



Texting and Educating on Lifestyle Therapy: A Pilot Study in a Spanish-Speaking Population in North Carolina

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Abstract

Background: Cardiovascular disease is a leading cause of death in Hispanic populations, largely due to the prevalence of risk factors such as diabetes and hypertension. Literature supports the use of mobile technology, particularly text messaging, as a nontraditional means to provide targeted health coaching and positively impact cardiovascular health.

Methods: The primary objective of this prospective cohort study was to determine the impact of an educational texting program on participants' blood pressure and confidence in managing their health. A total of 32 participants for this study were recruited via six weekly announcements during the Spanish Mass at a Catholic Church. Eligible patients were 18 years¹ or older, owned¹ a mobile phone with unlimited text messages, and provided informed consent. Following study enrollment, participants completed a pre-survey that described demographic characteristics, cardiovascular-related medical conditions, preference for English or Spanish messages, and confidence in managing their own health; investigators recorded the participants' blood pressure at baseline. Participants received two messages per week focused on lifestyle modifications for 20 weeks. At study conclusion, a total of 7 participants completed a post-survey assessing participant's perception of the program and a final blood pressure was recorded. The Siegel-Tukey was used to assess pre- and post-surveys; Wilcoxon signed-rank assessed pre- and post-blood pressure measurements.

Results: There were no differences in confidence measured before and after intervention. Participants who completed the post-survey found the messages to be helpful, ranking the messages 9/10 in terms of helpfulness, and 86% expressed interest in continuing their enrollment. There was a decrease in systolic blood pressure from pre-hypertensive to normal range (131 to 118 mmHg).

Conclusions: This pilot study exemplifies the potential benefits of a text messaging platform to provide health coaching.

Introduction

The Hispanic/Latinx population comprises the largest minority group in the United States; the majority of this population speaks Spanish at home.^{1,2,3} When compared to the non-Hispanic white population, this ethnic group is at a greater risk for cardiovascular disease, likely due to various cardiovascular risk factors such as uncontrolled hypertension, diabetes, obesity, and smoking.^{1,2} These elements have led heart disease to be the leading cause of death in this population. A study published in 2012 by the Journal of the

American Medical Association showed that 25% of Hispanic/Latino men and 24% of Hispanic/Latina women have hypertension, but only 15% reported taking prescribed anti-hypertensive medications.^{1,4} The Hispanic/Latinx population also has a higher risk for type 2 diabetes; compared to 11.3% of non-Hispanic/Latinx population, 22.6% of the Hispanic/Latinx population has a diagnosis of type 2 diabetes. Moreover, death related to diabetes was 51% higher in the Hispanic/Latinx population than in the non-Hispanic/Latinx white population.^{2,5} The prevalence of hypertension and diabetes, as well as the increased prevalence of diabe-

tes-related death, highlight the need for better management of cardiovascular risks in the Spanish-speaking population.

Lifestyle modifications such as exercising, weight loss, and consumption of a healthy diet have been proven effective in decreasing the risk of developing type 2 diabetes and improving blood pressure control.^{6,7} However, a study conducted in North Carolina showed that only 37.4% of Spanish-speaking participants met recommendations for physical activity, which could be associated with increased triglycerides, insulin resistance, and poor control of hypertension.^{8,9} Furthermore, as the median income for the Hispanic/Latinx population is substantially lower than their non-Hispanic counterparts, the typical diet may include more processed and high-calorie foods.^{10,11} Feeding America, a nonprofit charity organization composed of a nationwide network of food banks that feed underserved populations, reports that 17% of Hispanics in the United States participate in the program annually, compared to 10% of the white non-Hispanic population.¹² Lack of physical activity and access to healthy food pose as barriers to optimal control of cardiovascular risks in this population.¹³

In addition to lifestyle habits, the Hispanic/Latinx population reports low self-confidence in managing cardiovascular risks due to poor health literacy and lower socioeconomic status.^{2,14} A retrospective study showed that Spanish-speaking patients with type 2 diabetes were less likely to understand healthcare instructions such as prescription labels, which was shown to adversely affect glycemic control.¹⁴ The cost of managing cardiovascular risks is an additional barrier. Low income and a lack of health insurance were identified as primary reasons for Hispanic/Latinx patients not seeking medical care upon initial diagnoses of diabetes or hypertension.^{2,15} Resources in the Spanish language, cost-effective interventions reinforcing motivation for exercise, and providing tips on incorporating healthier foods may improve health outcomes by providing more accessible and understandable information.

Several organizations in North Carolina provide preventative healthcare to Spanish-speaking populations, including, but not limited to, blood pressure and blood glucose screenings. Our organization, the Student Health Action Coalition (SHAC)

Outreach, is a student-led interdisciplinary organization at the Eshelman School of Pharmacy at the University of North Carolina at Chapel Hill. SHAC Outreach provides healthcare services to underserved populations, including the Spanish-speaking congregation of a local Catholic church. SHAC Outreach provides monthly screenings with the goal of promoting awareness and increasing access to preventative care; however, more continuous support may be more effective in longitudinal health management.¹⁵ In an effort to improve health outcomes within the population we serve, the SHAC Outreach team began to explore the utility of mobile text messaging as a means to provide more frequent health coaching.

As access to mobile phones is becoming increasingly commonplace, recent studies have shown the success of cellular interventions in underserved populations through the reinforcement of lifestyle modifications.^{16,17,18} In particular, the TEXT ME study found that sending four text messages per week for six months to an underserved population with coronary heart disease significantly decreased low-density lipoprotein levels, body-mass index, and systolic blood pressure while significantly increasing physical activity.¹⁷

Our study, which was modeled after the TEXT ME study, aimed to evaluate the effectiveness of using cellular communication to enhance health outcomes in a community clinic situated in a Spanish-speaking Catholic church in suburban North Carolina. The primary objective of this study was to determine the impact of an educational text messaging program on participants' blood pressure and confidence in managing their own health. A secondary objective was to evaluate participant interest in continuing the program beyond the study.

Methods

This Institutional Review Board-approved prospective cohort study was conducted at a local Catholic church in Chapel Hill, North Carolina. Study participants were recruited through announcements at a Spanish-speaking Catholic mass for six consecutive weeks. The following inclusion criteria were used: age of 18 years or older and ownership of a mobile phone with unlimited text messaging (as assessed through interview

with the participant). Those without unlimited text messaging were excluded in the study to avoid placing a financial burden on participants. Participants provided consent prior to study enrollment. At the time of enrollment, participants completed a 7-item investigator-developed survey in either Spanish or English to self-report gender, age, diagnosis of type 2 diabetes mellitus (T2DM), hypertension (HTN), and/or hyperlipidemia (HLD), and preference for English or Spanish text messages. The pre-survey also assessed the frequency with which participants had difficulty understanding medical conditions and needed help reading prescriptions on scales of 1 to 5 (with 1 indicating never and 5 indicating always), as well as their confidence in self-management of their health on a scale of 1 to 10 (with 1 indicating least confident and 10 indicating most confident). The investigators manually measured and recorded each participant's baseline sitting blood pressure after participants rested for at least 5 minutes.

Following a rolling enrollment strategy, participants immediately began their 20-week intervention at the time of informed consent. The investigators sent two text messages per week using a secure texting platform, EZ Texting. Text messages informed the participants about simple lifestyle modifications. Investigators developed the recommendations using resources from the American Heart Association, American Society of Hypertension, National Institute of Health, and the National Heart, Lung, and Blood Institute (Appendix 1). For example, one text message read, "Whole grains are better for your heart, try whole wheat instead of white bread!" (Figure 1). All participants received the same messages in the same order, regardless of enrollment date. For example, the first message was always sent on the Tuesday following enrollment at 2:17pm. After the 20-week intervention, participants repeated the initial survey with three additional questions. The additional questions assessed the frequency with which participants read the messages on a scale of 1 to 3 (with 1 indicating never and 3 indicating always), the helpfulness of the messages on a scale of 1 to 10 (with 1 indicating not helpful and 10 indicating very helpful), and the desire to continue receiving messages (indicated with a yes or no). The investigators manually measured and recorded each participant's final sitting blood pressure after participants rested for at least

5 minutes. Survey questions with scaled responses were assessed with the Siegel-Tukey test; blood pressure readings were assessed using the Wilcoxon signed-rank test.

Results

Thirty-three participants enrolled in the study. One participant elected to withdraw from the study prior to initiation of the intervention. Of the 32 participants remaining, 97% (n=31) requested to receive Spanish-language messages. All study participants completed the 7-item pre-survey. Demographic data is found in Table 1. Participants of the study were 61% female (n=21) with a mean age of 48 years. Self-reported cardiovascular risk factors included 25% with T2DM (n=8), 22% with HTN (n=7), and 28% with HLD (n=9).

At the conclusion of the study, 7 persons completed the post-survey; 25 persons were lost to follow-up. Participants were sent a maximum of four messages as reminders to complete a post-survey. The median baseline score for participant difficulty understanding medical conditions was 2 and remained 2 upon study completion (1 indicating never, 5 indicating always). The median baseline score for participant needing assistance reading prescriptions was 2 and increased to 3 upon study completion (1 indicating never, 5 indicating always). The median baseline score for participant confidence managing health was 7 and remained 7 upon study completion (1 indicating least confident, 10 indication most confident). Of participants who completed both surveys at baseline and upon study completion, the mean systolic blood pressure decreased by 13 mmHg (95% confidence interval [CI] -27 to 0.7 mmHg, p=0.06) while the mean diastolic blood pressure decreased by 1 mmHg (95% CI -8 to 7 mmHg, p=1.00).

The median score for how often messages were read was 3 (1 indicating never, 3 indicating always). The median score in helpfulness of the messages was 9 (1 indicating least helpful, 10 indicating very helpful). Of participants who completed both pre- and post-surveys, a total of 6 persons (86%) expressed desire to continue the text-messaging program beyond study completion.

Figure 1. Example of text messages received by participants

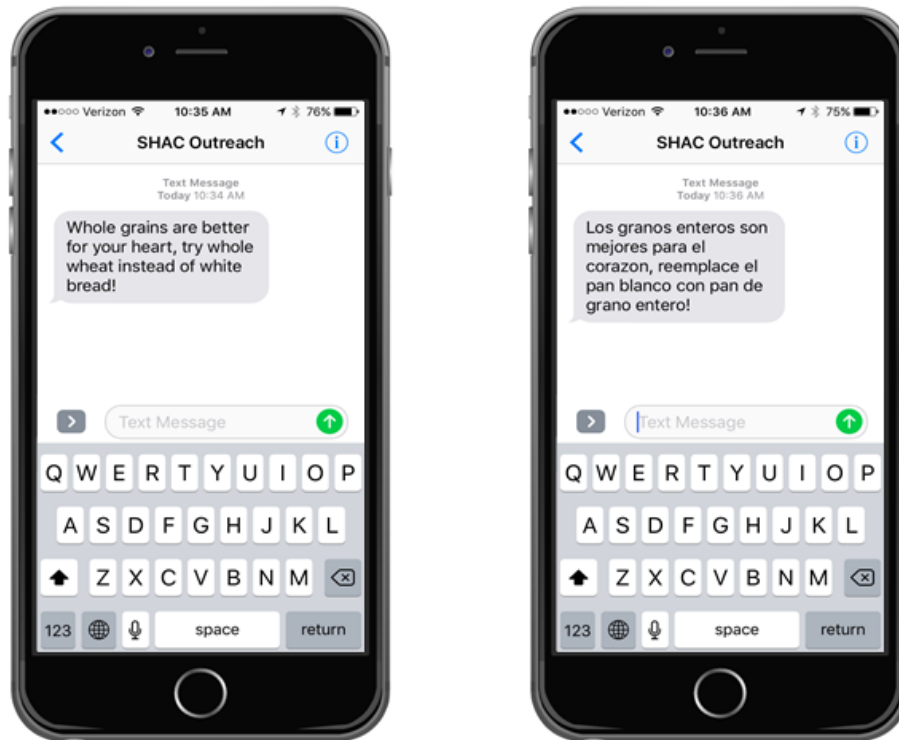


Table 1. Baseline characteristics

Characteristic	
Age, mean (SD)	48 (9)
Female, n (%)	21 (66)
Preference for Spanish messages, n (%)	31 (97)
Self-reported medical conditions, n (%)	
Type 2 diabetes	8 (25)
Hypertension	7 (22)
Hyperlipidemia	9 (28)
Blood pressure, mean mmHg (SD)	
Systolic mean	125 (17)
Diastolic mean	75 (10)

N = 32; SD: standard deviation

Discussion

The baseline characteristics of our study population are similar to those reported in national studies, especially in terms of the percentage of the population with cardiovascular risks such as T2DM and HTN. However, the mean baseline blood pressure of this population was within normal limits, which may indicate that this population is appropriately managed with medications. Future health interventions therefore should survey specific medications taken by participants to ensure that lifestyle modifications are combined with optimal medication management. Additionally, this study suggests that interventions should be conducted in a patient’s native language, as the majority of participants elected to receive the intervention in Spanish.

A decrease in mean systolic blood pressure by 13 mmHg was found at the conclusion of the text messaging intervention. While blood pressure may fluctuate based on various factors including

the consumption of caffeine, recent exercise, sitting with legs crossed, and changes in equipment or personnel involved, the marked decrease in mean systolic blood pressure may indicate that text messages reinforcing lifestyle changes make a positive impact on blood pressure control.¹⁹ As the study design did not control for the effect of any outside factors (new medications, etc.), the intervention cannot definitively take credit for the demonstrated blood pressure lowering. Future studies could improve upon this data by increasing the number of blood pressure readings obtained per participant, increasing the number of participants who return for follow-up, standardizing the measurements, and adding a control group. Furthermore, other markers of increased risks for heart disease may also be measured such as pre- and post-cholesterol levels as well as atherosclerotic cardiovascular disease risk status.

A primary objective of this study was to determine the impact of a text-messaging program on participants' confidence in managing their own health. The data shows no change after the intervention, with the mean confidence score remaining at 7/10 (with 10 being most confident). The results may be due to the small sample size and the method of measurement. Increasing the size of the study and improving rate of follow-up would allow for a more accurate approximation of the intervention's effect on confidence in managing health. Refining the questionnaire to include questions beyond the basic "How confident are you in managing your own health?" would improve the study's ability to demonstrate effect in this area. Additionally, this study only looked at the participants' confidence in maintaining their health and did not evaluate their retention or application of lifestyle modification information beyond blood pressure measurements. To further improve participant confidence, future studies should focus on individualizing the messages by identifying and targeting participants' specific health management needs.

The intervention received very positive feedback from participants who followed-up. Patient interest in and enthusiasm for the management of his or her health is a crucial step in creating a successful lifestyle modification program.²⁰ There was appreciable interest in continuing to receive text

messages beyond the end of the study, and no interested participants were excluded from the study due to a lack of unlimited texting. This indicates that future text messaging interventions in this Spanish-speaking population will be both feasible and acceptable.

A limitation of this study was the substantial percentage of patients who did not complete follow-up procedures despite multiple text message reminders, which may have introduced a participation bias. One possible explanation includes the lack of incentives to complete the post-survey. Because we made no contact beyond the biweekly messaging during the 20-week intervention, participant interest in measuring their progress (or in the text messages) may have waned. Incorporating incentives may be able to increase follow-up.

In conclusion, this study is the first to investigate the effect of a Spanish-language text messaging platform on the blood pressure and confidence in personal health maintenance of a Spanish-speaking population in suburban North Carolina. Despite an unchanged confidence in managing personal health, participant interest for the program, combined with the low financial burden, indicate that a texting intervention is a feasible method for student-run clinics to provide more frequent health coaching for Spanish-speaking populations.

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Disclosures

The authors have no conflicts of interest to disclose.

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Appendix 1. TExT Project Message Bank

Week 1	Message (English)	Message (Spanish)	Source
Monday 10:17am	For a healthier option, try replacing your soda and sweetened juice with water today!	Para una opción más saludable, usted puede reemplazar el refresco y jugo endulzado con agua hoy!	American Society of Hypertension
Wednesday 2:18 pm	Try to be active everyday! Walk as much as you can. Every step counts!	¡Intente ser activo todos los días! Camine lo más que pueda. ¡Cada paso cuenta!	American Society of Hypertension
Week 2	Message (English)	Message (Spanish)	Source
Saturday 10:13 am	Read food labels to find out how much sodium (salt) you eat every day. Aim to eat less than 1500 mg of sodium per day.	Lea usted las etiquetas del alimento para averiguar la cantidad de sal que come cada día. Intente comer menos de 1500 mg del sodio cada día.	American Society of Hypertension
Wednesday 11:07am	Do you or someone you know take medications? If so, always follow the directions on the bottle. If they are unclear, contact your doctor or pharmacist for help!	Siempre siga las direcciones en la botella del medicamento. Si no están claro, contacte con su médico o farmacéutico para ayuda.	American Heart Association
Week 3	Message (English)	Message (Spanish)	Source
Tuesday 3:03 pm	Try to replace your salty snack food with fruits and vegetables today!	Intente reemplazar su tentempié salado con las frutas y las verduras hoy!	American Society of Hypertension
Thursday 9:25 am	Try taking the stairs instead of an elevator as many times as possible this week!	Intente usar las escaleras en vez del ascensor esta semana!	American Heart Association
Week 4	Message (English)	Message (Spanish)	Source
Tuesday 8:00 pm	Try walking or jogging in place while you watch your favorite 30-minute TV show today.	Intente caminar o correr en lugar mientras mirar su programa favorito de la tele hoy.	American Heart Association
Thursday 8:15 pm	End each day telling yourself 5 things that you like about yourself. This can boost self esteem and reduce stress.	Termine cada día por decirse a usted mismo 5 cosas que le gustan sobre usted mismo. Esto puede estimular la autoestima y reducir el estrés.	Substance Abuse and Mental Health Services Administration
Week 5	Message (English)	Message (Spanish)	Source
Monday 9:15 am	Whole grains are better for your heart, try whole wheat instead of white bread	Los granos enteros son mejores para la corazón, reemplace el pan blanco con el grano entero!	NIH National Heart, Lung, and Blood Institute

Thursday 8:05pm	Stressful day at work? Take a moment to unwind and decompress - it's good for your heart!	¿Un día estresante al trabajo? Tome usted un momento para relajarse - ¡es bueno para el corazón!	NIH National Heart, Lung, and Blood Institute
Week 6	Message (English)	Message (Spanish)	Source
Saturday 11:00 am	When was the last time you took a family walk around the block? It can be a great way to bond and exercise at the same time!	¿Cuándo fue la última vez que caminó alrededor de la cuadra con su familia? ¡Es una manera excelente de hacer ejercicios y pasar tiempo conjuntos!	NIH National Heart, Lung, and Blood Institute
Wednesday 2:00 pm	While trans fats aren't good for you, unsaturated fats like avocados, nuts, and fish can lower your cholesterol and prevent heart disease	Las grasas insaturadas como los aguacates, las nueces, y los pescados son buenas para la salud. ¡Bajan el colesterol y prevenir la enfermedad cardíaca!	NIH National Heart, Lung, and Blood Institute
Week 7	Message (English)	Message (Spanish)	Source
Monday 11:00 am	Do you smoke or do you know someone who does? Quitting smoking can decrease your risk of developing heart diseases.	¿Fuma usted o fuma alguien quien conoce? Dejar de fumar puede subir el riesgo de desarrollar enfermedades cardíacas.	NIH National Heart, Lung, and Blood Institute
Wednesday 3:30 pm	Try to limit your intake of red meat- go for chicken and fish instead of steak!	Intente usted de limitar el consumo de carne roja - el pollo y pescado son opciones buenas en vez del bistec!	American Heart Association
Week 8	Message (English)	Message (Spanish)	Source
Saturday 10:35 am	Have you played a game outside with your kids or your friends recently? Sports can be a great way to have fun and stay healthy!	¿Ha jugado afuera con sus niños o amigos recientemente? ¡Los deportes son una manera buena de divertirse y mantener la salud!	American Heart Association
Wednesday 2:37 pm	Use smaller plates to help control your portion sizes.	Usar los platos pequeños puede ayudarle a controlar el tamaño de las porciones.	American Heart Association
Week 9	Message (English)	Message (Spanish)	Source
Tuesday 11:15 am	Try parking your car at the far end of the parking lot to get in a few more steps!	Usted puede aparcar su carro lejos del edificio para hacer más ejercicio!	American Heart Association
Thursday 4:13 pm	Try replacing whole milk with skim milk for a healthier option.	Para una opción más saludable, reemplace la leche entera con la leche descremada.	American Heart Association

Week 10	Message (English)	Message (Spanish)	Source
Monday 10:15 am	Drinking a warm glass of water with lemon can help food digestion and weight loss.	Beber un vaso templado de agua con limón puede ayudar con la digestión y la pérdida del peso.	American Society of Hypertension
Wednesday 3:18 pm	You can practice yoga, meditation, and deep-breathing to help reduce stress.	Usted puede practicar el yoga, la meditación, y los ejercicios respiratorios para reducir el estrés	American Society of Hypertension
Week 11	Message (English)	Message (Spanish)	Source
Friday 3:45 pm	Games are fun, right? Try making a competition out of exercising between family and friends to help you commit to your goals	¿Los juegos son divertidos, sí? Usted puede convertir el ejercicio en un juego entre familia y amigos para ayudar a lograr sus metas	American Society of Hypertension
Tuesday 11:10 am	Avoiding certain foods such as deli meat, pickles, frozen pizza, and salt can help maintain healthy blood pressure levels	Evitar comidas como la carne del delicatessen, encurtidos, pizza congelada, y sal puede ayudar a mantener la presión arterial saludable.	American Society of Hypertension
Week 12	Message (English)	Message (Spanish)	Source
Monday 2:00 pm	Always talk to your primary care provider before taking herbal supplements.	Usted siempre debe consultar con su médico antes de tomar los suplementos de hierbas.	ASHP Guidelines on Pharmacist-Conducted Patient Education and Counseling
Wednesday 10:37 am	Create a Food Diary so that you can document what you're eating. This can help you either maintain healthy eating habits or alter habits that are unhealthy.	Usted puede crear un diario de comida para documentar lo que coma. Esto puede ayudar a mantener hábitos saludables o cambiar los hábitos que no son saludables.	American Heart Association
Week 13	Message (English)	Message (Spanish)	Source
Tuesday 4:18 pm	Remember to monitor your blood pressure regularly and share your results with your doctor or pharmacist!	No olvídense usted a chequear la presión arterial regularmente y compartir los resultados con su médico o farmacéutico.	American Society of Hypertension
Thursday 10:07 am	Craving something sweet? Try adding fruit and granola to fat-free or low-fat yogurt for a delicious snack!	¿Ansia usted los dulces? ¡Puede añadir frutas y granola al yogur sin grasa para un tentempié delicioso!	American Society of Hypertension
Week 14	Message (English)	Message (Spanish)	Source
Monday 2:18 pm	If you are stressed, take 15-20 minutes every day to relax, sit, breathe and think of things that make you happy!	¡Recuerde a tomar 15-20 minutos cada día para relajarse, sentarse, respirar, y pensar de cosas que le hacen feliz!	American Heart Association

Wednesday 11:00 am	Try working out with a friend; it's fun and it keeps you accountable!	Hacer ejercicios con amigos es divertido y mantiene su responsabilidad al ejercicio.	American Heart Association
Week 15	Message (English)	Message (Spanish)	Source
Monday 10:00 am	It's important to take mini-breaks during the work day. Stop what you're doing, massage your shoulders and neck, stretch and walk around, or drink some water.	Tomar descansos pequeños durante el día de trabajo es importante. Párese usted, se masajee los hombros y el cuello, estire y camine, o beba el agua.	American Heart Association
Thursday 3:00 pm	Keep a journal to jot down your day. This can help you identify sources of stress and avoid them in the future	Mantenga usted un diario del día. Eso puede ayudarle a identificar fuentes del estrés y evitarlos en el futuro.	Substance Abuse and Mental Health Services Administration
Week 16	Message (English)	Message (Spanish)	Source
Tuesday 2:05 pm	Don't be afraid to ask your doctor or pharmacist any questions or concerns you might have about your medications!	¡No ten miedo de preguntar a su médico o farmacéutico de algunas preguntas o preocupaciones de sus medicamentos!	ASHP Guidelines on Pharmacist-Conducted Patient Education and Counseling
Thursday 11:00 am	Try making your own healthy snack so you can control the portion size! Go for unsalted nuts, raisins or popcorn.	Hacer su propia merienda saludable permite control de la talla de porciones. Buenas opciones incluyen las nueces sin sal, las pasas, y las palomitas de maíz.	American Heart Association
Week 17	Message (English)	Message (Spanish)	Source
Tuesday 4:00 pm	When going out to eat, ask to substitute fried sides with healthier options, such as vegetables.	Al restaurante pida usted a sustituir los platos adicionales fritos con opciones más saludables como las verduras.	American Heart Association
Thursday 11:18 am	Walking for as few as 30 minutes each day can provide huge heart benefits!	¡Caminar por lo menos 30 minutos cada día puede proveer beneficios cardíacos grandes!	American Heart Association
Week 18	Message (English)	Message (Spanish)	Source
Monday 10:07 am	Try eating fresh fruit instead of dessert this week!	¡Intente usted a comer frutas frescas en vez del postre esta semana!	American Heart Association
Wednesday 3:20 pm	Try parking farther away from stores and walking the extra distance this week.	¡Usted puede aparcar su carro lejos del edificio para hacer más ejercicio!	American Heart Association

Week 19	Message (English)	Message (Spanish)	Source
Tuesday 2:15 pm	What are your favorite dance songs? Try dancing to them for a fun exercise!	¿Cuales son sus canciones favoritas? ¡Escuchar música y bailar es un ejercicio divertido!	American Heart Association
Thursday 11:30 am	Is everything in the South really better fried? How about we “fry” that idea and instead grill/bake your foods. This can help with weight loss and cholesterol.	¿De verdad sea toda la comida frita mejor? Hornear y asar la comida puede ayudar con la pérdida del peso y el colesterol.	American Heart Association
Week 20	Message (English)	Message (Spanish)	Source
Monday 10:00 am	Create a rewards system that helps motivate you to live a healthy lifestyle. Treat yourself to an activity that you enjoy after you accomplish an exercise goal.	Cree usted un sistema de recompensa que le motiva a vivir una vida saludable. Premíese con una actividad que usted goza después de lograr una meta de ejercicio	American Heart Association
Wednesday 1:45 pm	Looking for healthy recipes? Local libraries have healthy cookbooks you can borrow. Or you can search online for “healthy recipes” for more ideas!	¿Busca usted las recetas saludables? Bibliotecas locales tienen libros con recetas saludables. O puede buscar en línea “recetas saludables” para más ideas.	NA
<i>NIH: National Institutes of Health; ASHP: American Society of Health-System Pharmacists; NA: Not Applicable</i>			