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A Study on the Impact of Diet on Unified Fire Authority Firefighter Performance

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Nutrition and physical activity impact physical performance for athletes, including tactical athletes such as firefighters. Firefighters currently working with Unified Fire Authority (UFA) were invited to participate in a survey via email. The survey was made up of questions on dietary habits, regular physical exercise habits, nutrition knowledge, and perceived performance during their Routine Physical Assessment (RPA). Chi Squared Distributions and Independent t-tests were used to assess group differences. Statistical significance was set at $p<0.05$. Results indicated that more High Performance firefighters ate five or more servings of fruits and vegetables per day than did Low Performance firefighters. There were no significant differences in nutrition knowledge or regular vigorous exercise when comparing groups.

Objective

This project aimed to examine the impact of physical activity, dietary intake, and nutrition knowledge on UFA firefighters' performance on their RPA.

Introduction

Firefighters are first responders who engage in rigorous physical activity on a daily basis as part of their job. Firefighters may engage in activities such as dragging firehoses, climbing many flights of stairs, and carrying unconscious individuals to safety, all while wearing heavy protective clothing and equipment. As such, firefighters may be referred to as tactical athletes (Xu et al., 2023). As with any other type of athlete, physical training supports optimal athletic performance. A study by Chizewski et al. (2021) reported that regular physical activity supported cardiovascular endurance and muscular endurance, which were the strongest predictors for completing firefighting tasks quickly.

Nutrition is also an important factor for athletes' physical performance (Beck et al., 2015). Previous research among other tactical athletes (military personnel) highlights the importance of nutrition. A study by Montain et al. (2002) provides evidence that a well-balanced diet with adequate calories and protein preserved lean body mass and reduced rates of illness and injury. In contrast, overeating promoted high body weight and fat mass (Leaf & Antonio, 2017), and was associated with increased risk of injury, premature discharge, and impaired fitness (Spartali et al., 2014).

Previous research suggests that lifestyle factors put firefighters at risk for impaired physical performance and overall health. Obesity (Baur et al., 2012), cardiovascular disease (Soteriades et al., 2011), and cancer (Daniels et al., 2014) are among the top health concerns. Current research shows an increase in obesity prevalence for firefighters over the last decade (Baur et al., 2012). Cardiovascular disease is the leading cause of on-duty death and lifetime

mortality among United States firefighters. An estimated 45% of on-duty fatalities are from sudden cardiac death (Soteriades et al., 2011). The second leading cause of death is cancer, accounting for 27% of lifetime mortality among US firefighters (Daniels et al., 2014); firefighters have increased risk for several types of cancer compared to the general public, primarily digestive and respiratory cancers (Daniels et al., 2014).

Factors that influence poor heart health among firefighters include obesity, sedentary behavior, high caloric communal meals involved in "firehouse culture", and the frequent consumption of fast food and sugar sweetened beverages. López-Bermudo & Gómez-Landero (2021) report that on-duty firefighters tend to consume more calories and have a higher intake of fats than those who are off duty. Similarly, Muegge et al. (2018) reported that firefighters tended to eat fattier, more affordable meals with minimal produce while on the job. Firefighters' workplace environment may therefore contribute to their health risks and may impair their physical performance.

Nutrition education may be beneficial for firefighters. A study of firefighters in the United States and Canada (N=3,657) indicated that the majority of firefighters felt they did not receive enough nutrition information (68%), and expressed learning more about health eating (75%) (Yang et al., 2015). Previous research also suggests that dietary interventions can improve firefighters' weight (Day et al., 2019; McDonough et al., 2015), as well as reduce markers for cardiovascular disease and improve physical performance on their bi-annual fitness assessment (Walder, 2019). Because firefighters' health and fitness influence their ability to save lives, it is important to assess their current nutrition and fitness levels, as well as influential factors that may be addressed in interventions or policy changes. This study aimed to assess United Fire Authority (UFA) firefighters' regular physical exercise habits, self-reported dietary habits, nutrition knowledge, and perceived performance on their Routine Physical Assessment (RPA).

Methodology

Approval was obtained by the Utah State University Institutional Review Board (Protocol #12389). UFA firefighters (N=430) were invited via email to participate in an anonymous research survey. The survey gathered demographic information, and assessed specialized diet adherence (e.g. Keto, Atkins, intermittent fasting, etc.), dietary intake (frequency of eating various foods and beverages, meal and snack frequency, etc.), nutrition knowledge (questions taken from the General Nutrition Knowledge Questionnaire (Kliemann et al., 2016), regular physical activity via the International Physical Activity Questionnaire (Hagströmer et al., 2006), as well as self-reported performance on their RPA (which simulates job-related tasks such as hose drag, hydrant connection, roof ventilation, maze crawl, dummy drag, stair climb with hose bundle, and ladder raise).

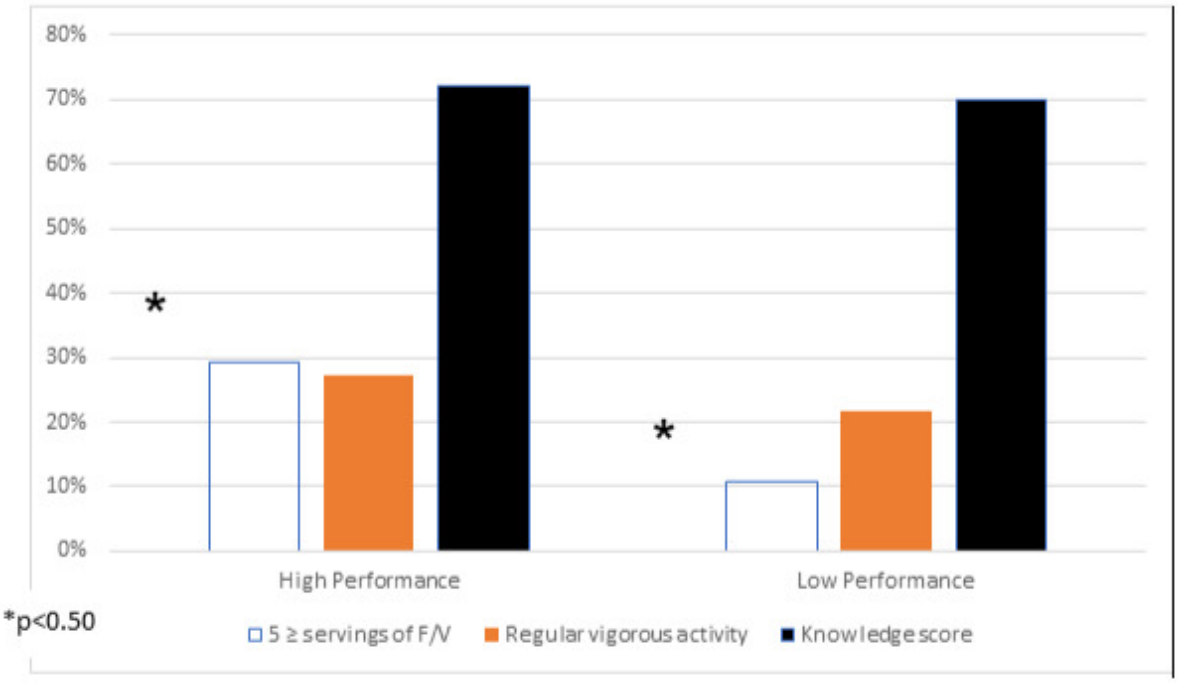

Figure 1. Firefighters' Fruit/Vegetable Intake, Regular Physical Activity Level, and Nutrition Knowledge Score by Physical Performance Category.

Analysis

A nutrition knowledge score was calculated by awarding one point for each correct answer, with 26 points possible. Based on their responses regarding perceived physical performance, participants were categorized into one of two groups: High Performance (performed exceptionally well/very well) and Low Performance (performed moderately well/slightly well/not well at all). Chi Squared Distributions and Independent t-tests were used to assess group differences. Statistical significance was set at $p<0.05$.

Results

Ninety-two firefighters participated in the survey. Of those ninety-two, seven were not included in the results for not completing the survey in it's entirety. Forty-eight (51%) participants were rated High Performance firefighters and 37 (39%) were rated Low Performance firefighters. More High Performance firefighters reported eating ≥5 servings of fruits and vegetables than Low Performance firefighters (29.2% vs 10.8%, p=0.04). There were no significant differences in prevalence of vigorous physical activity (12.1% vs 17.8%, p=.27), prevalence of following a specific diet (27.1% vs 21.6%, p=0.57), or nutrition knowledge score (18.7 vs 18.2, p=0.49) when comparing High Performance and Low Performance firefighters (See Figure 1).

The survey results also showed that 22.87% of participants were involved in some kind of specialized diet. These diets varied with only one to three participating in any specific one. The highest number of participants following an individual diet was taking part in intermittent fasting (3.3%). Of those adhering to a specific diet, 43.9% reported very strict adherence, 52.2% reported somewhat strict adherence and 4.7% reported not very strict adherence. There

was no significant difference in the percent of firefighters who followed a specific diet when comparing High Performance firefighters and Low Performance firefighters (27.1% vs 21.6%, p=0.57).

One of the questions asked participants if they wanted to know more about a nutrition topic. Of those who answered the question 35.3% stated they did not feel the need to learn more and 64.7% expressed interest in one or several nutrition topics they wished to learn more about. Another question asked if they agreed or disagreed with standard dietary recommendations and to please explain their answer. Of the participants who answered this question, 42.6% disagreed for various reasons. Only 27.9% stated that they agreed with standard dietary recommendations. The remaining responses were considered neutral. One participant stated that a survey cannot capture all the data necessary to determine their nutrition and physical fitness.

Discussion

More High Performance firefighters reported eating ≥5 servings of fruits and vegetables than Low Performance firefighters (29.2% vs 10.8%, p=0.04). This aligns with research by Manzano-Carrasco et al. (2019) that indicated that a dietary intervention study utilizing the Mediterranean diet, which is high in plant-based foods, showed that football players with greater adherence to the Mediterranean diet had better cardiorespiratory fitness and handgrip strength.

The finding in the current study that there was no difference in regular physical activity when comparing the High Performance Firefighters and the Low Performance Firefighters is surprising as regular exercise would presumably increase strength and endurance, both of which contribute to firefighters' successful completion of tasks (Chizewski et al., 2021). It is possible that other factors, such as practice with job-related tasks (Boyd et al., 2015) confounded the impact of general physical activity throughout the week.

Few firefighters reported following a restrictive diet, which is encouraging because said diets often don't support long-term weight loss (MacLean et al., 2011). In the current study, there was no difference in prevalence of following a specific diet when comparing High Performance firefighters and Low Performance firefighters. The low number of participants following a specified diet, coupled with variable diet adherence limits the conclusions that can be made from these results.

There were no differences when comparing nutrition knowledge scores of High Performance firefighters to those of Low Performance firefighters. It is concerning that the average score for both groups was approximately 70%. Fewer firefighters in the current study felt they needed to learn more about nutrition than did participants in the study by Yang et al. (2015) (35.5% vs 68%), the majority wanted to learn more about nutrition topics (68%), which was similar to Yang et al.'s findings (75%). Collectively these findings suggest that nutrition education is warranted in this population.

Limitations

There are limitations to using self-reported surveys to gather information regarding physical activity and diet. Results may not be as accurate as objective measures as they rely on the perceptions of the individuals (Park et al., 2018; Riley et al., 2005). In addition, the questions used in the survey in the current study were broad-level questions that only gathered information about food groups. A more comprehensive dietary assessment would have provided more information regarding overall diet quality (Park et al., 2018).

Conclusions

Results of this study suggest that nutrition knowledge and regular physical activity were similar when comparing High Performance firefighters and Low Performance Firefighters. Though, more High Performance Firefighters reported eating ≥5 servings of fruits and vegetables daily. Future research should explore the role of diet quality and physical performance among firefighters to determine if increasing intake of fruit and vegetables is an effective strategy for improving physical performance. Future research also should include objective measurements of diet, physical activity, and performance on RPAs. Firefighter organizations should consider providing nutrition education to their firefighters to promote optimal firefighter health and physical performance on job-related tasks.

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