“Investigation of Significant Others as Gatekeepers to Tactical Athlete Nutrition”

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Mary Green

Advisor: Jill Joyce, PhD, RD

Second Reader: Brooke Tuttle, PhD

CHAPTER 1:

INTRODUCTION

Current research is very clear among tactical populations [law enforcement officers (LEOs), firefighters, and military personnel] that obesity, cancer, and cardiovascular disease are occurring at abnormally high rates, at times even higher than that of the civilian population. One systematic review found that law enforcement officer (LEO) obesity was at 40.5% in 2014, while the national average was 35.5% and 35.8% for men and women in the United States at the time, respectively [2,3]. A cross-sectional study of 116 male firefighters determined that among participants 51.7% were obese [5]. Among Active-Duty Military personnel found that obesity prevalence increased significantly (p<.0.01) from 2002 to 2005. In 2002, 8.7% of military personnel were obese, and in 2005, 12.9% of military personnel were obese [6], a 48% increase in just three years.

Cancer incidence among tactical populations is also disproportionately high. Less evidence is available among LEOs, but studies do indicate that they suffer disproportionately from cancer [7]. In the fire service, a systematic review that studied cancer risk among firefighters found that firefighters are at an increased risk for myelomas, non-Hodgkin lymphoma, and prostate and testicular cancers [20]. A cross-sectional study of the military found that there is twice the incidence of prostate cancer among males in the military than the general population and a 20% to 40% higher incidence of breast cancer [22].

Cardiovascular disease (CVD) incidence is also high among tactical populations. CVD accounts for 22% of on-the-job deaths among LEOs [23-26], and LEOs suffer disproportionately from chronic heart disease, diabetes, and metabolic disorders [8-10]. In firefighters, CVD is the leading cause of on-duty deaths accounting for 45% of deaths on the job [5]. In the military, the increasing rates of obesity described previously will most likely result in an increase in CVD incidence, as BMI is directly associated with CVD in LEOs, firefighters, and military [2].One way to improve the incidence of obesity among tactical populations is through nutrition intervention [37]. Evidence suggests that the diets of LEOS, firefighters, and military are poor, which could contribute to obesity, as well as CVD and cancer independent of obesity, and that their diets could use significant improvements [23, 38, 39].

One way health improvements may be able to be made is through spousal relationships. Several studies have established the importance of marital relationships and their influence on mental and physical health among the civilian population. One study found evidence that marital relationships are associated with cardiovascular health. It was found that greater marital quality was related to lower cardiovascular reactivity during marital conflicts [43]. There are several studies that have specifically investigated marital relationships among tactical populations. One meta-analytic review looked at police work and its effects on marital relationships and reported that the stress of the job can reduce positive interactions between spouses [44,45].

Existing research on the relationships of tactical athletes and their spouses is limited. Even more limited is the role of spouses as gatekeepers to tactical athlete's nutrition. As mentioned above, research is clear that marital relationships impact elements of wellness,

indicating that spouses may indeed be gatekeepers to health and wellness for tactical athletes. Only one known intervention for the health of tactical athlete spouses has been completed [46] but are extremely limited. The ultimate goal of this research is to provide direction to create an appropriate intervention that educates spouses of tactical athletes on nutrition which will hopefully lead to the improvement of the health of themselves and their tactical athletes. The purpose of this study is to determine how the spouses of tactical athletes (e.g. firefighters, law enforcement officers, and military) act as gatekeepers in the home and, consequently, what the nutrition programming and education needs are of tactical athletes' significant others.

CHAPTER 2:

LITERATURE REVIEW

Obesity, Cancer, and Cardiovascular Disease among Tactical Populations

Current research is very clear among tactical populations [law enforcement officers (LEOs), firefighters, and military personnel] that obesity, cancer, and cardiovascular disease are occurring at abnormally high rates, at times even higher than that of the civilian population. Understanding trends in these chronic diseases among tactical populations, alone and in relation to the general population, as well as the unique causes of trends and disparities relative to the civilian population is important for the health and occupational performance of tactical populations and those they serve.

Tactical populations are not exempt from the obesity epidemic. Among LEOs, one cross-sectional study examining trends in obesity in the United States found that 38.7% of LEOs are obese [1] and one systematic review found that law enforcement officer (LEO) obesity was at 40.5% in 2014, while the national average was 35.5% and 35.8% for men and women in the United States at the time, respectively [2,3]. Based on limited evidence, LEOs appear to have obesity trends similar to or greater than that of the civilian population.

Among firefighters, a prospective cohort study of 332 firefighters found that in the span of five years, the mean body mass index (BMI) of participants increased from 29 to 30 and that the prevalence of obesity increased from 35% to 40% [4], which again is a similar occurrence to that among the general US population. A cross-sectional study of 116 male firefighters determined that among participants 51.7% were obese. It also determined that the lifestyle of

firefighters in the study was not supportive of health, as they experience long periods of inactivity, which combined with then sudden, strenuous activity puts strain on the cardiovascular system [5]. These lifestyle factors combined with obesity could lead to detrimental health effects.

Among military personnel, overweight and obesity prevalence is at an all-time high. A study analyzing the 2002 and 2005 Department of Defense Surveys of Health-Related Behaviors Among Active-Duty Military personnel found that obesity prevalence increased significantly ($p<.0.01$) from 2002 to 2005. In 2002, 8.7% of military personnel were obese, and in 2005, 12.9% of military personnel were obese [6], a 48% increase in just three years. This study also found that being married was a risk factor for obesity in military personnel and that military males were more likely to be obese than females.

Cancer incidence among tactical populations is also disproportionately high. Among LEOs, an epidemiological study of cancer among police officers found that LEOs suffer disproportionately from chronic heart disease, diabetes, metabolic disorders, and cancer [7,8,9,10]. One explanation for this high cancer rate is that LEOs are commonly exposed to carcinogens while working [7]. These carcinogens include clandestine labs and chemical spills [11]. Another explanation is that police experience a disruption in circadian rhythm from irregular hours and shift work, which may increase cancer risk [7,12-18]. There was also a significant association between cancer incidence and years worked, such that cancer incidence increased as years worked increased [9]. In a systematic review studying the risk of prostate cancer in firefighters and police, it was found that there was a statistically significant increased risk of prostate cancer if a person was an LEO or a firefighter compared to the general

population (I2=72%, 95% CI = 1.08-1.28). Factors like high stress, exposure of hazards, and breathing in toxins could potentially increase risk [19].

Firefighters and military personnel also see increased risk of cancer relative to the general population. Another systematic review that studied cancer risk among firefighters found that firefighters are at an increased risk for myelomas, non-Hodgkin lymphoma, and prostate and testicular cancer. Many of these cancers are also associated with obesity [20]. A longitudinal cohort study investigating the mortality of firefighters found a significantly increased risk of lung cancer in firefighters aged 60 to 74 and non-pulmonary cancer in firefighters aged 30 to 49. Again, it is believed that the inhalation of carcinogens may increase the risk of cancer in firefighters [21]. A cross-sectional study of the military found that there is twice the incidence of prostate cancer among males in the military than the general population and a 20% to 40% higher incidence of breast cancer [22].

Cardiovascular disease (CVD) incidence is also high among tactical populations. CVD accounts for 22% of on-the-job deaths among LEOs [23-26]. In firefighters, CVD is the leading cause of on-duty deaths accounting for 45% of deaths on the job [5]. Firefighting presents many risk factors for CVD including unreliable meal times, fast food, shift work [4, 27-34], smoke exposure, noise, stress, acute cardiovascular strain, sympathetic activation, physical workload, dehydration, smoking, hypertension, obesity, and dyslipidemia [5]. In the military, the increasing rates of obesity described previously will most likely be correlated with an increase in CVD incidence, although this is not well documented, as BMI is directly associated with CVD in LEOs, firefighters, and military [2].

Existing research has widely demonstrated health concerns for tactical populations. Addressing these concerns is imperative, but seems like a daunting task. There is a potential common risk factor to address connecting all of these health issues: obesity. According to one prospective cohort study, weight is related to about 20% of all cancer cases, and the American Cancer Society has suggested that obesity is linked with death from liver and pancreatic cancer, non-Hodgkin's lymphoma, and myeloma [35]. Another study that investigated the link between obesity and cardiovascular disease stated that excessive adipose tissue is associated with inflammation and insulin resistance, leading to deleterious cardiovascular consequences. It also stated that obesity is associated with reduced HDL cholesterol, leading to atherosclerosis and CVD [36]. By addressing the issue of obesity, we are also able to address the issues of cardiovascular disease and cancer, as there are associations between both obesity and cancer and obesity and CVD among the civilian population and also among tactical populations.

Nutrition of Law Enforcement, Firefighters, and Military

One way to improve the incidence of obesity among tactical populations is through nutrition intervention [37]. Evidence suggests that the diets of LEOS, firefighters, and military are poor, which could contribute to obesity, as well as CVD and cancer independent of obesity, and that their diets could use significant improvements.

One study of wildland firefighters found that study participants had lower Healthy Eating Index (HEI) scores for dietary quality than the general population. This study also found that participants were eating too little of important foods such as seafood, plant protein, fruit, whole grains, and dairy [38]. Another cross-sectional study of firefighters discussed the culture of firehouses and how family-style eating, large portion sizes, unhealthy food traditions, peer

pressure, interrupted eating schedules, and high caloric snacking all contribute to firefighter obesity [39]. In interviews with the participants, many expressed that they eat better while at home. One firefighter mentioned that he would be "better off" if he ate at home with his wife [40].

There is less evidence documenting LEO eating habits, however, in a study of police academy menus, researchers found that significant improvements could be made as the HEI score for the menu was 54/100 [23].

Amongst military populations, eating habits are less than idea. One survey conducted by the Department of Defense found that 51% of military personnel consumes energy drinks daily and under 15% of personnel meet the fruit and vegetable intake recommendations [40]. Eating habits of tactical populations are less than ideal. These poor eating habits may be contributing to obesity, cancer, and CVD. Considering that nutrition is being considered one of the leading risk factors for all chronic diseases and obesity, improving nutrition seems like an effective and efficient approach to reducing health issues for tactical groups.

Spousal Relationships among Tactical Populations and Their Impact on Health

Several studies have among civilian relationships have established the importance of marital relationships and their influence on people's mental and physical health. One systematic review asserted the idea that marital functioning is essential for health [36]. Data from national surveys demonstrated that marital happiness contributes the most to overall happiness and that unhappiness, such as stress, and the chronic release of cortisol is linked to CVD [41,42]. Evidence suggests that the immune and endocrine dysregulation associated with marital discord can decrease wound healing and increases infectious disease risk [41]. Another

study found more evidence that marital relationships are associated with cardiovascular health. It was found that greater marital quality was related to lower cardiovascular reactivity during conflicts [43].

There are several studies that have most specifically investigated marital relationships among tactical populations. One meta-analytic review looked at police work and its effects on marital relationships and reported that the stress of the job can reduce positive interactions between spouses [44,45]. This study also found that the variability in schedules that comes with shift work and the high rates of LEOs working second jobs led to two major stressors within a LEO marriage: work-family life and financials. Another intervention investigated the stressors military spouses face and formulated support programs to assist in relieving said stressors. This study found military spouses face many stressors (i.e., frequent moves, deployment, isolation) [46,47]. It also found that military spouses report low levels of participation in health behaviors [45,47], such as exercise, and high levels of obesity [45,49,50].

Opportunity for a Novel Solution among Spouses

Information regarding the relationships of tactical athletes and their spouses is limited. Even more limited is the role of spouses as gatekeepers to tactical athlete's nutrition. As mentioned above, research is clear that marital relationships impact elements of wellness indicating that they may indeed be gatekeepers to health and wellness. Only one known intervention for the health of tactical athlete spouses has been completed [46] but are extremely limited. The ultimate goal of this research is to provide direction to create an appropriate intervention that educates spouses of tactical athletes on nutrition which will hopefully lead to the improvement of the health of themselves and their tactical athletes. The

purpose of this study is to determine how the significant others of firefighters, law enforcement officers, and military act as gatekeepers in the home and, consequently, what the nutrition programming and education needs are of said significant others.

CHAPTER 3:

METHODS

This cross-sectional study will involve online surveys for tactical athletes and their spouses, as well as focus groups with spouses, to determine the extent to which spouses influence tactical athlete eating habits at home and on the job. The results of this study will be used as a needs assessment to guide future nutrition intervention development for tactical athletes.

Participants

For the purpose of this study, a tactical athlete is anyone who is serving as a first responder (EMT, firefighter, law enforcement officer) or military personnel. A spouse is anyone in an intimate couple relationship of any type with a tactical athlete, regardless of marital status. Inclusion criteria for tactical athletes will include being a current or previous tactical athlete, 18 years of age or older, and in an intimate couple relationship with someone who is not also a tactical athlete. Inclusion criteria for spouses will include being in a current or previous relationship (dating, engaged, married, divorced, separated, widowed) with a tactical athlete, 18 years of age or older, and not a tactical athlete themselves. Tactical athletes will be involved in the online survey element of this study, while spouses will be involved in the online survey, as well as the focus group element of this study.

Recruiting for the online survey, to include tactical athletes and spouses, will occur through flyers shared via emails to personal and professional contacts of the researchers, shared on social media sites for the lab, and posted at local first responder department

locations. Participants for the focus groups, to include spouses only, will be recruited through a flyer at the end of the online survey, shared via emails to personal and professional contacts of the researchers, shared on social media sites for the lab, and posted at local first responder department locations. Compensation will be provided in the form of Amazon Gift Cards for $25 for participating in one or more focus group sessions.

Informed consent will be obtained from participants before beginning all surveys and focus group sessions. This study has been approved by the Institutional Review Board of Oklahoma State University (IRB-22-388).

Online Survey

Two different online surveys will be offered, one to tactical athlete spouses and the other tactical athletes themselves, via Qualtrics. The spouse survey will collect demographics, employment status, relationship and family information, type of tactical athlete they are in a relationship with, meal planning/ preparation and eating habits of themselves and their tactical athlete, perceived influence on eating habits of their tactical athlete, and dietary quality. The tactical athlete survey will collect similar information but from the perspective of the tactical athlete instead of the spouse, including demographics, relationship and family information, type of tactical athlete, meal planning/ preparation and eating habits, perceived influence of their spouse and coworkers on their eating habits, and dietary quality. Demographic information obtained will include gender, age, and level of education as a proxy for socioeconomic status. Questions on employment status will include whether employed and average hours worked per week. Relationship information collected will include type of current or former relationship and length of time in that relationship. Information obtained related to

meal planning/ preparation and eating habits will include affordability of eating healthy; who does the meal planning/ preparation in the household; number of meals/ snacks eaten at home or away from the home (i.e., dining out) per week; number of meals/ snacks cooked at home by or for the tactical athlete to take to work; number of meals/ snacks obtained from a restaurant or convenience store while on shift; and Likert scales determining the extent to which the participant agrees with who influences or controls their tactical athletes eating habits and healthfulness of their diet. A modified food frequency questionnaire (mFFQ) has been created by our lab due to low response rates when using multi-day food records and 24-hour recalls to accommodate the population we work with. The mFFQ has been used several times effectively to show improvements in dietary quality following interventions by our lab with first responders, thus it will be used to asses dietary quality in this study. The mFFQ asks participants to choose how often per day, from 0 to 10 or more time, they consume certain types of foods. The types of foods listed are based on the Healthy Eating Index 2015 scoring components, a valid and reliable assessment tool for dietary quality [51] and translated into commonly consumed examples of foods identifiable by tactical athletes. Finally, information about the makeup of the family living in the household, which may influence eating habits, will include number of children under the age of 18 and age ranges (infant to 4 years, 5 to 12 years, 13 to 17 years), to what extent they influence eating habits of the household using a Likert scale, and an open-ended question related to how they influence eating habits. Additionally, the same questions will be asked regarding older adults living in the household. The online survey instrument can be found in Appendix A.

Focus Group Sessions

Four different focus group sessions will be held for spouses of: 1) EMT/ paramedic, volunteer firefighter, career firefighter, seasonal/ contract firefighter; 2) General duty law enforcement (i.e., police officer, sheriff deputy, state trooper, correctional officer, etc.) and special operations law enforcement; 3) Military in the National Guard and Reserves; 4) Military who are Active-duty. Spouses whose tactical athlete occupation(s) cover multiple areas (e.g., career firefighter and Army National Guard) will be invited to attend all focus group sessions that apply to them. Incentives will be provided in the form of a $25 Amazon gift card for attending any sessions. All sessions will be held on Zoom. Researchers will take detailed notes during sessions. Sessions will be audio recorded and transcribed.

Focus group questions will be semi-structure and will collect demographics (age, socioeconomic status), employment status, relationship and family information, type of tactical athlete they are in a relationship with, meal planning/ preparation and eating habits of themselves and their tactical athlete, perceived influence on eating habits of their tactical athlete, and perceived dietary quality and barriers to eating healthfully. In addition, focus group questions seek information related spouse suggested methods for improving tactical athlete eating habits and logistics for programs tailored specifically to spouses (i.e., what, when, where, how, etc.). A list of the focus group questions can be found in Appendix B.

Qualitative Analysis

Two researchers will immerse themselves in the data (notes, recordings, and transcripts). Inductive thematic analysis will then be performed on transcripts using NVivo qualitative data analysis software (QSR International, release 1.6.2). Analysis will be performed until researchers achieve 90% agreement on themes. Frequencies of major themes will be

recorded. Chi-square tests will be used to determine significant differences in theme frequencies across spouse demographics.

Statistical Analysis

SPSS statistical analysis software will be used to perform statistical analyses (IBM, SPSS Inc., version 25). Descriptive statistics will be calculated, including mean, standard deviation, and range for continuous data and frequencies and proportions for categorical data. If there is a large enough sample size, sub-analyses will include Chi-square tests to determine differences in responses across spouse and tactical athlete demographic groups.

CHAPTER 4:

RESULTS

Participation in the online survey included 30 spouses and 26 tactical athletes. Characteristics of spouses who completed the survey were female (100%), 35.6 ± 6.8 (mean ± standard deviation) years of age, majority college graduates (78.2%), mostly employed (90.6%), working 41.2 ± 14.4 hours per week, and majority married (93.8%) for 12.6 ± 7.8 years to a variety of tactical athlete types (see table 1). Spouses also were fairly evenly split on having children in the household (43.3%) of a variety of ages (see table 1). Characteristics of tactical athletes who completed the survey were 76.9% male and 23.1% female, 36.4 ± 7.9 years of age, majority completed some college or a bachelor's degree (46.2% and 11.5% respectively), employed (100%), working 52.5 ± 13.9 hours per week, and majority married (88.5%) working as a variety of tactical athletes (see table 1).

Table 1. Participant Characteristics

Demographic Characteristics		**Tactical Athlete Spouses (n=30)**	**Tactical Athletes (n=26)**
Gender (n, %)	Male	0, 0%	20, 76.9%
	Female	30, 100%	6, 23.1%
	Not specified	0, 0%	0, 0%
Age [in years, mean ± standard deviation (SD)]		35.6 ± 6.8	36.4 ± 7.9
Education Level (n, %)	Some high school	0, 0%	0, 0%
	High school diploma/ GED	1, 3.1%	0, 0%
	Some college	6, 18.8%	12, 46.2%
	Bachelor's degree	15, 46.9%	11, 42.3%
	Graduate degree(s)	10, 31.3%	3, 11.5%
Employment Status (n, %)	Employed	3, 9.4%	26, 100%
	Not employed	29, 90.6%	0, 0%
Hours Worked per Week (if employed, mean ± SD)		41.2 ± 14.4	52.54 ± 13.857

Relationship Type (n, %)	Dating, living apart	1, 3.1%	1, 3.8%
	Dating, living together	0, 0%	1, 3.8%
	Engaged	0, 0%	1, 3.8%
	Married	30, 93.8%	23, 88.5%
	Divorced	1, 3.1%	0, 0%
	Widowed	0, 0%	0, 0%
Relationship Length (in years, mean ± SD)		12.6 ± 7.8	11.8 ± 8.2
Tactical Athlete Type (n, %)	EMT	0, 0%	0, 0%
	Volunteer firefighter	0, 0%	0, 0%
	Career firefighter	8, 25%	10, 38.5%
	General duty law enforcement officer	8, 25%	3, 11.5%
	Special operations law enforcement officer	4, 12.5%	0, 0%
	Active-duty military	5, 15.6%	0, 0%
	Reserves	0, 0%	0, 0%
	National Guard	0, 0%	0, 0%
	EMT/Career Firefighter	1, 3.1%	6, 23.1%
	General Duty LEO/ Special operations LEO	1, 3.1%	0, 0%
	EMT/Career Firefighter/General duty LEO	1, 3.1%	0, 0%
	EMT/Career Firefighter/ Special Operations LEO	1, 3.1%	1, 3.8%
	EMT/Career Firefighter/National Guard	0, 0%	1, 3.8%
	EMT/General Duty LEO/National Guard	0, 0%	1, 3.8%
	EMT/Volunteer Firefighter/Active-Duty Military/Reserves/National Guard	0, 0%	1, 3.8%
Have Children in Household (n, %)	Yes	13, 43.3%	7, 31.8%
	No	17, 56.7%	15, 68.2%
Child Age Groups (n, %)	Infant to 4 years old	7, 21.9%	5, 33.3%
	5 to 12 years old	10, 31.3%	9, 60.0%
	13 to 17 years old	3, 9.4%	3, 20.0%
Have Older Adults in Household (n, %)	Yes	0, 0%	0, 0%
	No	30, 100%	22, 84.6%

Healthy Eating Affordability Perceptions

Healthy eating affordability perceptions were assessed with three 5-point Likert scales, such that a higher number indicated cost as more of a barrier to eating healthy. Data are presented in Table 2. Differences in these perceptions were explored in healthy eating affordability perceptions by various demographics, including age, gender, spouse employment status, spouse average hours worked, tactical athlete average hours worked level of education, type of relationship, length of relationship, and type of tactical athlete. There were no significant differences in healthy eating affordability perceptions by these demographics (*ps*>0.05).

Table 2. Summary of other influences on tactical athlete nutrition and eating habits

Assessment of Other Influencers	Spouse Response (n=30, mean ± SD)	Tactical Athlete Response (n=26, mean ± SD)
Eating healthy is too expensive[a]	2.8 ± 1.2	3.1 ± 1.3
Eating healthy is affordable[a]	3.6 ± 0.9	3.5 ± 0.9
Cost is a barrier to eating healthy[a]	1.7 ± 0.7	2.3 ± 1.2
Cost barrier score[b]	4.5 ± 1.7	3.5 ± 0.9
Frequency of meals/ snacks at home per week	12.3 ± 9.6	5.4 ± 2.3
Frequency of meals/ snacks away from home per week	4.0 ± 2.9	13.6 ± 18.8
Child influence on eating habits[a]	2.7 ± 1.2	2.7 ± 1.5

[a]5-point Likert scale, where 1 is "not at all" and 5 is "very much so"
[b]Max score 10, higher score indicates cost is a greater barrier to eating healthy

Control of Meal Planning and Preparation

Meal planning and preparation control perceptions were assessed with categorical options (*neither, you as the spouse, both, or the tactical athlete*). Data are presented in Table 3

below. Differences in these perceptions were explored by various demographics age, spouse employment status, spouse average hours worked, level of education, type of relationship, length of relationship, and type of tactical athlete. There were no significant differences in healthy eating by demographics (*p*s>0.05).

Table 3. Summary of spouse influence on tactical athlete nutrition and eating habits

Assessment of Influencer	Spouse Response (n=30, mean ± SD)	Tactical Athlete Response (n=26, mean ± SD)
Spouse influence on days off[a]	3.6 ± 1.5	3.9 ± 1.1
Spouse influence on shift[a]	2.2 ± 1.3	2.3 ± 1.3
Tactical athlete control on days off[a]	3.4 ± 1.2	2.6 ± 1.5
Tactical athlete control on shift[a]	4.3 ± 1.1	2.4 ± 1.4
Spouse is a greater influence than co-workers on shift[a]	2.5 ± 1.6	2.5 ± 1.4
Overall spouse is the main influence[a]	3.2 ± 1.4	3.7 ± 1.1
Overall tactical athlete is in control[a]	3.7 ± 1.2	3.4 ± 0.9
Spouse encourages healthy foods[a]	3.6 ± 1.3	3.4 ± 1.3
Tactical athlete eats better because of spouse[a]	3.2 ± 1.5	3.0 ± 1.3
Tactical athlete eats a healthy diet[a]	3.3 ± 1.1	3.0 ± 0.9
Agree on foods to buy and eat[a]	3.6 ± 1.1	3.7 ± 1.2
Spouse influence score[b]	15.3 ± 6.0	18.73 ± 5.3
Tactical athlete influence score[c]	14.6 ± 2.4	11.4 ± 3.1
Number of meals/ snacks made at home by spouse for shift	2.3 ± 3.4	1.3 ± 1.6
Number of meals/ snacks made at home by tactical athlete for shift	1.3 ± 1.8	2.1 ± 2.5
Number of meals/ snacks tactical athlete eats out on shift	2.8 ± 3.2	1.6 ± 1.4
Spouse influence score 2[d]	17.6 ± 8.9	20.0 ± 5.9
Tactical athlete influence score 2[e]	18.7 ± 4.7	15.0 ± 3.4

[a]5-point Likert scale, where 1 is “not at all” and 5 is “very much so”
[b]Max score 30, higher means greater spouse influence, total of all spouse influence Likert scale questions
[c]Max score 20, higher means greater tactical athlete influence, total of all tactical athlete influence Likert scale questions
[d]Spouse influence score combined with number of meals/ snacks made at home by spouse for shift, higher means greater spouse influence

[e]Tactical athlete influence score combined with number of meals/ snacks made at home by tactical athlete for shift, higher means greater tactical athlete influence

Location of Meals and Snacks

Location of meals and snacks was assessed as the frequency of meal locations per week (at home or away from home) and is presented in Table 3 above. Differences in location of meals were explored by the same demographics of age, spouse employment status, spouse average hours worked, level of education, type of relationship, length of relationship, type of tactical athlete, and cost as a barrier. There were significant differences in the frequency of eating at home per week by employment status (p=0.006) and average hours worked by spouse (p=0.022). No other significant differences were found.

How Obtain Food on Shift

How tactical athletes obtained their food on shift was assessed by the frequency of meals made per week by the spouse, by the TA, and how often the TA eats out. Data are presented above in Table 3. Differences in method of obtaining food on shift were explored by age, spouse employment status, spouse average hours worked, level of education, type of relationship, length of relationship, type of tactical athlete, and cost as a barrier score. Significant differences were found in the meals made by the spouse for work by average hours worked by the spouse (p<0.001) and by the cost as a barrier score (p=0.006). There was also a significant difference in meals made by the tactical athlete at home for work by average hours worked by the spouse (p=0.019). Spouse age also significantly impacted the difference in meals for work as take out (p<0.001).

Spouse Influence on TA Nutrition and Eating Habits

Two scores were calculated from spouse's responses to 5-point Likert scales. The spouse influence score 1 was combined 6 x 5-point Likert scales, max score 30, higher means greater spouse influence, total of all spouse influence Likert scale questions. The tactical athlete influence score 1 was combined 4 x 5-point Likert scales, max score 20, higher means greater tactical athlete influence, total of all tactical athlete influence Likert scale questions. Spouse influence score 2 was calculated from spouse influence score 1 combined with number of meals/ snacks made at home by spouse for shift, higher means greater spouse influence. Tactical athlete influence score 2 was calculated from tactical athlete influence score 1 combined with number of meals/ snacks made at home by tactical athlete for shift, higher means greater tactical athlete influence. Differences were explored by age, spouse employment status, spouse average hours worked, level of education, type of relationship, length of relationship, and type of tactical athlete. Spouse influence score 2 differed significantly by type of tactical athlete (p=0.017) and tactical athlete influence score 2 differed by relationship status (p=0.004), tactical athlete type (p=0.003), age (p=0.026), relationship length (p=0.017). Data are presented in Table 3 above.

Dietary Quality

Dietary quality was assessed by a Healthy Eating Index ratio (healthier food frequency/less healthy food frequency). A higher number indicates greater frequency of healthy food consumption relative to less healthy. Differences were explored by age, spouse employment status, spouse average hours worked, level of education, type of relationship, length of relationship, type of tactical athlete, frequency of meals at home and away from home, spouse and tactical athlete scores 1 and 2, frequency of meals made at home by the

spouse and tactical athlete for work, frequency of meals eaten out at work by the tactical athlete, child presence in the household, child age groups, and whether the spouse or tactical athlete does the meal planning, cooking, and shopping. The Healthy Eating Index ratio differed significantly by hours worked by a spouse (p=0.020), spouse influence score 1 (p<0.001 for continuous variable, p=0.017 as a dichotomous variable), frequency of meals made by the spouse at home for work (p=0.003), spouse influence score 2 (p=0.001 as a dichotomous variable). Data are presented in Table 4 below.

Table 4. Summary of dietary quality

Healthy Eating Index Food Component	Spouse Response (n=30, mean ± SD number of times per day)	Tactical Athlete Response (n=26, mean ± SD number of times per day)
Healthier vegetables	2.0 ± 1.6	1.6 ± 1.3
Less healthy vegetables	0.7 ± 1.2	0.61 ± 1.0
Healthier fruits	1.9 ± 2.4	1.5 ± 2.0
Less healthy fruits	0.2 ± 0.5	0.1 ± 0.3
Whole grains	2.1 ± 2.1	2.3 ± 1.8
Sweets and sugar-sweetened beverages	1.0 ± 1.4	0.9 ± 1.2
Healthier beverages	5.8 ± 3.2	5.3 ± 2.8
Healthier dairy	1.7 ± 2.3	0.52 ± 1.1
Less healthy dairy	0.9 ± 1.9	0.61 ± 1.2
Healthier proteins	2.7 ± 2.1	2.7 ± 2.0
Less healthy proteins	1.0 ± 0.9	1.4 ± 1.2
Less healthy fats	1.6 ± 1.9	1.9 ± 1.4
Healthy fats	1.3 ± 1.0	1.9 ± 1.8
Added sugar	0.5 ± 1.0	0.5 ± 0.8
Added salt	1.6 ± 1.4	1.7 ± 1.9
Healthy eating ratio[a]	3.7 ± 2.7	3.1 ± 3.4

[a]Healthier food frequency/ less healthy food frequency, >1 indicates consuming more healthier foods than less healthy foods and greater dietary quality, <1 indicates consuming more less healthy foods than healthier foods and poorer dietary quality

Other Household Family Members' Impact on TA Nutrition and Eating Habits

No participants reported any older adults living in the same household. Differences in eating habits and dietary quality were explored by child presence in the household and child age groups, but as mentioned above, no significance was determined.

Summary of Spouse Nutrition Programming and Education Needs

The focus groups are still underway. Data will be analyzed in the near future once all sessions are complete.

CHAPTER 5:

DISCUSSION

The purpose of this study was to determine if and how spouses (i.e., being in an intimate couple relationship currently or formerly; dating, engaged, married, divorced, separated, widowed) of EMTs, firefighters, LEOs, and military personnel act as gatekeepers of TA nutrition. Overall, the results of this study indicate that spouses influence TA eating habits on and off shift, including how they obtain their meals as well as the dietary quality of them. This spouse influence may fluctuate by spouse demographics, especially in this sample of spouse by employment status, how many hours the spouse works per week, and spouse age.

Influence on Eating Habits

When looking at the survey responses related to who influences TA eating habits and nutrition, both spouses and TAs agree that spouses have a greater influence on eating habits on days off than while on shift. Additionally, both spouses and TAs agree that spouses encourage healthy food consumption by the TA and that TAs eat better because of the spouse. In terms of overall spouse and TA influence on TA eating habits, the spouse feels the TA has a greater influence, while the TA feels the spouse has a greater influence. These results indicate that interventions to encourage healthier eating habits and improved nutrition among TAs need to include the spouse, especially related to meals consumed off duty. More specifically, the frequency of eating at home per week, as well as meals made by the spouse and TA at home for work, was influenced by the spouse, especially their employment status, average hours worked by spouse, spouse age, and cost as a barrier to healthy eating.

Influence on Dietary Quality

The healthy eating ratio, based off of the Healthy Eating Index to assess dietary quality, was 3.1 for TAs. Since this ratio is calculated as the frequency of healthier foods divided by less healthy foods, TAs' score being >1 indicates a higher consumption of healthier foods relative to less healthy in a 3:1 ratio. This ratio differed by hours worked by the spouse, overall spouse influence scores, and frequency of meals made by the spouse at home for work, indicating the spouse has an influence on how healthy TAs eat and thus should be a focus of interventions to improve TA dietary quality.

Comparison to Prior Research

This research is novel in that there is limited research on TA spouses, especially in relation to nutrition and eating habits. There is some research involving TA spouses, particularly LEO spouses, their relationship with their TA, and how it impacts mental and physical health of the TA [41, 42]. The results of the present study align with the results of previous research that indicate that marital happiness contributes the most to overall happiness and that unhappiness, such as stress, and the chronic release of cortisol is linked to CVD [41, 42] The present study begins to reveal a potential gatekeeping relationship between spouses and TA eating habits and dietary quality. This phenomenon is also seen in research on the protective nature of high-quality marital relationships among tactical populations on physical and mental health [46, 47].

Strengths

This study had several strengths. One strength was that two of the researchers on the team are tactical athlete spouses themselves. Another strength is that the research team

included nutrition/ dietary quality and family relationship experts, with tactical research experience. The personal insight and professional experience of these experts allowed our team to create a comprehensive exploratory survey that touched on all major aspects of the relationship between TAs, their spouses, and their nutrition habits.

Limitations

One limitation of this study was the study design(cross-sectional), which limited its scope but was most feasible considering this is the first study exploring this phenomenon. Another limitation was the small sample sizes of spouses and TAs, which limited power to detect differences and relationships in the data, but this not unusual for this field. The last limitation of this study was that the data may not be completely representative of the broader TA spouse population. Participants were all female, mostly not employed, mostly married, and mostly in relationships with career firefighters, LEOs, and active-duty military personnel. It may be that characteristics of spouses such as gender, employment status, relationship-type, and TA type could influence nutrition and eating habits in distinctly different ways; however the homogeneity of the current sample of participants made it such that these differences could not be captured.

Future Research

Future research could focus on why and more specifically how factors, like a spouse's employment status and hours worked, impacted the TAs' meals and snacks. Additionally, future studies should seek larger and more representative samples. Finally, in combination with results from the ongoing focus groups in our lab to dig deeper into these phenomena, this data

could guide development of tailored nutrition interventions for spouses that also benefit the TA.

Implications for Practice

The results of this study can be applied to the practice of registered dietitians and other public health practitioners who work with tactical groups in further highlighting that TA health behaviors may be to a varying extent influenced or even controlled by someone else, like their spouse. Some of the survey questions used this study could act as a guide to properly and thoroughly assess who impacts the nutrition of the TA (spouse, TA, coworkers) and thus better guide what approach they take to change TA eating habits and improve TA nutrition.

Conclusions

Spouses appear to influence TA eating habits on and off shift, including how they obtain their meals as well as the quality of them. Considering the disproportionately high and ever-increasing prevalence of chronic disease among tactical populations, nutrition and health interventions targeting spouses may be effective in slowing these trends. Ongoing research in our lab includes gathering focus group data to further detail the tactical athlete spouse influence on eating, nutrition, and health and to determine what they want and need in a program tailored to them.

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