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EXERCISE

ABSTRACT & COMMENTARY

The Relationship Among Step Count, Step Intensity, and Mortality in Adults

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Dr. Feldman reports no financial relationships relevant to this field of study.

SYNOPSIS: The authors of this observational study of 4,840 adults show an association between higher number of steps taken daily and lower all-cause mortality, lower mortality from cardiovascular disease, and lower mortality from cancer, but no association between intensity of steps and mortality in any of those areas.

SOURCE: Saint-Maurice PF, Troiano RP, Bassett DR, et al. Association of daily step count and step intensity with mortality among U.S. adults. *JAMA* 2020;323:1151-1160.

In a 1786 letter to his son-in-law, Thomas Jefferson wrote, "I have known some great walkers and had particular accounts of many more; and I never knew or heard of one who was not healthy and long lived."[1] More than 200 years later, Saint-Maurice et al have used research methods from 2020 to understand and delineate the relationship among walking, health, and longevity long ago noted by one of the United States' "founding fathers."

Saint-Maurice et al noted the lack of evidence-based studies supporting the popular goal of achieving 10,000 steps each day. Prior investigations involving walking and health have affirmed the health benefits of walking, but typically involved limited and specific populations.[2,3] Therefore, findings are not necessarily applicable to other groups or to a more general population.

In addition, there have been conflicting results in studies looking at step intensity and association with health benefits.[4,5] Citing these reasons, this team set out to look at any association between step count, step intensity, and mortality in a representative sample of the U.S. population older than 40 years of age.

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Integrative Medicine [ALERT]

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Summary Points

- In this prospective investigation based on data collected between 2003 and 2006, 4,840 U.S. adults used accelerometers to track seven days of step count and step intensity (measured by steps/minute).
- Mortality records for the group were followed until 2015.
- Participants taking fewer than 4,000 steps/day had an unadjusted incident density rate for all-cause mortality rate of 76.7/1,000 person-years, compared to 4.8/1,000 person-years in the group taking at least 12,000 steps/day.
- When comparing 12,000 steps daily to 4,000 steps daily, the hazard ratio (HR) for adjusted all-cause mortality was 0.35 (confidence interval [CI], 0.28-0.45) or a 65% risk reduction associated with longer walking.
- After adjusting step intensity for number of steps/day, there was no association noted between step intensity and mortality; HR was 0.90 (95% CI, 0.65-1.27; $P = 0.34$) when comparing the highest and lowest quartiles of step intensity and measuring association with mortality.

The National Health and Nutrition Examination Survey (NHANES), a Centers for Disease Control and Prevention-sponsored program, annually collects data from a nationally representative sample of the U.S. population.[6]

From 2003 to 2006, 4,840 respondents aged 40 years or older wore standardized hip accelerometers during a seven-day period. Saint-Maurice et al used data from the accelerometers to determine participant step count and step intensity. Given the breadth of information collected by NHANES, the team was able to adjust results for a variety of factors, including age, education, substance use, specific medical diagnosis, and self-reported general health. There were 6,355 respondents initially eligible for inclusion in the study, but only 4,840 had sufficient data for inclusion; 1,515 individuals either elected not to wear the accelerometer or did not submit a record for at least one 12-hour period.

The National Death Registry was accessed periodically until Dec. 31, 2015, to determine death of any participant from any cause. Indications that a participant had died casued by either cancer or cardiovascular disorder were noted as well.

The mean number of steps/day for the entire group of 4,840 participants was 9,124. The mean length of time wearing the accelerometer was 5.7 days, while the mean time each day was 14.4 hours.

Respondent data was stratified according to number of daily steps:

- < 4,000 steps/day (n = 655)
- 4,000-7,999 steps/day (n = 1,727)
- 8,000-11,999 steps/day (n = 1,539)
- > 12,000 steps/day (n = 919)

Table 1 shows the selected characteristics of these groups and highlights statistically significant differences.

Table 2 depicts the unadjusted results, including incident density rate, defined as the mortality rate within a specific timeframe, for all-cause mortality, as well as number and percentage of deaths/quartile. Given the differences between the groups, and an analysis showing significant attenuation of results with adjustment for some of the variables, Saint-Maurice et al presented several interpretive models for review and discussion.

Table 3 shows the results adjusted for multiple variables, including age; diet quality; sex; race/ethnicity; body mass index; education; alcohol consumption; smoking status; diagnoses of diabetes, stroke, coronary heart disease, heart failure, cancer, chronic bronchitis, and emphysema; mobility limitation; and self-reported general health. In addition to all-cause mortality, the authors examined death as the result of cardiovascular disease and cancer. Each revealed a similar pattern of a significant decrease in mortality rate with increasing step count. In addition, results indicated consistent findings of decreased

Table 1. Characteristics of Respondent Groups by Step Count

	< 4,000 steps per day (n = 655)	4,000-7,999 steps per day (n = 1,727)	8,000-11,999 steps per day (n = 1,539)	> 12,000 steps per day (n = 919)	*P* value of difference
Mean age (years)	69.9	59.9	54.0	51.1	< 0.001*
Body mass index	31.4	29.9	28.6	27.1	< 0.001*
Current smoker	109 (18.7%)	344 (22%)	302 (19.9%)	218 (22.8%)	0.62
Diabetes	204 (29.9%)	284 (13.9%)	168 (7.8%)	69 (4.5%)	< 0.001*
Heart failure	102 (16.2%)	92 (4.5%)	38 (1.7%)	12 (1.0%)	< 0.001*

*Statistically significant data

Table 2. Mortality Data for Respondent Groups by Step Count

	< 4,000 steps per day (n = 655)	4,000-7,999 steps per day (n = 1,727)	8,000-11,999 steps per day (n = 1,539)	> 12,000 steps per day (n = 919)
Number of deaths	419	488	176	82
Percent of deaths	56.5%	21.3%	7.3%	5.1%
Unadjusted incident density rate all-cause mortality per 1,000 person years	76.7	21.4	6.9	4.8

Table 3. Adjusted Mortality Rate and Hazard Ratios

	4,000 steps per day	6,000 steps per day	8,000 steps per day	10,000 steps per day	12,000 steps per day	*P* trend
Adjusted mortality rate per 1,000 adults per year	14.4 (95% CI, 13.0, 15.7)	9.7 (95% CI, 8.6-10.8)	7.1(95% CI, 5.7-8.4)	5.7 (95% CI, 4.4-7.0)	5.1 (95% CI, 3.8-6.5)	< 0.001*
Hazard ratio	REFERENT	0.68 (95% CI, 0.64, 0.72)	0.49 (95% CI, 0.44, 0.55)	0.40 (95% CI, 0.34, 0.46)	0.35 (95% CI, 0.28, 0.45)	

CI: Confidence interval

mortality rate with increased step count when reported separately for men, women, age groups, and ethnicity.

Table 4 shows the findings for cardiovascular and cancer deaths for each step quartile.

The second major part of this study looked at step intensity and mortality rate (MR). Step intensity was calculated in several manners (based on time and number of steps). Higher step intensity was associated with significantly lower MR — until adjusting these figures for number of steps daily.

For example, the unadjusted MR was 5.2 (95% confidence interval [CI], 3.2-7.3) per 1,000 adults/year for those in the highest quadrant of step intensity and 10.0 (95% CI, 7.1-12.9) for the respondents on the other end of the scale. However, when adjusting for the number of steps in both quadrants, this difference virtually vanishes, with an adjusted MR of 8.4 (95% CI, 4.0-12.9) per 1,000 adults/year and 9.2 (95% CI, 6.9-11.8) per 1,000 adults/year. The *P* value for the trend is 0.34.

■ COMMENTARY

This study gives backbone to the principle of viewing physical activity as essential "medicine" for health. The association between step count and longevity found by Saint-Maurice et al is consistent with studies of step count and health both in investigations centered on older adults and in studies of persons with chronic illnesses.[2,3] This work adds to the literature by generalizing the findings from these narrower studies and pointing toward a dose relationship between step count and longevity. It is important to note that this is an observational

Table 4. Unadjusted MR, Number, and Percentage of Deaths as a result of CVD and Cancer				
	< 4,000 steps per day (n = 655)	**4,000-7,999 steps per day (n = 1,727)**	**8,000-11,999 steps per day (n = 1,539)**	**> 12,000 steps per day (n = 919)**
Cancer deaths	62	133	56	32
Cancer death percentage	7.8%	6.4%	2.5%	2.0%
MR*/1,000 adults/year because of cancer	10.5	6.4	2.3	1.8
CVD deaths	169	162	52	32
CVD death percentage	23.2%	6.5%	2.3%	1.1%
MR/1,000 adults/year because of CVD	31.6	6.6	2.1	1.0
MR: Mortality rate CVD: Cardiovascular disease				

study; there is no evidence for causation. There are some significant limitations in this investigation, including that the participant group was self-selected, and that wearing of the accelerometer itself may have had an effect (such as motivating more walking or motivating a more active lifestyle). Future investigations with randomization and controls will be helpful in further understanding and quantifying the relationship between step count and longevity.

It is notable that, even when adjusted for a substantial number of variables, results still indicate a dose-response relationship between step count and longevity, with hazard ratio indicating a 65% reduced chance of death among the group taking 12,000 or more steps daily when compared to the referent group (taking 4,000 steps or fewer daily).

Future investigations may want to look more closely at the lifestyle of the most active group to see if there are other variables influencing longevity, such as participation in activities that may not register on an accelerometer (e.g., biking, swimming, etc.).

Another point to consider is that the only accelerometer data came from a seven-day period between 2003 and 2006. There is little evidence to suggest that this period is representative of a respondent's lifestyle in general and/or over time. More information and data from subsequent years will be helpful in evaluating whether accelerometer patterns stay stable over time and ultimately may help in attempts to address the question of causation.

The investigators expected to see an association of step intensity with mortality and were surprised at not finding this relationship. They noted that there have been only a smattering of studies looking at the impact of step intensity on mortality and suggested further studies to understand this in full.

In this paper, it appears that step intensity is associated with greater number of steps in general.

Even with the limitations noted, the Saint-Maurice et al study represents a true "step" forward in the field. While it is prudent to wait for evidence of causation, there is no need to wait for recommending an active lifestyle to patients. Today, many of our patients have wearable devices that measure not only step count, but also many other health parameters associated with activity, including heart rate, recovery time, etc. Use of these devices and active monitoring may become an integral component of a modern wellness plan.

We know that activity is helpful for a variety of health measures and conditions, including reducing the risk of type 2 diabetes, obesity, and heart disease. This study strengthens the argument for continuing to keep physical activity as the foundation of a healthy lifestyle and adds evidence to a role for physical activity in longevity. ■

REFERENCES

1. Thomas Jefferson's Monticello. Exercise. Nov. 6, 1990. https://www.monticello.org/site/research-and-collections/exercise
2. O'Donnell J, Smith-Byrne K, Velardo C, et al. Self-reported and objectively measured physical activity in people with and without chronic heart failure: U.K. Biobank analysis. *Open Heart* 2020;7:e001099.
3. Dohrn IM, Welmer AK, Hagströmer M. Accelerometry-assessed physical activity and sedentary time and associations with chronic disease and hospital visits – a prospective cohort study with 15 years follow-up. *Int J Behav Nutr Phys Act* 2019;16:125.
4. Lee IM, Shiroma EJ, Kamada M, et al. Association of step volume and intensity with all-cause mortality in older women. *JAMA Intern Med* 2019;179:1105-1112.
5. Ekelund U, Steene-Johannessen J, Brown WJ, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet* 2016;388:1302-1310.
6. Centers for Disease Control and Prevention. About the National Health and Nutrition Examination Survey. Updated Sep. 15, 2017. https://www.cdc.gov/nchs/nhanes/about_nhanes.htm

ABSTRACT & COMMENTARY

DASH Is Revisited and Updated, Lowering Subclinical Cardiac Injury Markers

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Dr. Baker reports no financial relationships relevant to this field of study.

SYNOPSIS: In individuals without pre-existing cardiovascular disease, the Dietary Approaches to Stop Hypertension diet plan and a diet consisting of fruits and vegetables, given over eight weeks, lowered biomarkers for cardiac strain and injury.

SOURCE: Juraschek SP, Kovell LC, Appel LJ, et al. Associations between dietary patterns and subclinical cardiac injury. *Ann Intern Med* 2020;172:786-794.

As clinicians, we continue to search for ways to aid our patients in long-term disease prevention, whether by primary or secondary actions. A large focus is continuing to reduce cardiovascular disease (CVD) risk. Although many interventions exist, elevated blood pressure is a main factor influencing the development of cardiovascular disease, and therefore, prevention and control are on our list of clinical concerns.[1,2]

Twenty-four years have passed since the Dietary Approaches to Stop Hypertension (DASH) diet study was published, showing that dietary interventions could lower systolic blood pressure (SBP) and diastolic blood pressure (DBP), as well as low-density lipoprotein (LDL) cholesterol.[3]

The use of current testing profiles on historic and curated specimens reveals new information regarding the importance of this diet plan. Jurascheck and his associates attempted to support the hypothesis that dietary intervention would reduce cardiovascular injury and therefore aid in primary prevention of CVD. They studied stored samples from a subpopulation of the original DASH trial participants to assess the effects of diet on three biomarkers of subclinical cardiac injury. They studied high-sensitivity troponin I (hs-cTnI) as a marker of cardiac myocyte damage, N-terminal pro-B-type natriuretic peptide (NT-proBNP) as a marker of cardiac strain, and high-sensitivity C-reactive protein (hs-CRP) as a marker for inflammation. These three markers have been shown to predict risk for vascular events in adults without known CVD.[4-6]

The DASH trial, conducted between September 1994 and March 1996, compared the influence of three isocaloric dietary styles (plans) on SBP.[3] The plans used were:

- a control, typical of American consumption at that time;
- a "fruit and vegetable" diet;
- the DASH diet, supported by the American Heart Association for "managing blood pressure and reducing risk of heart attack, stroke and other blood pressure-related health threats."[7,8]

Summary Points

- New findings from curated participant samples of the 1997 Dietary Approaches to Stop Hypertension (DASH) study reveal that dietary lifestyle reduces biomarkers of subclinical cardiac injury.
- Adhering to the DASH lifestyle reduces subclinical levels of N-terminal pro-B-type natriuretic peptide and high-sensitivity troponin I, but not high-sensitivity C-reactive protein.

Four clinical research centers were involved, selecting 459 participants and randomly assigning them to one of three iso-calorie, prepared dietary plans following a three-week run-in period of the control plan.

The control dietary plan consisted of a fiber and macronutrient content of average consumption with potassium, magnesium, and calcium levels close to the 25th percentile of U.S. consumption.

The fruit and vegetable diet plan contained higher quantities of fiber, potassium, and magnesium levels, close to the 75th percentile of human consumption.

The combination DASH diet contained the same higher levels of calcium, potassium, and magnesium, but also it included low-fat dairy foods and reduced amounts of saturated fat, total fat, and cholesterol as compared to the control.

All three plans limited salt to 3 g per day to reduce effects that sodium might have on SBP. The trial duration for participants was eight weeks. The original study revealed that the DASH diet could significantly lower SBP and DBP as well as LDL cholesterol.[3]

The blood samples used in this current analysis study were samples curated by the National Heart, Lung, and Blood Institute Biologic Specimen and Data Repository Information Coordinating Center (BioLINCC) from three of the four original sites submitting samples in the DASH trial, totaling 326 of the 459 trial participants. Of these 326 participants, 108 were assigned to the control plan, 109 to the fruit and vegetable plan, and 109 to the DASH diet plan.

The three markers of cardiac injury were analyzed from the baseline and eight-week samples. As in the original trial, the mean age of participants was 45.2 years. Of the participants, 52% were men, 48% were women, and 49% were Black.

Exclusions for the original DASH trial, and therefore this analysis, included adults with diabetes mellitus, those taking antihypertensive medications, a body mass index greater than 35 kg/m^2, renal insufficiency, or self-reported alcoholic beverage intake of greater than 14 drinks per week.

Statistically significant changes in values of hs-cTnI and NT-proBNP from baseline to eight weeks were seen in both the DASH and fruit and vegetable diet, but not in hs-CRP levels. (*See Table 1.*)

Compared with the control diet, the DASH plan reduced hs-cTnI levels by 0.5 ng/L (95% confidence interval [CI], -0.9 to 0.1 ng/L) and NT-proBNP levels by 0.3 pg/mL (95% CI, -0.5 to -0.04 pg/mL), while the fruit and vegetable plan lowered hs-cTnI levels by 0.5 ng/L (95% CI, -0.9 to -0.2 ng/L) and NT-proBNP levels by 0.3 pg/mL (95% CI, -0.5 to -0.1 pg/mL). There were no differences noted among the plans regarding hs-CRP. (*See Table 2.*)

The authors acknowledge that both the DASH and the fruit and vegetable plans lowered markers equally for myocyte damage and strain during the eight-week period. They suggest that these plans were higher in fiber, magnesium, and potassium, leading to the effects, but suggest that further research is needed to confirm these findings. They suggest also that patient weight is a principal determinant of elevated hs-CRP levels in obese adults, because this dietary intervention did not result in weight reduction, unlike other studies that showed reduction in hs-CRP with weight loss.

The authors conceded a number of limitations to their study analysis. Not all specimens were available from the DASH trial, and the findings were only observational in association with the injury markers, not to effects on clinical outcomes. The study was only eight weeks in duration, again without effect on clinical outcomes. There was concern over the freeze-thaw of samples, causing drift in the test levels, especially hs-CRP.

However, the authors thought that their study showed strengths in the original control and administration of diet plans and the use of individuals without CVD. The diets were calorie-controlled, minimizing weight change factors on the markers. Therefore, the recent demonstration of changes in markers of cardiac injury and strain imply that in even the short term of eight weeks, the effect on future CVD events can occur from dietary interventions.

■ COMMENTARY

This study adds to what we already know, and to perhaps integrate into our daily healthcare practices; that dietary lifestyle changes can make a long-term effect in the

Table 1. Biomarker Differences at Eight Weeks from Baseline

Biomarker and Diet	Baseline	Eight Weeks	Difference from Baseline
Mean high-sensitivity troponin I (ng/L)			
Control	1.6 (0.2)	1.7 (0.2)	2.8%
Fruit-vegetable	2.7 (0.4)	1.8 (0.2)	-33.6%
DASH	1.3 (0.2)	0.9 (0.1)	-30.4%
Mean N-terminal pro-B-type natriuretic peptide (pg/mL)			
Control	23.1 (2.0)	24.2 (2.3)	4.5%
Fruit-vegetable	25.0 (2.3)	20.4 (1.6)	-18.3%
DASH	24.6 (2.0)	20.5 (2.0)	-16.5%
Mean high-sensitivity C-reactive protein (mg/L)			
Control	1.2 (0.2)	1.2 (0.1)	-0.6%
Fruit-vegetable	1.6 (0.2)	1.5 (0.2)	-2.8%
DASH	1.7 (0.2)	1.7 (0.2)	-0.8%

DASH: Dietary Approaches to Stop Hypertension

Table 2. Differences of Biomarkers Between Diet Plans		
Biomarker and Diet	**Absolute Difference (95% Confidence Interval)**	**Percent Difference (95% Confidence Interval)**
Mean high-sensitivity troponin I (ng/L)		
Fruit-vegetable vs. control	-0.5 (0.2)	-35.4 (-51.5 to -13.9)
DASH vs. control	-0.5 (0.4)	-32.3 (-47.4 to -12.9)
Fruit-vegetable vs. DASH	-0.0 (0.2)	-4.6 (-27.8 to 26.1)
Mean N-terminal pro-B-type natriuretic peptide (pg/mL)		
Fruit-vegetable vs. control	-0.3 (2.0)	-21.8 (-34.7 to -6.4)
DASH vs. control	-0.3 (2.3)	-20.1 (-33.7 to -3.7)
Fruit-vegetable vs. DASH	-0.0 (2.0)	-2.2 (-20.2 to 19.9)
Mean high-sensitivity C-reactive protein (mg/L)		
Fruit-vegetable vs. control	-0.0 (0.2)	-2.2 (-24.5 to 26.6)
DASH vs. control	-0.0 (0.2)	-0.2 (-21.2 to 26.3)
Fruit-vegetable vs. DASH	-0.0 (0.2)	-2.0 (-22.8 to 24.3)
DASH: Dietary Approaches to Stop Hypertension		

outcomes of our lives. Twenty-four years ago, research established the importance of aiding blood pressure reduction by increasing the amount of fresh fruits and vegetables in our diet and and reducing saturated fats, thereby increasing magnesium and potassium. This study presses forward to alert us that we also can reduce pre-event markers for cardiovascular damage and perhaps the events that change lives.

There may be no new tests to order for reassurance or concern, but there is more meaningful knowledge and conceptual information to pass on to our patients to help them be more healthful. The concepts, research, plans, and guides for the DASH dietary plan are readily available in books and online as technology apps and classes. One only needs to go to the internet for the wealth of reasonably reliable research and help. The information is available to us, and help is within the reach of the individual.

The scientific evidence supports the DASH diet in helping to control many aspects of heart disease, and even all-cause mortality.[9] In the recent report of the White House Conference on Food, Nutrition, and Health, listed in the number of priority executive recommendations was, "Equip health professionals with effective nutrition interventions and better nutrition knowledge."[10] Many medical specialty colleges and academic groups support the use of nutrition in prevention of chronic diseases. Nutrition is one of the six pillars of the American College of Lifestyle Medicine in supporting the prevention and treatment of chronic diseases, including CVD.

Analyzing NHANES data from 2007 to 2012 and comparing intake of nine nutrients to target amounts, Kim and Andrade found that the hypertensive patients scored poorly (2.6 out of a possible 9 score in accordance to DASH targets), and that the reported diet was associated with increased consumption of sodium, saturated fat, total fat, and protein.[11]

Certainly, financial hurdles and regular access to fresh foods in rural or urban areas where we describe "food deserts" are becoming more apparent and garnering attention in th national media and consciousness. Consuming fresh vegetables and fruit, as well as lean and grass-fed, free-range meats, is an expensive change. But the diet can be adopted in low-income communities at reasonable cost.[12,13]

The DASH plan has not been sold as a "quick fix" for the upcoming wedding or prom, but as a lifelong lifestyle approach to good health. It is not an eating style that is as fast or convenient as the population generally desires. It takes time, commitment, and discipline for individual change to occur.

Steinberg et al, in a viewpoint statement, address the economic hurdles and those of the clinician in providing counseling support for their hypertensive patients. They note that the clinicians often are too busy to tackle the details of lifestyle nutrition in a short office visit, advocating for sodium reduction at a minimum and referring patients to registered dieticians who are suited for dietary counseling. They note that the emergence of strategies of self-management health tools for cell phones are a unique opportunity to help educate, yet state that a limited number of tools truly are evidence-based.[14]

Twenty-four years after the original study, the DASH diet plan continues to resonate as a clinician's tool in facilitating CVD risk reduction. Given the evidence accumulated, it is an easy recommendation to make to all patients at risk for hypertension as well as those already working to reduce their hypertensive burden. Juraschek et al provided further data to support that dietary lifestyle

adherence potentially reduces preclinical damage and therefore CVD risk. Using this information to support patients individual efforts to improve or maintain their health status will be well worth the time and effort in doing so. ■

REFERENCES

1. Fuchs FD, Whelton PK. High blood pressure and cardiovascular disease. *Hypertension* 2020;75:285-292.
2. Bundy JD, Li C, Stuchlik P, et al. Systolic blood pressure reduction and risk of cardiovascular disease and mortality: A systematic review and network meta-analysis. *JAMA Cardiol* 2017;2:775–781.
3. Appel LJ, Moore TJ, Obarzanek E, et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med* 1997;336: 1117-1124.
4. Jia X, Sun W, Hoogeveen RC, et al. High-sensitivity troponin I and incident coronary events, stroke, heart failure hospitalization, and mortality in the ARIC study. *Circulation* 2019;139:2642-2653.
5. Everett BM, Berger JS, Manson JE, et al. B-type natriuretic peptides improve cardiovascular disease risk prediction in a cohort of women. *J Am Coll Cardiol* 2014;64:1789-1797.
6. Parrinello CM, Lutsey PL, Ballantyne CM, et al. Six-year change in high-sensitivity C-reactive protein and risk of diabetes, cardiovascular disease, and mortality. *Am Heart J* 2015;170:380-389.
7. Van Horn L, Carson JAS, Appel LJ, et al. Recommended dietary pattern to achieve adherence to the American Heart Association/American College of Cardiology guidelines: A scientific statement from the American Heart Association. *Circulation* 2016;134:e505–e529.
8. American Heart Association. Managing blood pressure with a heart-healthy diet. Updated Oct. 31, 2016. https://www.heart.org/en/health-topics/high-blood-pressure/changes-you-can-make-to-manage-high-blood-pressure/managing-blood-pressure-with-a-heart-healthy-diet
9. Soltani S, Arablou T, Jayedi A, Salehi-Abargouei A. Adherence to the Dietary Approaches to Stop Hypertension (DASH) diet in relation to all-cause and cause-specific mortality: A systematic review and dose-response meta-analysis of prospective cohort studies. *Nutr J* 2020;19:37.
10. Mande J, Willett W, Auerbach J, et al. Report of the 50th anniversary of the White House Conference on Food, Nutrition, and Health: Honoring the past, taking actions for our future. Boston, MA; March 2020.
11. Kim H, Andrade FCD. Diagnostic status of hypertension on the adherence to the Dietary Approaches to Stop Hypertension (DASH) diet. *Prev Med Rep* 2016;4:525-531.
12. Young CM, Batch BC, Svetkey LP. Effect of socioeconomic status on food availability and cost of the Dietary Approaches to Stop Hypertension (DASH) dietary pattern. *J Clin Hypertens (Greenwich)*. 2008;10:603-611.
13. Beydoun MA, Nkodo A, Fanelli-Kuczmarski MT, et al. Longitudinal associations between monetary value of the diet, DASH diet score and the allostatic load among middle-aged urban adults. *Nutrients* 2019;11:2360.
14. Steinberg D, Bennett GG, Svetkey L. The DASH diet, 20 years later. *JAMA* 2017;317:1529-1530.

CME QUESTIONS

1. In the Saint-Maurice et al study, a higher daily step count was found to:

a. be associated with decreased mortality until a plateau of 10,000 steps daily at a rapid rate; over this level did not seem to provide further, measurable health benefits.

b. be associated with decreased mortality in a dose-response pattern; evidence of a link between walk intensity and mortality diminished when adjusted for daily step count.

c. be associated with decreased mortality until a plateau of 10,000 steps daily at any rate (slow to rapid); over this level did not seem to provide further, measurable health benefits.

d. be associated with decreased mortality in a dose-response pattern; evidence of a link between walk intensity and mortality is suggested from this study as well, but pattern is not as linear and may plateau at moderate walk intensity.

2. Participants in the Dietary Approaches to Stop Hypertension dietary plan arm of the original 1997 study, as well as the additions of the 2020 Juraschek study, experienced changes in all the following parameters *except*:

a. systolic blood pressure.

b. high-sensitivity C-reactive protein.

c. high-sensitivity troponin I.

d. N-terminal pro-B-type natriuretic peptide.

[IN FUTURE ISSUES]

ADHD and Nutrition

Vitamin D, Altitude, and Colorectal Polyps

Acupuncture During Labor