 90% veterans recorded 7 days of dietary intake in the food logs. For the Telephone-Based ASPIRE-VA intervention, 84% recorded seven days of dietary intake at baseline and 76% at the 3-month interval.
Table 7. Number of Days Documented for Each Intervention at Baseline and Three-Months

<table>
<thead>
<tr>
<th></th>
<th>ASPIRE-VA Telephone-Based (n=25)</th>
<th>ASPIRE-VA Group-Based (n=18)</th>
<th>Standard of care MOVE (n=20)</th>
<th>Total (n=63)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>18</td>
<td>20</td>
<td>63</td>
</tr>
<tr>
<td>7 days</td>
<td>21 (84%)</td>
<td>16 (89%)</td>
<td>19 (95%)</td>
<td>56 (89%)</td>
</tr>
<tr>
<td>6.5 days</td>
<td>0 (0%)</td>
<td>2 (11%)</td>
<td>0 (0%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>6 days</td>
<td>2 (8%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>5.5 days</td>
<td>2 (8%)</td>
<td>0 (0%)</td>
<td>1 (5%)</td>
<td>3 (5%)</td>
</tr>
<tr>
<td>Avg Days</td>
<td>6.80</td>
<td>6.94</td>
<td>6.93</td>
<td>6.88</td>
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<tr>
<td><strong>3-month</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>18</td>
<td>20</td>
<td>63</td>
</tr>
<tr>
<td>7 days</td>
<td>19 (76%)</td>
<td>17 (94%)</td>
<td>18 (90%)</td>
<td>54 (86%)</td>
</tr>
<tr>
<td>6.5 days</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (5%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>6 days</td>
<td>5 (20%)</td>
<td>1 (6%)</td>
<td>1 (5%)</td>
<td>7 (11%)</td>
</tr>
<tr>
<td>5.5 days</td>
<td>1 (4%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Avg Days</td>
<td>6.74</td>
<td>6.94</td>
<td>6.93</td>
<td>6.86</td>
</tr>
</tbody>
</table>

For the individuals that completed the food logs and provided thorough documentation, there was a greater amount of weight loss observed. Thorough is described as providing adequate descriptive information about the product type, quantity, and quality of a product consumed, to provide enough data that intake can be quantified using the Stoplight Diet. The food logs analyzed in the current study provided several examples of this. For example, a veteran with a BMI of 35.4 at baseline and 32.7 at the 3-month interval provided thorough documentation of his dietary intake for all seven days in each interval. On the other hand, an individual who was excluded with a BMI of 63.0 at baseline and 62.4 at the 3-month interval did not provide thorough documentation of his dietary intake and recorded three days at baseline and zero days at the 3-month interval. On each day that this veteran did record his intake, he documented having one or two meals, and did not describe quality or quantity of items well.
DISCUSSION

The purpose of the current study was to determine if the behavioral change interventions (Telephone-Based Individual ASPIRE-VA, Group-Based ASPIRE-VA, and standard of care MOVE) were effective in improving dietary intake and BMI over a three-month period in a population of free-living veterans.

Demographic Variables

Gender, age, race, baseline BMI, education level, income range, disability status, and level of employment were assessed to determine if there were any differences between interventions or if these characteristics were at all related to changes in dietary intake and BMI. There were four female veterans in each intervention used in this study, so they were equally represented within each arm of the study. The percentage of male and female veterans in the current study was distributed closely to the current national percentage, 51 male (81%) and 12 female (19%) for ASPIRE-VA, and 92% male and 8% female nationally. The current study is representative of the female veteran population. The BMI of the excluded veterans was slightly higher than that of the included veterans. Our data is in line with existing literature that shows that individuals with greater BMI are less likely to honestly record dietary intake, leading to them being excluded from analysis.

The study included 59 Caucasian/Asian and four African American veterans, and each intervention had either one or two African American veterans included. The subset of veterans in this study had little representation of African American and Asian veterans. There were differences in documentation between races (Caucasian/Asian and African
American), as there was less descriptive information documented in the food logs completed by the African American veterans. This led to a higher percentage of African American than Caucasian veterans being excluded from the current study. Eight (67%) of the initial 12 African American veterans chosen for these analyses (prior to exclusion) were excluded, compared to nine (13%) excluded of the initial 68 of the Caucasian/Asian veterans. As supported in previous research, the current study showed that the African American veterans who opted to participate in this study were less likely to provide complete documentation of their dietary intake for the entire seven days, leading to exclusion from analysis.

**Changes in Dietary Intake and BMI**

As described in the results, the average difference in changes in red, yellow, and green foods over the three months of the intervention period differed by various characteristics (gender, income, education, disability status, and level of employment) across the three intervention arms (ASPIRE-Telephone, ASPIRE-Group, and MOVE). Research has supported the idea that various demographic, behavioral, and socioeconomic variables, including but not limited to gender, BMI, age, level of education, and social class, contribute significantly to whether or not behavioral and dietary interventions will be implemented and maintained.

For all interventions, there was an average decrease in red foods, a small change in yellow foods, and an increase in green foods consumed. Previous studies support that using the Stoplight Diet will result in a decrease of red and yellow foods, an increase in green foods consumed, and ultimately weight loss, as shown in this study. For all three
interventions, there was a decrease in BMI (indicating weight loss) over the three-month period, with the largest decrease seen in the Group-Based ASPIRE-VA intervention. It was assumed at the start of this study that BMI would decrease as the intake of green foods increased and intake of red foods decreased. This supports our hypothesis and is the basis for using the Stoplight Diet in the current study.

Changes in dietary intake varied between the three intervention arms, as well as amongst various demographic variables. On average, men both decreased their intake of red foods and increased their intake of green foods significantly more than women did over the three-month intervention period in the ASPIRE-Group intervention. The most significant change in both dietary intake and BMI was observed in the ASPIRE-Group intervention. This could be attributed to the greater average baseline BMI, which allowed more room for improvement (reduction in BMI). Men also increased their dietary intake of green foods significantly more than women over the three-month intervention period in the MOVE intervention. Men are more likely to accurately report their dietary intake, while women are more likely to underreport their intake of all foods, which may have contributed to the smaller change that was seen.

Dietary changes also differed by employment status. Employed veterans decreased their intake of yellow foods significantly more than those that were not employed in the ASPIRE-Telephone intervention. As described in previous research, employment status and socioeconomic status can impact whether or not behavioral and dietary changes are made. This could be attributed to less financial constraints and increased mobility in working, non-disabled veterans. In addition, less financial constraints can also reflect more ability to purchase products or services to aid in weight
loss, for example a gym membership or fresh produce. There were no statistically significant differences in change in red, yellow, or green foods as related to disability status, income range, education level, race, or age.

**Data Quality**

Data quality of the food logs from the 63 veterans used in this study was analyzed, and there were differences in response rate and completeness between the three interventions – the two ASPIRE programs, telephone-based and group-based, and the standard of care, MOVE. As described in the results section, the interventions ASPIRE-VA Group-Based and MOVE received a greater percentage of food logs returned with 7 days recorded at the baseline and 3-month intervals than the ASPIRE-VA Telephone-Based intervention. For the ASPIRE-VA Group-Based and MOVE interventions, at least 90% of veterans recorded 7 days of dietary intake in the food logs, whereas 84% and 76% of veterans recorded 7 days of dietary intake at the baseline and 3-month intervals, respectively, in the ASPIRE-VA Telephone-Based intervention. Although documentation of dietary intake in the ASPIRE-VA Telephone-Based food logs was fewer days (5.5-6.5 days as compared to the full 7 days), there were a greater number of completed logs returned.

The documentation in most of the excluded food logs was too vague, for example, a meal would read, “some pasta” or “sandwich” or “chips” with no serving size provided and no clear explanation of the brand or type of item eaten. The information documented was insufficient to determine what item or portion of the item was actually consumed. Of the 17 excluded food logs that were vague or incomplete (less than 5.5 days), three of the
participants were in the telephone-based individual ASPIRE-VA intervention, nine in the
group-based ASPIRE-VA intervention, and five in MOVE, indicating that the ASPIRE-
VA Telephone-Based intervention was highly effective in obtaining completed food logs
(5.5-7 days) at baseline and 3-months, as compared to ASPIRE-VA Group and MOVE
interventions. This data also indicates that the individuals in the ASPIRE-VA Group
intervention were the least likely to provide complete food logs, which is in line with data
that indicates that the higher the BMI, the less likely the individual is to accurately and
completely report dietary intake.\textsuperscript{19-20}

Aside from the specific amount of complete and incomplete food logs returned,
one must address the data quality of each food log. The dietary intake recorded in the
food logs was self-reported with limited staff assistance during documentation. Although
study staff instructed the ASPIRE-VA participants on how to complete the food log and
quantify their intake using the VA Stoplight Guide, for some participants, there was
limited adherence to the instructions provided. MOVE participants did not receive formal
instruction on how to complete the food logs or use the VA Stoplight Guide, which may
have contributed to less complete documentation in the food logs.

Discrepancies in data quality across interventions, or varying accuracy and
completeness of the food logs, may be attributed to the differences in education and the
varied modes of intervention (group versus individual and in-person versus telephone)
within the current study. The individuals in the two interventions administered in an in-
person group setting (ASPIRE-VA Group-Based and MOVE) provided more complete
food logs. The increased amount of social support provided in these settings may lead to
a better overall understanding of the information presented by learning from each other
and may encourage accountability for completing the task on hand, which contributes to a
greater outcome seen; in this study, weight loss and changes in dietary intake.\textsuperscript{23} On the
other hand, the experience of one-on-one education, counseling, and follow-up could
contribute to the increased number of completed logs that were returned as a result of the
personal reminder from the lifestyle coach to turn in the data that is collected, regardless
of the number of days that it encompassed. There is some research that supports the
benefits of one-on-one weight loss education as being equally effective remotely as in
person, in maintaining short- and long-term weight loss and lifestyle changes.\textsuperscript{24}

There were differences seen in the food logs that indicate the greater the BMI, the
less likely the veteran was to fully record their dietary intake and provide thorough
documentation (including weights, volumes, portion sizes, lists of toppings, restaurant
that meal is purchased, etc.). As seen in the ASPIRE-Group intervention, there was a
higher baseline and three-month average BMI, with more morbidly obese individuals in
this intervention. One might expect to see less accurately reported data in this group. One
might also expect to see a greater initial weight loss in these individuals with higher
BMI’s, as there is more room for initial weight loss in a morbidly obese individual than
in someone who is closer to a normal BMI. These changes may also be attributed to the
success of this arm of the study. As described and shown with an example in the results
section, individuals that completed the food logs and provided thorough documentation,
there was a greater amount of weight loss observed. The concept that monitoring dietary
intake and exercise using food logs to aid in weight loss has been widely supported by
research.\textsuperscript{25-26} This was the trend throughout the food logs, that the higher the BMI, the
less thorough the food logs were and the less likely the individuals were to complete all seven days, as seen in the ASPIRE-VA Group-Based intervention.

For many veterans, as well as the general public, there is a lack of understanding as to how to complete the food logs and how to document intake. For people who are not familiar with the nutrient and calorie content of foods, it is difficult to understand how many calories or how much of a nutrient they are actually eating, and how this may relate to weight loss or gain. Therefore, self-reported dietary intake from these individuals may be unintentionally underreported. Evidence that self-reported data is often unreliable has been documented thoroughly, and there is much research that has shown that self-reported energy intake is usually underestimated, especially in individuals who are overweight or obese, as well as in those with diabetes.\textsuperscript{27-29} In addition to underreporting energy intake, the amount of physical activity is usually overestimated,\textsuperscript{30} which does not allow the researcher to obtain a clear estimate of energy balance (energy consumed versus energy expended). In an article by Klem et al,\textsuperscript{31} it was reported that even in the National Weight Control Registry (NWCR), a large, well-known study of individuals who have been successful at weight maintenance and weight loss, there are concerns about the accuracy and reliability of self-reported dietary intake and physical activity data. Due to the underreporting of data in food logs, it is possible that dietary intake is actually higher in the general population than is reported in this study and others. The amount (portion size) and item that is recorded in food logs or in food frequency questionnaires (FFQ) alike can also be skewed in self-reported data. Items are sometimes unintentionally omitted in the food log or FFQ due to a misunderstanding of how to record intake, or due to the forgetfulness of the reporter. In addition to the incorrect food
item or portion size of that food item, individuals tend to intentionally not record or
decrease the quantity of food items that they know are considered discretionary
calories. The same concept applies as above, that since discretionary calories are often
underreported intentionally, the average intake of these foods within the general public is
likely much higher than this study population.

In self-reported data, there is the chance that an individual is recording a diet that
is not theirs, but rather what they think the researchers are expecting to see. There may
also be shame involved in self-reporting dietary intake if the reporter knows that their
intake is excessive or inadequate in a nutrient or food group. Self-reported data can be
skewed if an individual eats a large amount of prepared items, as they might not know all
of the ingredients included or the quantities of these ingredients (for example, the amount
of mayonnaise in tuna salad or the percent fat of a meat or dairy item). This may lead to
an item being recorded incorrectly, and thus intake is not accurately quantified.

There is research that indicates that recording dietary intake, as a way to engage
in self-monitoring of intake, is a beneficial tool to aid in weight loss or maintenance in a
variety of settings. This research provides evidence that the use of food logs may increase
awareness of portion sizes, mood and hunger/fullness levels during eating, and timing of
meals, due to the fact that these are the items being recorded on the logs. Food logs may
also provide insight into the itemized dietary choices that individuals are making, since
they are able to use their food logs to look back at the dietary choices they have made,
and use these past food logs as an example and to make better dietary choices in the
future. Food logs provide a physical record of dietary consumption, which allows
individuals to go back and see their strengths and areas for improvement in their diet. In a
study by Wing and Hill,\textsuperscript{35} it was shown that frequent monitoring of dietary intake, weight, and physical activity had a positive influence on weight loss and maintenance. In another study by Guare et al,\textsuperscript{36} participants monitored their dietary intake for a one-year period, and maintained an 18kg weight loss as compared to 5kg in those who did not monitor their intake. Butryn, Phelan, Hill, and Wing\textsuperscript{37} provided information in regards to the association between frequent self-monitoring (of weight) and decreased weight regain. There is sufficient evidence from numerous studies that indicates the potential benefits of using food logs to aid in weight loss and maintenance.

**Limitations**

Several limitations are previously described,\textsuperscript{10} but should be mentioned for this study. All participants were military veterans receiving their healthcare at the VAAAHS and the programs used are only offered within the VHA; therefore, these results may not be representative or generalizable to the general public if they are receiving care at other healthcare facilities and/or if there is no access to equivalent programs with the same education and frequency of follow-up. There was no control group in this study, only the comparison of ASPIRE-VA to itself and to MOVE. The data were collected using self-recorded food logs, which are not always accurately reflective of true dietary intake. The education provided to each intervention in this study varied, as MOVE participants did not get as much education in regards to documenting and quantifying their dietary intake as ASPIRE-VA participants. Due to this difference in education provided, the ASPIRE-VA participants may have had an advantage to understanding how to document and quantify their intake, or how to make dietary changes using the VA Stoplight guide.
Threats to Validity

With every effort to avoid threats to validity, we are aware that some may occur. Some threats to internal validity included history, maturation, and testing. The veterans who dropped out of the study were not motivated to continue, and therefore, the study was comprised of individuals who were likely more motivated than those who dropped out. History and maturation are threats to interval validity for any long-term study, as there may have been events that happened during the three-month period that interfered with one's ability to do “better”. Testing is a threat to validity because someone is much more likely to thoroughly record their intake at the three-month period, since they had done it at least once prior. There were also some threats to external validity present. The ASPIRE-VA study is only available for veterans receiving care within the VHA, and it is therefore not generalizable outside of the VHA. In addition, the pretests and questionnaires that were given at baseline may have given the participants clues about what the researchers were looking for, which could potentially persuade the veterans to provide inaccurate information that they thought the researchers wanted to see.

Researchers in this study attempted to control for biases. It was expected that the amount of green foods would increase, the amount of red foods would decrease, and that BMI would decrease over the three-month period. Although this was, it did not happen to the extent that was thought. The change in red and green foods, and BMI was not as large as expected. In an effort to avoid biases, the individual who quantified dietary intake was unaware of the intervention to which the veterans belonged.
Implications for Research and Practice

This study will contribute to the understanding of data quality in self-reported dietary intake in the veteran population and the possible reasons why quality of data is often compromised. This study contributes data on dietary intake and BMI of female veterans, which is not commonly assessed. The current study provides insight into the reasons why veterans may or may not accurately complete food logs, which may include differences in backgrounds and lifestyles, for example, in this study gender, age, race, baseline BMI, income, education, disability status, and level of employment. These barriers to learning are important for educators to understand, so that the most beneficial approaches to teaching food journaling and weight maintenance can be used.

Conclusion

In conclusion, results suggest that the ASPIRE-VA and MOVE programs may promote weight loss through use of the Stoplight Diet to quantify dietary intake. Although the current study provides useful information on dietary intake and weight loss in veterans, further research is needed to provide a larger set of research on this topic. Further research using ANOVA analyses will permit comparison of the effectiveness of all three arms (ASPIRE-VA telephone-based, ASPIRE-VA group-based, and MOVE) by assessing changes in dietary intake and BMI while addressing covariates. It would be beneficial for further research to look at a larger sample size of veterans, taking into account various demographic data, in an effort to provide more research as to potential complications for veterans that are trying to implement or maintain dietary and lifestyle modifications, including weight loss.
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