UNIVERSITY OF CINCINNATI

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I, Lee Jenny, hereby submit this original work as part of the requirements for the degree of:
Master of Science

in Nutrition

It is entitled:
The Relationship between Food Monitoring and Dietary Blood Pressure Changes in Youth Participating in a Behavioral Nutrition Intervention Focused on a DASH-type Diet

Student Signature: Lee Jenny

This work and its defense approved by:
Committee Chair: Sarah Couch PhD, RD
Seung-Yeon Lee PhD

Approval of the electronic document:
I have reviewed the Thesis/Dissertation in its final electronic format and certify that it is an accurate copy of the document reviewed and approved by the committee.

Committee Chair signature: Sarah Couch PhD, RD
The Relationship between Food Monitoring and Dietary and Blood Pressure Changes in Youth Participating in a Behavioral Nutrition Intervention Focused on a DASH-type Diet.

A thesis submitted to the Division of Research and Advanced Studies of the University of Cincinnati in partial fulfillment of the requirements for the degree of Master of Science in Nutrition in the Department of Nutrition Sciences of the College of Allied Health Sciences

2009

by

Lee Jenny
B.A., Ohio University, 2003

Committee Chair:
Sarah C. Couch, PhD, RD
Abstract

The Relationship between Food Monitoring and Dietary and Blood Pressure Changes in Youth Participating in a Behavioral Nutrition Intervention Focused on a DASH-type Diet.

by

Lee Jenny

**Objective:** Examine the relationship between food monitoring and change in fruit and vegetable, low-fat dairy, and DASH unfriendly food servings and in relative blood pressure in youth participating in a nutrition intervention focused on the DASH diet.

**Subjects:** A subset of the participant’s data reported by Couch et al. (2008) was used. Only participants who were in the DASH intervention group who completed the intervention or through the follow-up were considered. Participants were adolescents aged 11 to 18 with diagnosed pre-hypertension or hypertension.

**Study Design:** Participants were randomly assigned to a behavioral nutrition intervention focused on the DASH diet or routine nutrition care.

**Methods:** Participant food trackers were coded and six components of food self-monitoring were derived: actual days of food recording, foods described, foods with an amount, recording sufficiency for foods recorded, recording sufficiency for foods described and recording sufficiency for foods with an amount. Changes in servings of fruits and vegetables, low-fat dairy foods, and unfriendly foods were assessed using 3 multi-pass 24-hour food recalls. Relative
Results: There was a significant negative correlation between actual days of food recording and change in intake of unfriendly food servings \((r=-0.56, \ p=0.01)\). Correlations that trended towards significance included: actual days of food recording, recording sufficiency for foods with an amount and foods described and change in intake of fruit and vegetable servings \((r=0.36, \ p=0.09; \ r=0.35, \ p=0.10; \ r=0.34, \ p=0.10)\). There was a non-significant trend toward a difference between high versus low recording sufficiency for foods recorded and relative change in systolic blood pressure \((p=0.09)\) and change in intake of low-fat dairy servings \((p=0.06)\) post-intervention. There was a non-significant trend toward a difference between high versus low recording sufficiency for foods described and relative change in systolic blood pressure \((p=0.09)\) and change in intake of low-fat dairy servings \((p=0.06)\) post-intervention. There was also a non-significant trend toward a difference between high and low recording sufficiency for food amounts and change in low-fat dairy servings \((p=0.09)\) and change in DASH unfriendly food servings \((p=0.10)\) post-intervention.

Conclusion: The concept of DASH unfriendly foods was hard for subjects to understand, but repeatedly recording foods drew awareness to and understanding of this food category. More days of recording some foods appeared to be related to increasing intake of fruits and vegetables (two food groups important in lowering blood pressure). Describe and giving amounts for foods was important in helping adolescents increase intake of fruits and vegetables too. A more complex level of recording was necessary to effect changes in blood pressure and changes in
low-fat dairy servings likely because in order to effect these outcomes subjects needed a good understanding of the DASH diet, and recording and describing 5 or more foods more frequently enabled this understanding.
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Introduction/Literature Review

Overweight and obesity in children and adolescents has become increasing prevalent in recent years (Jelalian & Saelens, 1999; Sorof, Lai, Turner, Poffenbarger, & Portman, 2004). Consequently there has been a rise in the rate of primary hypertension in the pediatric population (Sorof, Lai, Turner, Poffenbarger, & Portman, 2004). Because primary hypertension is a risk factor for other cardiovascular and renal diseases and there is evidence to suggest that primary hypertension in childhood predicts hypertension in young adulthood addressing this trend is of great importance (Muntner, He, Cutler, Wildman, & Whelton, 2004). While many pharmacological options for treating primary hypertension are available less explored dietary approaches for the treatment of hypertension exist as well.

Interest in creating a dietary pattern helpful in lowering blood pressure was spurned by the National Guidelines set forth by The Joint National Committee on the Detection, Evaluation and Treatment of High Blood Pressure in 1993 and by a growing body of research indicating that specific dietary modifications were useful in lowering blood pressure (The Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure, 1993). Both suggested dietary salt/sodium reduction was essential to reducing hypertension. In addition to reduced sodium the data also suggested that a reduction in red meat, cholesterol, saturated fats and an increase in potassium, magnesium, calcium and fiber were all associated with blood pressure reduction (Sacks, Rosner & Kass, 1974; Rouse et al., 1983; Margetts et al., 1986; Ascherio et al., 1992; Harlan et al., 1984; & Stamler et al., 1996). As a result a dietary pattern was designed to optimize levels of all of the suggested dietary nutrients purported to alter blood pressure. This diet was dubbed the DASH diet (Dietary Approaches to Stopping Hypertension).

The original clinical trial designed and executed by Appel, et al. (1997) examined the efficacy of the DASH diet for lowering blood pressure and included adult participants not taking
antihypertensive medications. The average systolic blood pressure of participants at baseline was between 120 and 160 mmHg and their diastolic blood pressure was between 80-95 mmHg. Participants were assigned to one of three possible diets: a control diet (low in fruits and vegetables and dairy products with a fat content typical of the average American diet), a diet rich in fruits and vegetables, or a “combination diet” (high in fruits and vegetables and low-fat dairy and reduced in saturated and total fat). Sodium and weight were maintained at a constant level across groups. The control diet reflected a diet with potassium, magnesium and calcium levels close to the 25th percentile of U.S. consumption and a macronutrient and fiber content typical of the average American diet. The fruits and vegetables diet contained potassium and magnesium at levels that approximated to the 75th percentile of U.S. consumption and high amounts of fiber. Snack and sweets were also reduced in the fruit and vegetables diet, but the diet was otherwise similar to the control diet. The combination diet provided potassium, magnesium and calcium at levels that approximated to the 75th percentile of U.S. consumption. The diet also included high amounts of fiber and moderate amounts of protein. The sodium content of each diet was held steady at approximately 3g per day.

All participants consumed the control diet for the first three weeks of the study at which time the participants were randomly assigned to one of the three experimental diets for eight more weeks. The study was a controlled feeding study so meals specific for each diet were provided and participants were asked not to consume any outside sources of food. Participants were also asked to limit their caffeinated and alcoholic beverage intakes and not to use table salt. Findings from the DASH trial suggest that a diet high in fruits and vegetables can favorably affect blood pressure in adults with primary hypertension. The dietary pattern that was most successful in blood pressure reduction was the combination/DASH diet high in not only fruits
and vegetables, but also low-fat dairy and reduced in saturated and total fat. The combination diet lowered systolic blood pressure by 5.5mmHg and diastolic blood pressure by 3.0 mmHg more than the control diet. These findings suggest that this specific dietary pattern may be an important means of treating primary hypertension.

In a follow-up study on the DASH diet Svetkey et al. (2004) demonstrated that the DASH dietary pattern in combination with reduced sodium intake was more effective in reducing elevated blood pressure than compared with DASH dietary pattern alone or a reduced sodium diet alone. This finding provided further evidence that a low sodium DASH dietary pattern because of its unique combination of nutrients is an effective means of treating primary hypertension and an exciting possible alternative to pharmacological management of elevated blood pressure.

In response to the observed benefits of the DASH dietary pattern on managing primary hypertension in adults and the ever growing problem of primary hypertension in children and adolescents Couch, et al. (2008) sought to investigate the effectiveness of the DASH dietary pattern in reducing blood pressure in adolescents aged 11 to 18 years with primary hypertension. More specifically participants were randomized to receive either a 12-week telephone and mail-based behavioral nutrition intervention initiated in a primary care setting focused on the DASH diet or a single session of hospital-based dietary counseling (routine care) emphasizing the National Dietary Guidelines for Managing Blood Pressure in Children (low fat, low sodium, emphasizing fruits and vegetables). Findings from this study included greater reduction in systolic blood pressure (SBP) among DASH participants compared with routine care subjects post-intervention, a 61% normalization of BP among DASH participants post-treatment compared with 44% normalization of BP in the routine care group, a greater increase in intake of
fruit servings, potassium and magnesium, a greater reduction in intake of saturated fat from baseline to post-treatment among DASH participants compared to routine care, and a greater increase in intake of low-fat dairy foods among DASH participants from baseline to follow-up compared to routine care participants.

Because of the promising results from this study, the aim of the present study was to examine the data from the study described above to determine if there were particular behavioral skills associated with better adherence to a DASH-type diet contributing to significant blood pressure reduction. If efficacious behavioral skills could be identified it would seem likely that targeting and improving these skills in study populations and in the general public using DASH-type diets would be helpful for improving blood pressure outcomes.

Among published studies on variables associated with dietary adherence, the importance of self-monitoring has repeatedly emerged. In a study examining the relationship between self-monitoring and adoption of a low GI, high fiber diet and weight control Miller, et al. (2008) found that the best predictor of weight loss was the number of food records completed during the study intervention period. Also, these researchers showed that those who monitored more consistently than others lost more weight. Hollis, et al. (2008) found weight loss to be associated with more frequent attendance at group sessions, minutes of moderate intensity physical activity per week and number of food records completed per week. Similarly, Baker & Kirschenbaum (1993) found individuals participating in a weight control program with the highest overall level of consistent and complete monitoring lost significantly more weight than the group with the lowest overall level of monitoring. Milas, et al. (1995) investigated factors related to adherence to diets modified in protein content. These researchers found that diet adherers self-monitored protein intake more frequently than non-adherers. Approximately fifty percent of adherers self-
monitored 6 to 7 days per week on average for the entire two years of the study. Adherers also rated self-monitoring significantly more useful than non-adherers in helping them stick to their diet plan. Sperduto, et al. (1986) looked at adherence to a 15 week weight loss program among a group of adults being treated for obesity in a hospital-based clinic for managing overweight/obesity. These investigators found a significant difference in weight loss at the end of the program and three months thereafter among adults that used targeted behavior monitoring forms related to eating and activity levels compared to adults that did not use these forms. In this study researchers showed that 55% of the variance in weight loss post treatment was explained by the use of the monitoring forms.

Burke, et al. (2007) also identified a relationship between weight loss and self-monitoring. Specifically, these researchers examined a sub-sample from the PREFER study in which subjects were randomized to either a standard calorie and fat restricted diet or to a lacto-ovo-vegetarian diet and asked to self-monitoring using a diary that electronically registered when it was opened and closed. Subjects were not aware that opening and closing of the diary was being monitored. The relationship between frequency with which the diaries were opened and closed and weight loss was then examined and findings included a significant correlation between the percent of weight loss achieved at 6 months post-treatment and the percent of days that the electronic food diary was used.

The literature on variables associated with dietary adherence among youth is sparse but also points to self-monitoring as a key factor. Israel, Silverman & Solotar (1988) evaluated the relationship between adherence to monitoring tasks and reduction in overweight among child participants of a pediatric weight management program. Monitoring involved the completion of weekly food, activity and behavior change assignments by the families. Adherence was
determined by the degree to which families completed these assignments and participated in prescribed behavior changes. While at least one parent was involved in the monitoring of eating and activity behaviors, children in the study were also encouraged to participate and certain behaviors could only be reported by the child. Adherence to food monitoring skills was examined by determining scores for completion of intake records and completion of nutritional summaries (nutritional category and food color group for each food). Completion of intake records emerged as the only significant predictor of weight loss after eight weeks of intensive treatment. Completion of intake records along with completion of activity records and staying below the recommended calorie limit were all significant predictors of weight loss at 18-month follow-up.

Saelens & McGrath (2003) examined food self-monitoring in children participating in a behavioral intervention for weight control. These researchers used five self-monitoring indices collected from food tracking data: “day recorded” that indicated whether or not any food or beverage was recorded on a day, “recording sufficiency” that indicated whether or not at least five food or beverage items were recorded on a day, “amounts recorded” that indicated the fraction of food or beverage items recorded that also had a recorded amount each day, “calories recorded” that indicated the fraction of food or beverage items recorded for which calories were also recorded each day, and “calories summed” that indicated whether or not the total calories for a day were summed. Findings from this study showed that recording sufficiency was the most important recording variable related to weight outcome. Mean recording sufficiency was negatively related to body mass index (BMI) z-scores both at post-treatment and follow up time points. In addition there was a significant interaction between the level of recording sufficiency and time. These results not only highlight the potential importance of self-monitoring in
pediatric behavioral nutrition intervention studies but also indicate that there may be some specific components of monitoring for this population that emerge as more crucial to adherence than others.

The purpose of this investigation was to expand on the findings from the studies above and to investigate the relationship between self-monitoring and dietary and blood pressure changes among adolescents participating in a behavioral nutrition intervention to lower blood pressure. Six components of food self-monitoring required in the nutrition intervention were examined including: the number of actual days the participants recorded some foods out of the 60 days of the intervention (actual days of food recording), the mean percentage in which participants recorded detailed descriptions for the foods they recorded (foods described), the mean percentage in which participants recorded amounts for the foods they recorded (foods with an amount), the number of days the participants recorded five or more foods out of the days they recorded at least some foods (recording sufficiency for foods recorded), the number of days the participants recorded descriptions for five or more foods out of the days they recorded at least some foods (recording sufficiency for foods described), and the number of days the participants recorded amounts for five or more foods out of the days they recorded at least some foods (recording sufficiency for foods with an amount). Beverages were not considered separately and are included in the foods category. Five or more was used to determine sufficiency because Jahns, Siega-Riz & Popkin (2001), in an analysis of population-based data, showed that adolescents eat approximately two snacks a day. These two snacks in addition to the usual 3 meals eaten daily suggests that at least 5 food or beverages are likely to be consumed by most adolescents daily.
We predicted that a greater degree of recording some foods as measured by actual days of food recording, as well as a greater degree of recording sufficiency for foods recorded would be negatively correlated with change in blood pressure (post-pre intervention blood pressure) and intake of unfriendly foods and positively correlated with change in intake of fruits and vegetables and low-fat dairy foods. In addition we hypothesized that subjects who did these monitoring skills more often or were “high recorders” would differ post-3-month intervention with respect to blood pressure changes and food serving changes from those who did not execute the skills as often or were “low recorders.”

Methods

Participants

A subset of the participant’s data reported by Couch et al. (2008) was used for this study. The complete participant selection criteria were described in detail in this publication. For this thesis we considered only participants in the DASH intervention group, as they were the only ones to complete food tracking data. We also considered only participants who had completed the intervention as well as those who completed through the follow-up period (had baseline and post-treatment assessment data, baseline and both post-treatment and follow-up assessment data or baseline and 3-month follow-up assessment data). There were 24 intervention completers at the post-treatment time point and 18 completers at the 3-month follow-up. Participants were adolescents aged 11 to 18 with diagnosed pre-hypertension or hypertension based on national blood pressure standards for children (National High Blood Pressure Education Program, Working Group on High Blood Pressure in Children and Adolescents, 2004).
**Intervention**

The DASH intervention emphasized gradual dietary changes culminating in a DASH-like dietary pattern of 8 servings a day of fruits and vegetables, 3 servings a day of low fat dairy foods, and 2 servings or less a day of DASH unfriendly foods (foods containing more than 3 grams of fat or 480mg of sodium per serving). Initially those subjects randomized to the DASH treatment group met with a dietitian and DASH diet specific counseling was provided. Participants also received a handbook that detailed the DASH dietary components, tips for incorporating DASH food groups into the diet, foods lists and behavioral strategies for changing intake. After this initial face-to-face session weekly food serving goals were set for fruits and vegetables, low-fat dairy foods and unfriendly foods during phone calls from study trained research interventionists. Subjects then received monetary compensation for meeting goals which were verified by review of a completed food record (tracker) that were mailed in by subjects. For more complete details on the intervention refer to Couch et al. (2008).

**Dietary Self-Monitoring**

All participants were required to self-monitor food intake for at least 5 of 7 days each week. The food trackers completed by subjects included the time and place foods were eaten, a complete description of the foods eaten including the kind of food and any food descriptors on the food label, an amount for foods eaten in common units of measurement such as cups, teaspoons and ounces, the method used to cook the foods eaten, and if the foods were a fruit, vegetable, low-fat dairy product, or a DASH unfriendly food. DASH unfriendly foods were defined by foods that had more than 3 grams of fat and 480 mg of sodium per serving. Subjects were educated on food types, how to accurately describe foods, food amounts and serving sizes and how to correctly complete the food trackers in an initial face-to-face counseling session with
a registered dietitian. At this session twelve trackers were provided to enable the participant to record foods eaten for 5 days each week for 12 weeks. In addition the first two phone calls during the intervention were used to re-educate subjects on complete and accurate tracking. Food trackers were also mailed in to the research staff weekly from the participants so that feedback on the quality of tracking could be provided at subsequent calls.

**Measures**

Blood pressure measurements were performed in accordance with standardized procedures (National High Blood Pressure Education Program, Working Group on High Blood Pressure in Children and Adolescents, 2004), and as described in detail by Couch et al. (2008). Blood pressure was calculated as a mean from 6 measurements taken at baseline, and from 3 measurements taken at post-treatment and 3-month follow-up. Change in blood pressure was determined as post-treatment-baseline and 3-month follow-up-baseline values. Systolic and diastolic blood pressure changes were evaluated independently. For each of these variables, relative blood pressure change was calculated as post-treatment (or follow-up) blood pressure minus baseline blood pressure divided by baseline blood pressure.

**Anthropometrics**

Body mass index was also calculated based on height and weight measurements taken at each visit. Standardized procedures were used to collect anthropometric variables and described by Couch et al. (2008).

**Food Servings**

Changes in servings of fruits and vegetables, low-fat dairy foods, and unfriendly foods were assessed using 3 multi-pass 24-hour food recalls. Each recall was collected by phone over a two week period by a trained research dietitian at the Cincinnati Children’s Hospital Medical
Food data were then entered into the Minnesota Nutrition Data Systems software (2005) and analyzed for food servings and nutrient content.

**Food Tracking and Compliance**

Food trackers were independently reviewed and coded using a measure specifically designed to assess compliance and accuracy for the DASH-type diet used in the intervention, by two coders who were no involved in the conduction of the clinical trial. A *DASH-4-Teens Food Monitoring Compliance and Accuracy Assessment* form was specifically developed for this study and consisted of three major components: 3 items that assessed basic compliance to food tracking, 5 items that assessed the accuracy of placing foods recorded into food categories including fruits and vegetables category, low-fat dairy and DASH-unfriendly, and 4 items that assessed the accuracy of recording serving amounts for foods recorded. For the purposes of this thesis only basic compliance to food tracking was considered and items related to accuracy were not evaluated.

The three items that assessed basic compliance to food tracking in the DASH intervention were “how many foods were recorded”, “how many foods were accurately described” and “for how many foods was the amount of food recorded.” A description of a food was considered complete if it included the brand name (e.g., Honey Nut Cheerios), the type of food (e.g., Colby cheese), whether the food was modified for any ingredient (e.g., low-fat, sugar-free, etc.) and whether the cooking method was included if appropriate (e.g., baked, fried, scrambled, hard-boiled, etc.). The amount was considered complete if it was written in common units of measure (e.g., cups, ounces, tablespoons) or included the size for fruits and vegetables (e.g., small, medium or large). Basic compliance to food tracking was assessed from weekly food trackers kept by each subject per day across five days. If the subject did not complete all five days in
their food tracker only those days that were completed were coded and if the subject coded for more than 5 days only the first 5 days completed were coded.

The “how many foods were recorded” item was used to determine the number of actual days the participants recorded some foods out of the 60 days of the intervention (actual days of food recording), and the number of days the participants recorded five or more foods out of the days they recorded at least some foods (recording sufficiency for foods recorded). The “how many foods were accurately described” item was used to determine the mean percentage in which participants recorded detailed descriptions for the foods they recorded (foods described), and the number of days the participants recorded descriptions for five or more foods out of the days they recorded at least some foods (recording sufficiency for foods described). The “for how many foods was the amount of food recorded” item was used to determine the mean percentage in which participants recorded amounts for the foods they recorded (foods with an amount), and the number of days the participants recorded amounts for five or more foods out of the days they recorded at least some foods (recording sufficiency for foods with an amount). The complete assessment can be found in Appendix 1. In addition, a set of guidelines was developed to help determine accurate descriptions and acceptable amounts and serving sizes for the more difficult foods (e.g., combination foods made of more than one ingredient), which can be found in Appendix 2.

The datasets from both independent coders were compared on the following variables: foods recorded, foods described and foods with an amount. The comparison of scores showed that 90% of the scores on these three variables varied by less than or equal to 2, and 75% of the scores varied by less than or equal to 1. This degree of score variance was deemed acceptable by the investigators. To avoid rounding decimal point values for food items and serving
numbers derived from mean values for these variables, one coder was designated the primary coder initially and the analysis includes only this coder’s dataset.

Data Analysis

Data were analyzed using the Statistical Analysis Systems (SAS) software, version 9.2. Pearson’s correlations were done to examine relationships between food monitoring variables (actual days of food recording, foods described, foods with an amount, recording sufficiency for foods recorded, recording sufficiency for foods described and recording sufficiency for foods with an amount) and relative blood pressure change and changes in intake of servings of fruits and vegetables, low-fat dairy foods or unfriendly foods. Correlations were determined for relative blood pressure change and food serving changes at post intervention (3 months after baseline) and at and 3-months follow-up (6 months after baseline).

In addition student’s t-tests were done to compare groups of “high recorders” and “low recorders” on relative blood pressure changes and changes in intake of fruit and vegetable, low-fat dairy foods and unfriendly food servings. High and low recorders were determined for actual days of food recording, recording sufficiency for foods recorded, recording sufficiency for foods described and recording sufficiency for foods with an amount. High recorders in each category were defined as the group of subjects who recorded at least some foods for greater than or equal to 66% of the intervention days, those who recorded at least 5 foods for greater than or equal to 66% of the intervention days, those who recorded food descriptions for at least 5 foods for greater than or equal to 66% of the intervention days, and those who recorded amounts for at least 5 foods for greater than or equal to 66% of the intervention days respectively. Low recorders in each category were defined as the group of subjects who recorded at least some food for less than or equal to 65% of the intervention days, those who recorded at least 5 foods for less
than or equal to 65% of the intervention days, those who recorded food descriptions for at least 5 foods for less than or equal to 65% of the intervention days, and those who recorded amounts for at least 5 foods for less than or equal to 65% of the intervention days, respectively. Comparisons between high versus low recorders were determined for relative blood pressure change and food serving change at post-intervention and at 3-months follow-up.

**Results**

The participants in the DASH-4-Teens intervention who completed their baseline and post-intervention assessment (n=24) had a mean age of 14.2±1.8 years were mostly Caucasian (78% versus 22% African American) and male (70%), had a mean systolic blood pressure of 131±4.5 mmHg and diastolic blood pressure of 88.5±2.3 mm Hg. The participants in the DASH-4-Teens intervention who completed their baseline and 3-month follow-up assessment (n=18) had a mean age of 14.4±1.9 years, were mostly Caucasian (79% versus 21% African American) and male (73%), had a mean systolic blood pressure of 133±4.7 mmHg and diastolic blood pressure of 87.5±2.2 mm Hg.

Correlations between food monitoring variables, relative blood pressure change and change in food serving intake at post-treatment (Table 1) showed a significant negative correlation between actual days of food recording and change in intake of unfriendly food servings (r=-0.56, p=0.01). There were also several correlations that trended towards significance including actual days of food recording and change in intake of fruit and vegetable servings (r=0.36, p=0.09), recording sufficiency for foods with an amount and change in intake of fruit and vegetable servings (r=0.35, p=0.10), and foods described and change in intake of fruit and vegetable servings (r=0.34, p=0.10) However, by the 3-month follow-up no significant relationships were observed (Table 2).
<table>
<thead>
<tr>
<th></th>
<th>Actual Days of Food Recording</th>
<th>Foods Described</th>
<th>Foods with an Amount</th>
<th>Recording Sufficiency for Foods Recorded</th>
<th>Recording Sufficiency for Foods Described</th>
<th>Recording Sufficiency for Foods with an Amount</th>
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<td>-0.15</td>
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<td>0.45</td>
<td>0.52</td>
<td>0.50</td>
<td>0.24</td>
</tr>
</tbody>
</table>

* indicates a significant relationship (p<0.05), ** indicates a trend towards significance (p≤0.10)
Table 2. Pearson Correlation Coefficients and P-Values for Food Monitoring Skills and Intervention Outcome Variables at 3-Month Follow-Up

<table>
<thead>
<tr>
<th></th>
<th>Actual Days of Food Recording</th>
<th>Foods Described</th>
<th>Foods with an Amount</th>
<th>Recording Sufficiency for Foods Recorded</th>
<th>Recording Sufficiency for Foods Described</th>
<th>Recording Sufficiency for Foods with an Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.16 0.53</td>
<td>-0.08 0.75</td>
<td>-0.26 0.30</td>
<td>-0.12 0.62</td>
<td>-0.13 0.60</td>
<td>-0.27 0.27</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>0.06 0.82</td>
<td>-0.28 0.26</td>
<td>-0.06 0.81</td>
<td>-0.09 0.72</td>
<td>-0.08 0.76</td>
<td>-0.02 0.94</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>0.13 0.62</td>
<td>0.17 0.49</td>
<td>0.12 0.64</td>
<td>0.01 0.97</td>
<td>0.00 0.10</td>
<td>-0.01 0.98</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.09 0.72</td>
<td>-0.01 0.96</td>
<td>-0.02 0.94</td>
<td>0.10 0.69</td>
<td>0.07 0.78</td>
<td>-0.08 0.75</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.01 0.97</td>
<td>0.18 0.48</td>
<td>0.31 0.22</td>
<td>0.06 0.82</td>
<td>0.07 0.80</td>
<td>0.23 0.37</td>
</tr>
</tbody>
</table>

Student’s t-test comparisons between high food recorders and low food recorders showed no difference in relative blood pressure change or change in intake of any of the food servings between high recorders and low recorders with respect to the actual number of days of food recording at post-intervention or 3-month follow-up (Tables 3 and 4).
Table 3. A Comparison of High versus Low Recording for Actual Days of Food Recording for Relative Blood Pressure Change and Change in Food Servings Post-3-Month Intervention

<table>
<thead>
<tr>
<th></th>
<th>High Recorders (n=11)</th>
<th>Low Recorders (n=13)</th>
<th>T-Test Comparison P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.07</td>
<td>0.05</td>
<td>-0.10</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.06</td>
<td>0.14</td>
<td>-0.10</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>2.88</td>
<td>2.46</td>
<td>2.45</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.70</td>
<td>1.67</td>
<td>0.64</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-1.84</td>
<td>2.95</td>
<td>0.06</td>
</tr>
</tbody>
</table>

* High recorders in each category were defined as the group of subjects who recorded at least some foods for greater than or equal to 66% of the intervention days; Low recorders in each category were defined as the group of subjects who recorded at least some foods for less than 65% of the intervention days.
Table 4. A Comparison of High versus Low Recording for Actual Days of Food Recording for Relative Blood Pressure Change and Change in Food Servings at 3-Month Follow-Up

<table>
<thead>
<tr>
<th></th>
<th><strong>High Recorders</strong></th>
<th></th>
<th><strong>Low Recorders</strong></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=10)</td>
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<td>(n=8)</td>
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<tr>
<td></td>
<td>Mean</td>
<td>Standard</td>
<td>Mean</td>
<td>Standard</td>
<td>T-Test Comparison P-Value</td>
</tr>
<tr>
<td>Mean</td>
<td>1.05</td>
<td>2.13</td>
<td>0.90</td>
<td>0.76</td>
<td>0.85</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.07</td>
<td>1.11</td>
<td>0.29</td>
<td>0.81</td>
<td>0.72</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.46</td>
<td>1.11</td>
<td>0.29</td>
<td>0.81</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>-0.61</td>
<td>3.64</td>
<td>-0.96</td>
<td>1.83</td>
<td>0.81</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.61</td>
<td>3.64</td>
<td>-0.96</td>
<td>1.83</td>
<td>0.81</td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.09</td>
<td>0.07</td>
<td>-0.05</td>
<td>0.09</td>
<td>0.39</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.05</td>
<td>0.12</td>
<td>-0.07</td>
<td>0.11</td>
<td>0.66</td>
</tr>
</tbody>
</table>

* High recorders in each category were defined as the group of subjects who recorded at least some foods for greater than or equal to 66% of the intervention days; Low recorders in each category were defined as the group of subjects who recorded at least some foods for less than 65% of the intervention days

There was a non-significant trend toward a difference between high versus low recording sufficiency for foods recorded and relative change in systolic blood pressure (p=0.09) and change in intake of low-fat dairy servings (p=0.06) post- intervention (Table 5); however these same differences were not observed at 3-months follow-up (Table 6).
Table 5. A Comparison of High versus Low Recording Sufficiency for Foods Recorded for Relative Blood Pressure Change and Change in Food Servings Post-3-Month Intervention

<table>
<thead>
<tr>
<th></th>
<th><strong>High Recorders</strong></th>
<th></th>
<th><strong>Low Recorders</strong></th>
<th></th>
<th>T-Test Comparison P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>Relative Change in Systolic Blood</td>
<td>-0.10</td>
<td>0.07</td>
<td>-0.03</td>
<td>0.08</td>
<td><strong>0.09</strong></td>
</tr>
<tr>
<td>Pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood</td>
<td>-0.09</td>
<td>0.12</td>
<td>-0.05</td>
<td>0.11</td>
<td>0.62</td>
</tr>
<tr>
<td>Pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in Fruit and Vegetable</td>
<td>2.96</td>
<td>2.69</td>
<td>1.12</td>
<td>2.69</td>
<td>0.23</td>
</tr>
<tr>
<td>Servings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.90</td>
<td>1.26</td>
<td>-0.54</td>
<td>1.56</td>
<td><strong>0.06</strong></td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.95</td>
<td>2.99</td>
<td>-0.12</td>
<td>2.68</td>
<td>0.61</td>
</tr>
</tbody>
</table>

* High recording sufficiency for foods recorded was defined as those who recorded at least 5 foods for greater than or equal to 66% of the intervention days; low recording sufficiency for foods recorded was defined as those who recorded at least 5 foods for less than 65% of the intervention days

** indicates a trend towards significance (p<0.10)
Table 6. A Comparison of High versus Low Recording Sufficiency for Foods Recorded for Relative Blood Pressure Change and Change in Food Servings at 3-Month Follow-Up

<table>
<thead>
<tr>
<th></th>
<th><strong>High Recorders</strong> (n=15)</th>
<th></th>
<th><strong>Low Recorders</strong> (n=3)</th>
<th></th>
<th>T-Test Comparison P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.08</td>
<td>0.08</td>
<td>-0.04</td>
<td>0.11</td>
<td>0.51</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.06</td>
<td>0.11</td>
<td>-0.07</td>
<td>0.14</td>
<td>0.92</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>0.90</td>
<td>1.66</td>
<td>1.41</td>
<td>1.70</td>
<td>0.64</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.44</td>
<td>1.05</td>
<td>0.09</td>
<td>0.10</td>
<td>0.58</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.68</td>
<td>3.19</td>
<td>-1.18</td>
<td>0.42</td>
<td>0.79</td>
</tr>
</tbody>
</table>

* High recording sufficiency for foods recorded was defined as those who recorded at least 5 foods for greater than or equal to 66% of the intervention days; low recording sufficiency was defined as those who recorded at least 5 foods for less than 65% of the intervention days.

There was a non-significant trend toward a difference between high versus low recording sufficiency for foods described and relative change in systolic blood pressure (p=0.09) and change in intake of low-fat dairy servings (p=0.06) post-intervention (Table 7); however these differences were not observed at 3-months follow-up (Table 8).
<table>
<thead>
<tr>
<th></th>
<th><strong>High Recorders</strong> (n=20)</th>
<th><strong>Low Recorders</strong> (n=4)</th>
<th>T-Test Comparison P-Value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.10</td>
<td>0.07</td>
<td>-0.03</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.09</td>
<td>0.12</td>
<td>-0.05</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>2.96</td>
<td>2.69</td>
<td>1.12</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.90</td>
<td>1.26</td>
<td>-0.54</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.95</td>
<td>2.99</td>
<td>-0.12</td>
</tr>
</tbody>
</table>

* High recording sufficiency for foods described was defined as those who recorded food descriptions for at least 5 foods for greater than or equal to 66% of the intervention days; low recording sufficiency for foods described was defined as those who recorded food descriptions for at least 5 foods for less than 65% of the intervention days.

** indicates a trend towards significance (p<0.10)
Table 8. Comparison of High versus Low Recording Sufficiency for Foods Described for Relative Blood Pressure Change and Change in Food Servings at 3-Month Follow-Up

<table>
<thead>
<tr>
<th></th>
<th><strong>High Recorders</strong> (n=15)</th>
<th></th>
<th><strong>Low Recorders</strong> (n=3)</th>
<th></th>
<th><strong>T-Test Comparison P-Value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>T-Test Comparison P-Value</td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.08</td>
<td>0.08</td>
<td>-0.04</td>
<td>0.11</td>
<td>0.50</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.06</td>
<td>0.11</td>
<td>-0.07</td>
<td>0.14</td>
<td>0.92</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>0.90</td>
<td>1.66</td>
<td>1.41</td>
<td>1.70</td>
<td>0.64</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.44</td>
<td>1.05</td>
<td>0.09</td>
<td>0.10</td>
<td>0.58</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.68</td>
<td>3.19</td>
<td>-1.18</td>
<td>0.42</td>
<td>0.79</td>
</tr>
</tbody>
</table>

* High recording sufficiency for foods described was defined as those who recorded food descriptions for at least 5 foods for greater than or equal to 66% of the intervention days; low recording sufficiency for foods described was defined as those who recorded food descriptions for at least 5 foods for less than 65% of the intervention days.

There was a non-significant trend toward a difference between high and low recording sufficiency for food amounts and change in low-fat dairy servings (p=0.09) and change in DASH unfriendly food servings (p=0.10) post-intervention (Table 9). Again, these differences were not observed at 3-months follow-up (Table 10).
Table 9. Comparison of High versus Low Recording Sufficiency for Food Amounts for Relative Blood Pressure Change and Change in Food Servings Post-3-Month Intervention

<table>
<thead>
<tr>
<th></th>
<th>High Recorders (n=17)</th>
<th>Low Recorders (n=7)</th>
<th>T-Test Comparison P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.09</td>
<td>0.07</td>
<td>-0.06</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.09</td>
<td>0.13</td>
<td>-0.08</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>3.20</td>
<td>2.75</td>
<td>1.29</td>
</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.97</td>
<td>1.33</td>
<td>-0.07</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-1.44</td>
<td>2.83</td>
<td>0.72</td>
</tr>
</tbody>
</table>

* High recording sufficiency for food amounts was defined as those who recorded food amounts for at least 5 foods for greater than or equal to 66% of the intervention days; low recording sufficiency for food amounts was defined as those who recorded food amounts for at least 5 foods for less than 65% of the intervention days

** indicates a trend towards significance (p≤0.10)
<table>
<thead>
<tr>
<th></th>
<th><strong>High Recorders</strong></th>
<th></th>
<th><strong>Low Recorders</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Relative Change in Systolic Blood Pressure</td>
<td>-0.0810</td>
<td>0.0790</td>
<td>-0.035</td>
<td>0.0875</td>
</tr>
<tr>
<td>Relative Change in Diastolic Blood Pressure</td>
<td>-0.0530</td>
<td>0.1160</td>
<td>-0.084</td>
<td>0.1215</td>
</tr>
<tr>
<td>Change in Fruit and Vegetable Servings</td>
<td>0.8629</td>
<td>1.7157</td>
<td>1.415</td>
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</tr>
<tr>
<td>Change in Low-Fat Dairy Servings</td>
<td>0.3771</td>
<td>1.0578</td>
<td>0.415</td>
<td>0.6480</td>
</tr>
<tr>
<td>Change in Unfriendly Servings</td>
<td>-0.4200</td>
<td>3.1362</td>
<td>-1.968</td>
<td>1.6112</td>
</tr>
</tbody>
</table>

* High recording sufficiency for food amounts was defined as those who recorded food amounts for at least 5 foods for greater than or equal to 66% of the intervention days; low recording sufficiency for food amounts was defined as those who recorded food amounts for at least 5 foods for less than 65% of the intervention days
Discussion

We predicted that a greater number of actual days of recording some foods as well as a greater degree of recording sufficiency for foods recorded would be negatively correlated with relative blood pressure change and change in intake of DASH unfriendly foods and positively correlated with change in intake of fruits and vegetable servings and low-fat dairy food servings. We also hypothesized that subjects who did food monitoring skills more often or were “high recorders” would differ post intervention with respect to relative blood pressure changes and change in intake of food servings compared with those subjects who were “low recorders.”

As predicted, at post intervention, we found a significant negative correlation between actual days of food recording and change in unfriendly food servings indicating that as study participants increased the number of days they recorded some foods in their food tracker, their intake of DASH unfriendly foods (high fat, high sodium foods) decreased. This suggests that although the concept of DASH unfriendly foods may have been hard for subjects to understand, as evidenced by intake of sodium that did not change with the intervention (Couch et al., 2008), the act of repeatedly recording foods may have increased awareness and understanding about this food category. We also observed a trend towards significance in the positive direction between actual days of food recording and change in intake of fruit and vegetable servings; thus more days of recording some foods also appeared to be related to increasing intake of fruits and vegetables, two food groups containing nutrients important in lowering blood pressure. In addition we found correlations that trended towards significance between change in intake of fruit and vegetables and foods described and recording sufficiency for foods with an amount suggesting that being able to describe and give amounts for foods was also important in helping adolescents increase intake of fruits and vegetables.
In contrast to what was hypothesized for food monitoring and relative blood pressure change, no significant correlations were observed. There was also no difference observed in relative blood pressure change or change in food servings between high recorders and low recorders with respect to the actual days of recording. There was a non-significant trend; however, for a difference between high and low recorders in recording sufficiency for foods recorded and relative change in systolic blood pressure and change in low-fat dairy servings at post intervention. A similar trend was observed for recording sufficiency for foods described and relative change in systolic blood pressure and low-fat dairy servings at post-intervention. This suggests that a more complex level of recording was necessary to effect changes in blood pressure and changes in low-fat dairy servings. Furthermore, it is likely that subjects who recorded and described 5 or more foods more frequently in doing so achieved a better overall understanding of the DASH diet which allowed them to better adhere to the diet and lower their blood pressure.

Overall these results are in line with previous research examining food monitoring variables and health outcomes that used weight loss as the outcome. The majority of this research found that doing some form of food monitoring was predictive of greater weight loss outcomes. Our results expand on these findings because they suggest that recording foods, recording food descriptions, recording food amounts and doing this recording sufficiently (at least 5 foods per day) impacts dietary behavior changes in adolescents participating in a behavioral nutrition intervention focused on a DASH type diet. In particular, eating more fruits and vegetables and less high fat and sodium foods were dietary behaviors that were positively impacted by these food monitoring skills. In addition there is some evidence that food
monitoring effects relative changes in blood pressure in adolescents, but with only recording sufficiency emerging as an important monitoring skill.

To the best of our knowledge this is the first study to investigate the relationship between food monitoring skills and dietary and blood pressure changes. Previous studies have identified the importance of monitoring in weight loss, but our results indicate that monitoring skills may also be important in dietary interventions focused on specific dietary changes that lead to a reduction in blood pressure in youth. However, our study is not without limitations. First the study sample used was taken from a pilot study and therefore was not very large which reduced the likelihood of detecting changes. Also the duration of the intervention period was relatively short at only three months and may not have been long enough to reflect changes that may have resulted from more extended monitoring. In addition, there may have been inaccuracies in determining the number of foods recorded, described and with amounts recorded that could have resulted in an over or under estimation of the degree to which subjects monitored.

Because the DASH diet has shown good efficacy in blood pressure reduction and primary hypertension has become more prevalent in children and adolescents any tools helpful in getting adolescents to adhere to this diet are important. Our findings suggest that food monitoring is likely one of those tools. For this reason future studies with a larger sample, longer intervention period and with consistent and rigorous coding quality checks should be done to further investigate the possible relationship between food monitoring skills and dietary and blood pressure changes in adolescents following the DASH diet.
References


National High Blood Pressure Education Program, Working Group on High Blood Pressure in


Appendix 1

DASH-4-TEENS FOOD MONITORING COMPLIANCE AND ACCURACY ASSESSMENT

Basic Compliance: - Compliance with daily recording of foods, accurate description of foods, and amount of foods defined as recording, giving accurate description for and giving an amount for at least 5 foods per day.

Category Accuracy- Accuracy with which foods are placed in the DASH categories of low-fat dairy, fruits and vegetables, or in the DASH-unfriendly category.

Serving Accuracy- Accuracy with which the DASH and DASH unfriendly food servings are calculated.

BASIC COMPLIANCE

Compliance with recording per day:

How many foods were recorded?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

Compliance with food descriptions:

How many foods were accurately described with accurately described defined as a complete description of kind to include all adjectives on the food label (low-fat, 100%, 1%, Colby, No-sodium, low-sodium, low-fat, Sugar-free, etc.) and cooking method if the method effects the kind (baked, fried, scrambled, hard-boiled, etc.)?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

Compliance with food amount recording:

For how many foods was the amount of food recorded?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____
CATEGORY ACCURACY

**Fruits and Vegetables Category:**

How many food items belong in the fruits and vegetables category?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many foods were recorded in the fruits and vegetables category?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many food items were correctly recorded in the fruits and vegetables category?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many additions were there in the fruits and vegetables category where an addition is defined as a food added to a category that it does not belong in?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many omissions were there in the fruits and vegetables category where an omission is defined as a food omitted from a category that it does belong in?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

**Low-fat Dairy Category:**

How many food items belong in the low-fat dairy category?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many foods were recorded in the low-fat dairy category?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many food items were correctly recorded in the low-fat dairy?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____

How many additions were there in the low-fat dairy category where an addition is defined as a food added to a category that it does not belong in?

Day 1 ____  Day 2 ____  Day 3 ____  Day 4 ____  Day 5 ____
How many omissions were there in the low-fat dairy category where an omission is defined as a food omitted from a category that it does belong in?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

**DASH-Unfriendly Category:**

How many food items belong in the DASH-unfriendly category?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

How many foods were recorded in the DASH-unfriendly category?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

How many food items were correctly recorded in DASH-Unfriendly category?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

How many additions were there in the DASH-unfriendly category where an addition is defined as a food added to a category that it does not belong in?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

How many omissions were there in the DASH-unfriendly category where an omission is defined as a food omitted from a category that it does belong in?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

**SERVING ACCURACY**

What is the number of correctly recognized foods in the **fruits and vegetables** category?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____

For how many correctly recognized **fruits and vegetables** foods was the subject able to identify the correct serving amount?

Day 1 ____   Day 2____   Day 3____   Day 4____   Day 5____
Considering the correctly recognized **fruits and vegetables** what is the total number of fruit and vegetable servings?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

Considering the correctly recognized **fruits and vegetables** what is the total number of fruit and vegetable servings calculated by the subject?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

What is the number of correctly recognized foods in the **low-fat dairy** category?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

For how many correctly recognized **low-fat dairy** foods was the subject able to identify the correct serving amount?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

Considering the correctly recognized **low-fat dairy** foods what is the total number of low-fat dairy servings?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

Considering the correctly recognized **low-fat dairy** foods what is the total number of low-fat dairy servings calculated by the subject?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

What is the number of correctly recognized foods in the **DASH-Unfriendly** category?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____

For how many correctly recognized **DASH-unfriendly** foods was the subject able to identify the correct serving amount?

Day 1 ____  Day 2____  Day 3____  Day 4____  Day 5____
Considering the correctly recognized **DASH-unfriendly** foods what is the total number of DASH-unfriendly servings?

Day 1 _____ Day 2 _____ Day 3 _____ Day 4 _____ Day 5 _____

Considering the correctly recognized **DASH-unfriendly** foods what is the total number of unfriendly servings calculated by the subject?

Day 1 _____ Day 2 _____ Day 3 _____ Day 4 _____ Day 5 _____
Appendix 2

Guidelines

Major Issues of Concern:

Most of these problems could be avoided if brand were listed. This really needs to be emphasized!!!

Not recognizing that although something is light or reduced fat it still may be unfriendly (ex. Reduced fat peanut butter)

Measurement Accuracy

As long as a unit measure is given for a food it should be counted, only exclude measures that are ambiguous such as a bag or a serving when the amount in a serving is not listed- However- there are some exceptions on the list provided in the manual such as celery and carrot sticks

1 can ok for accurate amount b/c a standard can is 120z

Salad with lettuce, carrots, radish, croutons, breadstick then amount 1 bowl, I would count this as 5 foods, 0 with accurate amount

Things such as turkey links and 5 strawberries: should estimate the serving and count as accurate amount- turkey link is 1oz, 5-7 strawberries is approximately ½ a cup

Waffles and pancakes need small, medium, large or a diameter estimate or restaurant or brand name, 1 piece or 1 not good enough

Turkey as slice is not accurate for amount

Fruit and grain cereal bar low-fat-strawberry- 1 bar is accurate for amount but there is no fruit serving

A12, A3, A17 is coding for serving sizes that there is a reference sheet for
**Alfredo sauce**

½ cup = 1 unfriendly serving

**Bagels**

Are friendly unless a specific kind is stated and you look it up and it meets unfriendly criteria, example- everything bagel

**Barbeque Sauce**

Is friendly

**Bars**

Protein bars – 1 not accurate for amount b/c serving size could vary, need brand for it to be accurate description

Granola bars- accurate description if they put something like chocolate chip or peanut butter without brand, 1 is accurate for amount b/c 1 bar is one serving

**Beans**

Not accurate description unless type is listed (green, black, pinto, etc.)

**Bread**

Don’t have to say slice or pieces, a number is enough for accurate amount

**Breadsticks**

Need restaurant or brand to be accurate

**Burgers**

Cheeseburger- Amount 1

This should be counted as 3 foods- cheese, hamburger and bun with 1 accurate description and no accurate amounts: however, if a restaurant is given then give accurate amt. and description for all 3 b/c these are known across restaurants
Cheese

Slice for cheese- accurate amount b/c assumption is that it is a standard slice which is 1.5 ounces.
String cheese alone is not an accurate description because it does not tell you the type of cheese.
Just a number for string cheese is accurate b/c most string cheese is a standard size.

Chicken

Chicken must be specified by white or dark and the part of the chicken in order to be considered an accurate description.

Chicken is friendly only if it is specified as white meat and skinless or chicken breast and skinless any other part, not specified as skinless or if it is dark it is unfriendly.

Chicken wings: 1oz per wing.

Chicken Nuggets: 1oz per nugget.

Chicken Tenders/Fingers: 1.5-2oz per tender.

Combination Foods

How to handle combination things such as chicken fried rice with veggies (or shrimp alfredo with broccoli) where they list only 1 measurement: You know there are 3 separate foods namely chicken, rice and vegetables and they are referring to there being 2 cups of the 3 together- Count accurate amount for only 1 of the 3.

Lasagna is another example of a combo food, need to have descriptions of all of the ingredients such as lasagna with hamburger and mozzarella cheese, just lasagna isn’t enough.

Another example: crab alfredo: 3 foods (crab, noodles, alfredo sauce), 2 accurate descriptions, and if a serving size is given such as 2 cups this refers only to the noodles so only 1 accurate amount.
Cheeseburger- Amount 2oz., count as 3 foods cheese, hamburger and bun with 1 accurate
description and 1 accurate amount for the hamburger
If the restaurant is given for something like a hamburger then you should look up the serving size
and accept the description and amount as both accurate

*Cookies*

1 small = $\frac{1}{2}$ unfriendly serving
1 med = $\frac{3}{4}$ unfriendly serving
1 large = 1 unfriendly

*Crab*

Is friendly

*Croutons*

Just crouton is enough for an accurate description

$\frac{1}{4}$ cup = 1 serving, is friendly

*Description Accuracy*

If the type of something is described such as bread or fish or sauce then the description is
accurate, examples: ciabata bread, salmon, cod, etc.

*Donut*

3 small = 1 unfriendly serving

*Dressing*

Fat free or low-fat dressing is friendly, light dressing or reduced fat is unfriendly unless the
brand is given and you verify that that brand meets the fat and sodium requirements for friendly
-- As long as they put a type like ranch count it as accurate description even if the brand is not
given the brand is just necessary in order to declare it friend
Eggs
Eggs are only friendly when they are whites or substitute
Do not need cooking method to be accurate description

Fries
Baked fries should be counted as a veggie serving
10 fries or a small= 1 unfriendly serving, medium= 1.5 unfriendly servings and a large= 2 unfriendly servings

Fruits
For all fruits they must say small, medium or large or the amount is not accurate because this needs to be known in order to determine the amount of DASH servings

Goodies
2 is accurate for reeces cups because they really only come in one size
A 2 by 2 inch slice of cake is 1 unfriendly serving- have to have dimensions to be able to assess unfriendly servings
Candy bar is not accurate because they vary a lot by type- snickers, butterfinger, etc.
1 is not accurate for a candy bar b/c size differs a lot as well

Ham
As long as there is some description such as baked or honey the description is accurate, but ham is not friendly

Ice Cream
Weight Watchers ice cream is friendly any type
**Juices**

If it says drink or punch it should not be counted as a fruit but all juices should be counted as a fruit

40z. or ½ cup = 1 DASH fruit serving

**Lettuce**

2 slices (large leaves) is 0.5 oz., 1.7 oz. or 1 cup of lettuce = 1 DASH veggie serving

**Mac n cheese**

Mac-n-cheese should not be counted as accurate b/c they vary in fat content by brand and preparation technique (i.e. kraft made with low-fat milk and low-fat butter is different than velveeta

½ cup = 1 unfriendly serving

**Mayonnaise**

Mayonnaise is an accurate description, but it is unfriendly, only miracle whip light is a friendly version- so- mayo or light mayo is ok for description but need the brand in order to declare it friendly

**Noodles**

Noodles or pasta need to be specific by type or brand

**Pancakes**

Pancakes are friendly, any toppings consider separately

**PBJ**

PBJ counts as 2 foods

If only 1 amount is listed for PB&J divide the amount by 2 to get the amount of each (ex. 2 tablespoons would be 1 tablespoon of PB and 1 of J)
There is no such thing as friendly peanut butter even if it is described as low-fat

**Pickle**

Not a veggie serving (d/t sodium content)

**Pie**

As long as there is some description of the type of pie then it is accurate

**Pizza**

Pizza is counted as an accurate description if there is at least some descriptor such as sausage or cheese, etc. – it does not have to be described as pizza then each ingredient listed to be counted as accurate. **However**- if it is broken down into ingredients only count those that are accurately described (i.e. cheese and tomato sauce only give credit for the tomato sauce because there is not enough description of the type of cheese)

How to handle the veggies on pizza- only count in fruit and veggie category if there is a measurement given specifically for the vegetable on the pizza otherwise it is simply unfriendly as a whole

Two medium slices of pizza is 1 unfriendly serving therefore 2 small slices is ¾ an unfriendly serving, 2 large slices of pizza is 1 ¼ unfriendly servings, 1 large slice of pizza is ¾ of an unfriendly serving

Pizza has to say small, medium, or large piece or slice or give dimensions to be accurate amount

**Popcorn**

Need at least brand for accurate description

**Potatoes**

Just potato is accurate if the cooking method is listed

Mashed potatoes are unfriendly unless the milk used is specified as not being full fat
Should be a veggie serving even if no method is listed

**Pretzels**

Need more then just pretzel for accurate description, all pretzels are friendly though

Just a number is accurate for amount b/c they are all friendly

**Roll**

Friendly

One or two is enough for amount because rolls are a standard size mostly

**Salad**

Salad = lettuce, count as accurate description

**Sausage**

Accurate because implies beef sausage they were not told to specify beef just something else if it wasn’t beef

**Sloppy Joes**

Unfriendly due to the hamburger and sodium content of the sauce

**Smoothie**

Smoothie Rule- 1 dairy, 2 fruit servings in 12oz

**Soups**

As long as they say type such as tomato, chicken noodle this is an accurate description

**Steak**

Steak needs to have some kind of descriptor or a cooking method to be counted as an accurate description
**Tomato Sauce**

Tomato sauce is unfriendly and not veggie b/c of the sodium unless it is specified as low-sodium or the brand is given and found to be low-sodium.

**Tortillas**

Just tortilla is enough for an accurate description.

**Turkey**

Non-deli turkey (i.e. a whole turkey) and chicken breast are friendly when the cooking method is baked or grilled, but unfriendly if there is no method listed or the method is fried.

Do give turkey *breast (as in non-deli)* without brand since we have said that that determination is made based on cooking method.

Deli turkey is *unfriendly* unless it is listed as low in sodium, healthy choice or boar’s head.

Just turkey is not an accurate description because we need at least brand or some descriptor such as low in sodium in order to determine if it is friendly or unfriendly.

Ground turkey is unfriendly.

Products such as turkey hotdogs, turkey bacon, and turkey salami are *unfriendly* unless the brand is given and that brand is low-fat and low-sodium or they specifically put low-sodium and low-fat.

**Yogurt**

If only yogurt is listed with no brand this is not an accurate description because they can vary in content per brand.