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Perspectives of Health and Eating Behaviors in Marathon and Half-Marathoners

Original Research

Laurie Stickler, PT, DHS, OCS[1] Isaac J. Harding, SPT,[2] Michelle N. Koetje, SPT,[2] Heather M. Minder, SPT,[2] Barbara Hoogenboom, PT, EdD[1]

[1]*Professor, Grand Valley State University Department of Physical Therapy and Athletic Training, Grand Rapids, MI, USA*
[2]*Graduate Student, Grand Valley State University Department of Physical Therapy and Athletic Training, Grand Rapids, MI, USA*

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Abstract

Introduction: Marathon and half-marathon runners are a growing population of athletes who have unique training and nutritional demands that put them at risk for health issues. The purpose of this study was to investigate perspectives regarding sport-related health and factors impacting eating behaviors in adult marathoners and half-marathoners.

Methods: The Runners Health Choice Questionnaire was deployed online and distributed via a snowball sampling approach. Participants were adult runners who had completed a marathon or half-marathon in the previous three years and planned to participate in another marathon or half marathon in the next 24 months. Collegiate athletes were excluded.

Results: Five hundred male and female marathon and half-marathon runners ages 18-79 completed the survey. The relationship between sex and diet classification was significant (χ^2 [1, 500]= 7.2194, p= 0.0072); males were significantly more likely to select an atypical diet when compared to females. *Time to prepare meals* (83.40%) and *training run/race that day* (81.00%) had a moderate to high impact on daily meal decisions. If provided new nutrition education, 77.24% of runners reported being *very likely* or *somewhat likely* to change their diet.

Conclusions: Health and eating behaviors and decisions are complex and impacted by several variables: time, training, and an athlete's age and sex. However, runners have a desire to be healthy and a willingness to change with new nutritional information.

Key Words: nutrition, runners, survey

Corresponding author: Laurie Stickler, PT, DHS, OCS; sticklel@gvsu.edu

Introduction

Competitive and recreational running has increased in popularity throughout the 20th century and continues into the present day. There has been an increase of over 57% in running participation in the last 10 years alone,[1] reflected in participation in races ranging from 5Ks to marathons.[2] The training regimen of a marathon runner has been shown to be high in volume and frequency.[3–5] Olympic marathon trials qualifiers, including both male and female runners, average 90 and 72 miles per week respectively.[3] As mileage goes up so do dietary demands.[3–6] Training at moderate to high intensity can burn 600-1,200 kilocalories per hour[6] depending on intrinsic and extrinsic factors including training

intensity, training volume, height-weight ratio, sex, and age. Therefore, personalized eating plans are required to meet exercise demands in order to prevent low energy availability (LEA).[7]

The results of several studies indicate that both elite and recreational athletes may not consume sufficient nutrients through daily food to support their athletic needs.[4,8,9,10,11,12] LEA puts athletes at risk for developing the female athlete triad (triad) and relative energy deficiency syndrome (RED-S).[13–16] Both the triad and RED-S place individuals at an increased risk for health issues including stress fractures and reproductive disturbances.[14,15,17] Long distance runners specifically are known to be an at-risk group for developing stress fractures as an overuse injury due to repetitive mechanical loading sustained during training and their potential for having low bone density.[18-21] Other risk factors associated with stress fractures are an increase in training volume or intensity, prior stress fracture, low BMI, dietary disorders, and older age.[22] All of these factors can be prevalent in an adult marathoner population. Investigating the health and eating behaviors of runners may help reduce LEA and therefore decrease injury and health risks and improve participation in sport, running, and physical activity.

The rise in the popularity of marathons and half-marathons may lead to the risk for health and nutrition related injury and illness in these runners. Previous research that has been conducted in recreational and professional marathoners focuses on training characteristics,[3,4,8] and studies exploring sport-related health and eating behaviors have focused on collegiate cross-country runners, who experience different demands.[23,24] Developing an understanding of adult marathoners' and half-marathoners' nutritional and health choices, including the reasoning behind their beliefs, is imperative before beginning to attempt to address issues such as LEA, RED-S, and the triad in this population. Therefore, the purpose of this study was to investigate perspectives regarding sport-related health and factors impacting eating behaviors in adult marathoners and half-marathoners.

Scientific Methods

A cross-sectional survey research design was employed for the purposes of this study. The survey utilized was The Runner's Health Choices Questionnaire (RHCQ) (Appendix A), which was previously created and piloted by Stickler et al.[24] It was originally developed using information from qualitative studies and relevant research in order to survey health beliefs and eating behaviors in female collegiate cross-country runners. Face and content validity of the RHCQ were established by a panel of experts.[24] Since then, the questionnaire has been effectively adapted to be utilized with male distance runners.[23] Likewise, for the purposes of this study, wording was modified slightly for adult marathon and half-marathon runners.

Participants

To be included in this study, participants had to be 18 years of age or older, must have previously competed in a half or full marathon (virtual or live event) in the prior three years, and be enrolled in/registered for or planning to compete in a half or full marathon or virtual marathon in the upcoming 24 months. Participants were excluded if they were current collegiate runners or under the age of 18. Each participant voluntarily read and agreed to an informed consent in an online format prior to completing the survey. Human subject approval was obtained by the Grand Valley State University Human Research Review Committee.

Protocol

The survey was administered through the online platform, QualtricsXM (Provo, UT). A goal of 298 participants was set using a power analysis for a chi-squared test assuming four degrees of freedom, an effect size of 0.2, and a power of 0.8.[25] The survey was distributed through various methods including emailing running club coaches, race directors, and the researchers' personal running contacts, posting to Facebook , Instagram and Twitter, and by posting flyers at local running events as well as running associated businesses. *Running in the USA* database was utilized to systematically identify marathon and half-marathon contacts. Running clubs were identified utilizing internet searches. Respondents were given a Quick Response (QR) code or a web link to allow for survey completion. A snowball sampling approach was used in which respondents were encouraged to share the survey with other recreational runners. The expected amount of time to complete the survey was approximately fifteen minutes. Survey incentivization included two drawings for a $20 gift card. Emails for the drawing were not linked to the survey answers.

Statistical Analysis

Incomplete surveys and extreme outliers were excluded from response analysis. Trends and patterns among responses were analyzed using descriptive statistics. Statistical tests used included chi-square analyses (to compare two categorical

variables) and ordinal logistic regression (to compare an explanatory continuous variable with categorical ranks). The level of significance used was $p < 0.05$.

Results

Demographics

Five-hundred and ninety runners fully met the inclusion criteria and participated in the survey. Of those, 84 participants were excluded for incomplete data, and six participants were excluded as extreme outliers (i.e., reported running times that were below the world record), leaving 500 participant responses for analysis.

Of the respondents, 54.4% were female and 45.6% were male. Participants reported ages ranging from 18 to 79, with a mean age of 36.4 years for females, 34.6 for males, and 35.6 across all participants. When asked to identify their race/ethnicity, 88.4% reported white; the remaining 11.6% was divided among Hispanic or Latino, Black or African American, Native American or American Indian, Asian/Pacific Islander, Native Hawaiian or Pacific Islander, and "other/prefer not to answer," or a combination thereof.

For this study, "Marathoners" were defined as any participant who had completed at least one marathon (including those who had also run half-marathons), while "half-marathoners" were considered any participant who had never completed a marathon but had completed at least one half-marathon. Of the respondents, 25.0% were half-marathoners, while 75.0% were marathoners. The average weekly mileage for marathoners and half-marathoners was 45.6 mi/week and 23.2 mi/week, respectively. The average weekly mileage for all female runners was 28.6 mi/week and 33.7 mi/week for male runners.

Why Do You Run?

Participants were presented with the question "Why do you run?" The top choice was *to stay healthy* for females (25.74%) and a tie between *to stay healthy* and *enjoyment* for males (22.8%).

Diet Classification

Participants were asked to classify their diet. The majority of participants classified their diet as *regular* (68.80%); followed by the remaining classifications of *vegan* (11.80%), *other* (6.00%), *vegetarian* (5.80%), *pesco-vegetarian* (4.20%) and *paleo* (3.40%). For the purposes of our analysis, we classified the response of *regular* as a "typical" diet, and all other answer options as an "atypical" diet. The relationship between sex and diet classification was significant (χ^2 [1, 500]= 7.2194, p= 0.0072). Males were significantly more likely to select an atypical diet (37.28%) when compared to females (26.10%). No relationship was found between age and a participant's likelihood of having a typical diet as opposed to an atypical diet (χ^2 [1, 500] = 0.0138, p=0.906).

Participants were also asked how much of an impact 13 different factors had on their choice of overall diet classification. The factors that were most often ranked "high impact" were *enjoyment of food* (52.4%), *makes you feel healthy* (40.6%), *health condition* (32.2%), and *athletic performance* (29.8%). The factors that were most often ranked "no impact" were *religious reason(s)* (64.4%), *coach* (53.6%), and *animal welfare* (38.2%).

Likelihood of Diet Change with New Information

When asked how likely or unlikely participants were to make dietary or health changes when given new information from a healthcare professional, most participants reported that they were either *very likely* (19.24%) or *somewhat likely* (58.12%) to do so. The remaining participants reported that they were either *unsure* (15.23%), *somewhat unlikely* (4.81%) or *very unlikely* (2.61%) to make a dietary change. There was no significant difference between sex and likelihood of making dietary or health changes (χ^2 [4, 499]= 0.8749, p=0.9281). Similarly, ordinal logistic regression indicated no relationship between age and the likelihood of making a dietary change given new nutritional information (χ^2 [1, 499] = 0.4373, p=0.5087).

Nutrition Sources

Participants were asked about their frequency of use of ten different sources of nutritional information on a scale from "never" to "often." Based on combined percentages from the "often" and "occasionally" answer options, the most used nutrition sources were internet sources (66.60%), friends/peers (46.40%) and social media (45.20%). The complete breakdown of results is presented in Table 3. When examining the relationship between sex and frequency of nutrition source, males were significantly more likely to select *coach*, (χ^2 [3, 500]= 16.6507, p=0.0008) *magazines*, (χ^2 [3, 500]= 13.5040, p=0.0037) and *nutritional course* (χ^2 [3, 500]= 9.6995, p=0.0213) when compared to females. Females

selected *registered dietitian* (χ^2 [3, 500]= 18.5646, p=0.0003) as a source significantly more often than males. There were no statistical differences between males and females for the remaining seven nutritional choices (Table 1).

Table 1. Chi Square Results for Q22- Sources for Nutritional Information and Sex

DOF: 3	**Sample Size: 500**	
	Pearson Chi-Square	**P-Value**
Coach	16.6507	0.0008*
Friends/Peers	1.9669	0.5793
Family	3.2111	0.3602
Social media	1.24487	0.7423
Internet Sources	7.1626	0.0669
Magazines	13.5040	0.0037*
Book/Textbook	5.2403	0.1550
Nutritional Course	9.6955	0.0213*
Registered Dietitian	18.5646	0.0003*
Primary Care Physician	2.8807	0.4104

*Indicates statistically significant result, p-value < 0.05.

When examining the relationship between age and source of nutritional information (Table 2), proportional odds ratios for both family and social media were not met, so the resulting models were unreliable; all other proportional odds ratios were met. Age had a significant impact on the usage of three different nutritional sources: *coaches*, *nutrition courses*, and *dieticians*. For every one-year increase in age, i.e., increasing from age 18 to 19, the odds of using a coach for nutrition information often are 0.944 to 0.975 times less than using a coach for nutrition information less than often (*sometimes*, *rarely*, or *never*), given that all of the other variables are held constant (χ^2 [1, 500]= 26.2467, p<0.0001). Similar outcomes were seen for both nutrition courses and dieticians. For every one-year increase in age, the likelihood of using a course for nutritional information often is 0.955 to 0.983 times less (χ^2 [1, 500]= 18.0711, p<0.0001), and the likelihood of using a dietician for nutritional information often is 0.952 to 0.982 times less (χ^2 [1, 500]= 18.7446, p<0.0001), given that all other variables are held constant. In summary, as a participant gets older, they are less likely to report *often* using a coach, nutrition course, or dietician to obtain nutrition information.

Daily Meal Decisions

Participants were asked how much of an impact 11 different factors had on their daily meal decisions. The answer options ranged from no impact to high impact. The most common factor that had a moderate to high impact on daily meal decisions was *time to prepare meals* (83.40%). This was followed by *training run/race that day* (81.00%) and *creating a balanced diet* (80.00%). The factors that had the least impact on daily meal decisions and were most selected to have no impact were *coach* (59.40%) and *friends/peers* (28.40%). When examining the relationship between participant sex and the impact of factors on daily meal decisions we found a significant relationship between participant sex and the reported impact on daily meal decisions. Females were significantly more likely than males to report their daily meal decisions to be moderately to highly impacted by *creating a balanced diet* (χ^2 [3, 500]= 15.9702, p=0.0012), *nutritional knowledge* (χ^2 [3, 500]= 18.9178, p=0.0003), *experience with cooking* (χ^2 [3, 500]= 9.3357, p=0.0251), and *time to prepare meals* (χ^2 [3, 500]= 18.2183, p=0.0004), while males were significantly more likely than females to report their daily meal decisions to be moderately to highly impacted by a *coach* (χ^2 [3, 500]= 35.4304, p=<0.0001) and by *friends/peers* (χ^2 [3, 500]= 7.9260, p=0.0476). Additionally, the factor of *family* (χ^2 [3, 500]= 8.7566, p=0.0327) was more likely to be reported by females to have either a high impact or no impact while males were more likely to report *family* having either a minimal or moderate impact on daily meal decisions. There were no significant relationships in responses between males and females for the remaining six factors (See Table 3).

Table 2. Age vs. Nutrition Source Proportional Odds, Ordinal Logistic Regression (n=500)

Source	Proportional Odds Met	Proportional P-value	χ^2 Value	Model P-value	Odds Ratio (Lower, Upper)
Coach	$\chi^2(2) = 0.5698$	0.7521	26.2467	<0.0001	0.944, 0.975
Peers	$\chi^2(2) = 1.4558$	0.4829	0.3059	0.5801	0.982, 1.01
Family	$\chi^2(2) = 8.3223$	0.0156*	2.6297	0.1045	0.975, 1.002
Social Media	$\chi^2(2) = 6.3311$	0.0422*	2.3669	0.1243	0.976, 1.003
Internet	$\chi^2(2) = 2.6492$	0.2659	0.2045	0.651	0.989, 1.07
Magazines	$\chi^2(2) = 4.8955$	0.0865	3.2636	0.0711	0.999, 1.027
Books	$\chi^2(2) = 2.2058$	0.3319	1.1331	0.287	0.994, 1.021
Course	$\chi^2(2) = 2.1111$	0.3480	18.0711	<0.0001	0.955, 0.983
Dietitian	$\chi^2(2) = 0.9407$	0.6248	18.7446	<0.0001	0.952, 0.982
Primary Care Doctor	$\chi^2(2) = 3.6392$	0.1621	0.0508	0.8217	0.985, 1.012

*Indicates that the proportional odds assumption was not met, so the test is not reliable.

Table 3. Chi Square Results for Q13- Daily Meal Decisions and Sex (n=500)
DOF: 3 Sample Size: 500

	Pearson Chi-Square	P-Value
Health Concerns	3.2070	0.3608
Creating a Balance Diet	15.9702	0.0012*
Nutritional Knowledge	18.9178	0.0003*
Experience with Cooking	9.3357	0.0251*
Time to Prepare Meals	18.2183	0.0004*
Presence of Others	4.5318	0.2095
Family	8.7566	0.0327*
Friends/Peers	7.9260	0.0476*
Coach	35.4304	<0.0001*
Cost	0.8797	0.8303
Training Run/Race That Day	0.3042	0.9592

*Indicates statistically significant result, p-value < 0.05.

No relationship was found between age and health concerns, nutritional knowledge, or experience with cooking. There was a relationship found between age and *creating a balanced diet* (χ^2 [1, 500]= 7.4245, p=0.0064), *family* (χ^2 [1, 500]=4.4795, p=0.0346), *time to prepare meals* (χ^2 [1, 500]=5.7441, p=0.0164), *friends/peers* (χ^2 [1, 500]=11.7036, p=0.0006), *coach* (χ^2 [1, 500]=17.2421, p<0.0001), and *cost* (χ^2 [1, 500]=15.6661, p<0.0001) (Table 4). Proportional odds ratios were not met for the *presence of others* and *training/racing*, so these models are not reliable (Table 4). As participants aged, they were more likely to consider *creating a balanced diet* and *family* when making daily meal decisions. For every

one-year increase in age, the likelihood that a participant would rate *creating a balanced diet* as having a high impact on their meal decisions increases by 1.006 to 1.035 times and *family* 1.001 to 1.029 times. The younger the participant, the more likely runners were to consider *time to prepare meals*, *friends/peers*, *coach*, and *cost* as factors that have a *high impact* on their daily meal decisions. For every one-year increase in age, the likelihood that a participant would rate *time to prepare meals*, *friends/peers*, *coach*, and *cost* as having a high impact on their meal decisions decrease by 0.969 to 0.997 times, 0.962 to 0.99 times, 0.945 to 0.986 times, and 0.959 to 0.986 times, respectively.

Table 4. Age vs. Factors Affecting Daily Meal Decisions, Ordinal Logistic Regression (n=500)

	Proportional Odds Met	Proportional P-value	χ^2 Value	P-value	Odds Ratio (Lower, Upper)
Health Concerns	$\chi^2(2) = 4.6125$	0.0996	2.3269	0.1288	0.997, 1.05
Creating Balanced Diet	$\chi^2(2) = 3.1007$	0.2122	7.4245	0.0064	1.006, 1.035
Nutritional Knowledge	$\chi^2(2) = 2.9879$	0.2245	3.2876	0.0689	0.999, 1.028
Cooking Experience	$\chi^2(2) = 3.2646$	0.1955	1.8887	0.1696	0.976, 1.004
Time to Prepare Meals	$\chi^2(2) = 0.2292$	0.8917	5.7441	0.0164	0.969, 0.997
Presence of Others	$\chi^2(2) = 7.3158$	0.0258*	5.0010	0.0254	0.971, 0.998
Family	$\chi^2(2) = 0.9526$	0.6211	4.4795	0.0346	1.001, 1.029
Friends/Peers	$\chi^2(2) = 1.3351$	0.5130	11.7036	0.0006	0.962, 0.99
Coach	$\chi^2(2) = 1.8997$	0.3868	17.2421	<0.0001	0.945, 0.98
Cost	$\chi^2(2) = 1.6389$	0.4407	15.6661	<0.0001	0.959, 0,986
Training Run/Race That Day	$\chi^2(2) = 7.8592$	0.0197*	0.2023	0.6528	0.989, 1.018

*Indicates that the proportional odds assumption was not met, so the test is not reliable.

Discussion

This research was conducted using the RHCQ to assess the perspectives of full and half marathon runners regarding factors influencing dietary decisions and nutrition beliefs. A broad spectrum of responses indicates that adult runners have unique inherent and extraneous factors influencing perspectives on their nutritional choices. Sex and age appear to impact decisions in many instances.

Motivation to Run

In previous research, both male and female collegiate athletes identified *it's a way of life* as the top choice as motivation for running.[23,24] Conversely, in the current study, the top choice for male runners was a tie between *enjoyment* and to *stay healthy*. Female runners in this study similarly selected *to stay healthy* as the top choice. The top shared motivation among the full and half marathoners as *to stay healthy*, regardless of sex, highlights a core value among adult recreational runners. The contrast in findings between studies could be an indication that the adult runner population is more motivated to run to improve or maintain physical fitness and health, while the younger collegiate population is more motivated by the lifestyle involved in running.

Diet Classification

When classifying their diet, over one quarter of adult marathon and half marathon runners (37.28% of males and 26.10% of females) reported adhering to atypical diets. This contrasts with previous research which found that male and female collegiate runners reported having an atypical diet of 11.4% and 16.4% respectively.[23,24] Unlike college runners who reported being limited by their cafeteria options, [23,24] adult runners have more ability to choose their diet. Previous research in non-runners found that adults aged 40 and over were more likely than younger adults to be on a diet for health and weight loss.[26] As runners in this study were driven by a desire to stay healthy, this drive may also contribute to the higher prevalence of atypical diets, as runners may perceive atypical diets as being healthier options. Surprisingly, male runners were more likely to have an atypical diet than female runners. This is inconsistent with recent research findings. In the general population, women are more likely than men to be vegetarian[27] and are more

likely to be on a special diet for health or weight loss.[26] Furthermore, in a study of male and female half marathon, marathon, and ultra-marathon runners, females were significantly more likely to be vegan or vegetarian than their male counterparts.[28] Thus, it is unique in that males in this study were found to be more likely than females to seek atypical diet options, however, the methods used in the current study do not allow the reasons(s) for this outcome to be discerned.

Nutrition Sources

When examining the use of nutrition sources, the most frequently utilized source was the internet. This can likely be attributed to the efficiency and accessibility of the internet, as well as the increasing popularity of nutrition information on social media. Since the accuracy of information varies on the internet, it may be useful to educate runners on where to find accurate information (such as that provided by health professionals) and/or how to assess the reliability of information.

The sources that were most often reported as "never" or "rarely" utilized were coaches and registered nutritionists. The 51.6% of runners who reported never using a coach as a nutrition source could be explained if a low percentage of adult runners have a formal coach, however, this information was not obtained on the questionnaire, so we cannot draw a definite conclusion. An unsettling 50.8% of athletes reported never utilizing a registered dietitian as a nutrition source, the undisputed nutrition expert in the healthcare field, and only 7% reported utilizing this source often. A study examining nutrition sources utilized by NCAA Division III athletes from several sports found that a similar 8.5% of athletes reported utilizing a registered dietician for nutrition information.[29] However, given that the risk of LEA is so high for endurance athletes specifically, nutritional experts should not be overlooked as a valuable source of nutrition information.

Female participants were significantly more likely than males to "often" utilize registered dietitians as a nutrition source. A large majority (92%) of licensed dietitians are female.[30] One systematic review examined the effects of same gender and different gender pairing between doctors and patients. They found that different gender pairings resulted in increased tension due to power dynamics and status, while this tension was not present in same gender pairings.[31] Perhaps the presence or absence of this power and status tension dissuades males and encourages females to consult the largely female demographic of registered dieticians.

Male participants utilized magazines, coaches, and nutrition courses significantly more than female participants. While nutrition courses can provide accurate and trustworthy information, this same quality information cannot be assumed from coaches or magazines. A study examining the information provided by Men's Health magazine found that 23% of recommendations were supported by evidence while the remaining 77% were supported by "unclear, nonexistent, or contradictory" evidence.[32] Male runners may not be aware of this fact and should be educated on quality resources. On a positive note, the younger the runner was, the more likely they were to access coaches, nutrition courses, and registered dietitians for nutrition information. These younger runners show more curiosity and ascribe more value to trustworthy sources. This could be due to these sources being more readily available to younger adults or perhaps, as they age, runners are less likely to break their established eating patterns. Regardless, it should also be noted these younger runner's tendencies to utilize coaches for nutrition information may not be beneficial as it has been shown that coaches' sports nutrition knowledge is inadequate.[33] If being younger leads to participants being more likely to experiment or search for information, we must be sure that the information they receive will help them succeed.

Daily Meal Decisions

Adult marathoners and half-marathoners' daily meal decisions were most impacted by their *time to prepare meals*, *training run/race that day*, and *creating a balanced diet*. This is similar to previous studies using the RHCQ as male and female collegiate runners found the most impactful factors to be *practice/race that day*, *creating a balanced diet,* and *available choices in the cafeteria*.[23,24] Adult recreational runners are likely attempting to balance the demands of life and fueling running training with their nutritional decisions, reflected in the high impact of time considerations and creating a balanced diet.

Significant differences were found between males and female runners in the factors that influence their daily meal decisions. Notably, males were more likely to be impacted by their coach than females, mirroring the results we saw with access frequency of nutrition sources. Since the RHCQ did not identify if a runner had a coach, it can only be hypothesized that this difference may be due to males being more likely to have a coach.

Further differences between males and females include that females are more likely to consider the following factors: *creating a balanced diet*, *nutritional knowledge*, *experience cooking*, *time to prepare meals*, and *family* when making daily meal decisions. In the case of female adult runners, there may also be other adults and children impacted by meal decisions. This array of factors shows a more complex relationship with meal decisions that exists for female adult marathoners and half-runners than for males. It is possible that many women assume a greater amount of mental load cognitive and emotional labor that comprise family life[34] which affected their choices.

The age of the runner also played a significant role in their daily meal decisions. As runners aged, they were more impacted by *creating a balanced diet* and *family*. The younger the runner, the more likely they were to be impacted by *time to prepare meals, friends/peers, coach,* and *cost*. Although time and finances are more likely to impact younger runners, it appears be that all runners are heavily impacted by the people with which they spend the most time. Younger adults likely spend more time around or live with their friends and peers, where older adults likely spend more time with their family. If this is the case, the meal decisions of adults are heavily impacted by the people around them, regardless of age.

Likelihood to Change

Regardless of sex or age, the majority of runners in the current study reported that they were *very likely* or *somewhat likely* to make a change in dietary decisions if provided nutritional education. This is consistent with previous studies of male and female collegiate runners.[23,24] The cohesion between runners' responses about likelihood to change proves that willingness to change is not the limiting factor in establishing healthier eating patterns. One survey of the literature shows that knowledge alone cannot lead to change.[35] However, both motivation and knowledge play important roles in food behavior changes,[35] and it appears that these runners do not lack motivation.

Clinical Implications

Adult marathon and half-marathon runners generally report wanting to be healthy and are willing to make changes given nutritional information. Although there is valuable information available on the internet, runners should be educated on the reliability of various sources and the function of the registered dietician.

Healthcare providers should be aware of the increased frequency of atypical diets in the adult marathoner and half-marathoner population. These runners may require education to make sure adequate nutrition intake is achieved within the bounds of a different dietary pattern. Providers should take care in noting that males should not be overlooked when it comes to atypical diets. Additionally, female runners may have a more complex relationship with food and nutrition as they may take more factors into account when making daily meal decisions. When appropriate, healthcare providers should tailor nutrition advice specific to factors impacting the runner. This may include healthy foods that can be made in bulk, easy to prepare meals, or meals that can be made quickly when these runners need to be prepared for the whole family.

The younger a runner is, the more likely they are to make meal decisions based on cost and time to prepare meals. Therefore, it is important for healthcare professionals to educate accordingly on quick low budget meal planning/preparation without compromising nutritional value. In contrast, with older runners whose priorities reflect family and creating balanced diets, education regarding nutritious meals that can be made in mass or prepped in advance may be of more value. In general, it is important to first identify the runner's influences on daily meal decisions and then cater education to meet their particular needs.

Limitations and Further Research

This study utilized a convenience sample that may not be fully representative of the adult marathoner and half-marathoner population. It may include participants mostly located in the midwestern United States due to recruitment methods. The majority of our participants were white, and while there was a wide variety of racially diverse participants in the minority, this ratio may not be representative of the adult marathoner and half-marathoner population in the United States. Finally, there were extreme outliers who reported inaccurate/impossible race completion times that had to be removed before analysis, and the survey did not have a question to discern if participants had a coach or were racing competitively. Future research is needed to compare nutrition and health choices of adult recreational and adult professional runners.

Conclusions

The findings of this study indicate that adult runners have a variety of inherent and extraneous factors that impact their perspectives on nutritional choices. The major consensus among runners was the shared desire to be healthy and willingness to change provided nutritional education. Age and sex may influence nutritional and health decisions. Thus, it is important that healthcare professionals consider these influences when educating runners on individualized dietary options, and to refer to a reputable source as required.

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Appendix A

Runner's Health Choices Questionnaire

1) I agree to participate in this study.

- ○ Yes
- ○ No

Skip To: End of Survey If I agree to participate in this study. = No

2) Are you **currently** a member of a collegiate track or cross-country team?

- ○ Yes
- ○ No

Skip To: End of Survey If Are you currently a member of a collegiate track or cross country team? = Yes

3) What is your age?

- ○ 18-25 years old
- ○ 26-35 years old
- ○ 36-45 years old
- ○ 46-55 years old
- ○ > 55 years old

4) What is your sex?

- ○ Male
- ○ Female
- ○

5) Please specify your race/ethnicity (choose all that apply):

- ☐ White
- ☐ Hispanic or Latino
- ☐ Black or African American
- ☐ Native American or American Indian
- ☐ Asian/Pacific Islander
- ☐ Native Hawaiian or Pacific Islander
- ☐ Other/Prefer not to answer

6) In how many half-marathons have you raced?

- ○ 0
- ○ 1-5
- ○ 6-10
- ○ 11+

7) In how many full marathons have you raced?

- ○ 0
- ○ 1-5
- ○ 6-10
- ○ 11+

8) Currently, on average, what is your running mileage per week? _____

9) Why do you run? Please rank the following reasons from most important to least important.

_____ Enjoyment
_____ To stay healthy
_____ Competition
_____ To be part of a team
_____ Sense of accomplishment
_____ It's a way of life

10) Have you ever taken a nutrition course?

- ○ Never
- ○ Once, in high-school
- ○ Once, in college
- ○ More than once

11) How would you classify your diet?

- ○ Regular (includes all food groups)
- ○ Vegan (excludes all animal products including dairy, eggs, fish, poultry, and meat)
- ○ Vegetarian (excludes fish, poultry, and meat)
- ○ Pesco-vegetarian (a brand of vegetarianism that includes fish in the diet)
- ○ Paleo (A diet consisting mostly of naturally raised animal products and plants, focusing on high protein and fiber)
- ○ Other (please specify): _____

For the following questions, please rate how much each factor impacts you personally. Please mark your answer.

12) Please rate how much of an impact you feel the following factors have on your choice of ***overall diet*** specified in the above question.

	No Impact	Minimal Impact	Moderate Impact	High Impact	Neutral/Don't know
a. Enjoyment of food	○	○	○	○	○
b. Makes you feel healthy	○	○	○	○	○
c. Health condition	○	○	○	○	○
d. Injury prevention	○	○	○	○	○
e. Weight loss or maintenance	○	○	○	○	○
f. Athletic performance enhancement	○	○	○	○	○
g. Cost	○	○	○	○	○
h. Family	○	○	○	○	○
i. Friends/peers	○	○	○	○	○
j. Coach	○	○	○	○	○
k. Animal welfare	○	○	○	○	○
l. Environmental concerns	○	○	○	○	○
m. Religious reason(s)	○	○	○	○	○

Please comment on any additional factors here.

_____

_____

13) Please rate how much of an impact you feel the following factors have on your ***daily meal decisions***.

	No Impact	Minimal Impact	Moderate Impact	High Impact	Neutral/Don't know
a. Health concerns	○	○	○	○	○
b. Creating a balanced diet	○	○	○	○	○
c. Nutritional knowledge	○	○	○	○	○
d. Experience with cooking	○	○	○	○	○
e. Time to prepare meals	○	○	○	○	○
f. Presence of others	○	○	○	○	○
g. Family	○	○	○	○	○
h. Friends/ peers	○	○	○	○	○
i. Coach	○	○	○	○	○
j. Cost	○	○	○	○	○
k. Training run/race that day	○	○	○	○	○

Please comment on any <u>additional</u> factors here.

_____

_____

14) Please rate how much of an impact you feel the following factors have on your ***running performance***.

	No Impact	Minimal Impact	Moderate Impact	High Impact	Neutral/Don't know
a. Motivation	○	○	○	○	○
b. Confidence	○	○	○	○	○
c. Daily Mood	○	○	○	○	○
d. Sleep	○	○	○	○	○
e. Hydration	○	○	○	○	○
f. Caloric Intake	○	○	○	○	○
g. Body Weight	○	○	○	○	○

15) Please rate how much of an impact you feel the following factors have on your ***overall health***.

	No Impact	Minimal impact	Moderate Impact	High Impact	Neutral/Don't know
a. Energy balance (intake versus expenditure)	○	○	○	○	○
b. General eating habits	○	○	○	○	○
c. Body weight	○	○	○	○	○
d. Training routine	○	○	○	○	○
e. Sleep	○	○	○	○	○
f. Daily mood	○	○	○	○	○

16) Please mark the frequency of your use of the following sources for nutritional and health information.

	Never	Rarely	Occasionally	Often
a. Coach	○	○	○	○
b. Friends/peers	○	○	○	○
c. Family	○	○	○	○
d. Social media (i.e. Facebook, Twitter)	○	○	○	○
e. Internet sources	○	○	○	○
f. Magazines	○	○	○	○
g. Book/textbook	○	○	○	○
h. Nutritional course	○	○	○	○
i. Dietitian	○	○	○	○
j. Primary care physician	○	○	○	○

Please comment on <u>additional</u> sources here.

_____

17. If provided or given access to new or additional information from a healthcare professional, how likely would you be to make dietary or health changes?

- ○ Very likely (1)
- ○ Somewhat likely (2)
- ○ Unsure (3)
- ○ Somewhat unlikely (4)
- ○ Very unlikely (5)
