Firefighter- and Fire Department–Level Barriers and Promoters of Physical Activity and Fitness Among Volunteer Firefighters

A Qualitative Study Using Semistructured Interviews

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Objective: To describe volunteer firefighters' perspectives on how firefighter- and fire department–level factors influence their physical activity and fitness. **Methods:** Firefighters (n = 28) were interviewed, stratified by their years of firefighting, using an interview guide. Thematic analysis and systematic coding were used to analyze the interview transcripts. **Results:** Five themes were identified: (1) health and firefighting performance, (2) firefighter time and availability, (3) responsibility of the fire department to support volunteer members' physical fitness, (4) fire training drills as a form of functional physical activity, and (5) fitness initiatives at the department. Interviewing by years of experience showed varied perspectives that converged toward similar conclusions. **Conclusions:** Incorporating fitness discussions into department meetings and trainings and identifying fitness advocates within the department may contribute to overcoming barriers to physical fitness among volunteer firefighters.

Keywords: barriers, physical activity, physical fitness, promoters, volunteer fire departments, volunteer firefighters

LEARNING OUTCOMES

- Describe individual- and fire department–level barriers and promoters to physical activity and fitness among volunteer firefighters.
- Discuss how individual, firefighter lifestyle, and fire department influence volunteer firefighter physical activity and fitness.

While protecting our communities, firefighters often respond to dangerous situations that put them at risk of adverse health events. Firefighting as an occupation is associated with elevated risk of injuries and diseases including certain cancers[1,2] and cardiac events, which are a major contributor to line-of-duty fatalities among firefighters.[3–5] Physical activity and fitness can reduce the risk of these adverse conditions[6–9] and are critical to ensure firefighter safety and improve firefighting response capacity.

Volunteer firefighters, constituting the majority (65%) of the US Fire Service,[10] have a higher prevalence of insufficient cardiorespiratory fitness necessary for essential firefighting tasks while wearing firefighting personal protective equipment and self-contained breathing apparatus.[11–13] They also have a higher prevalence of overweight and obesity compared with career firefighters.[11,12] In 2020, 71% of volunteer departments lacked basic firefighter fitness programs compared with 27% of career departments, accounting for the population size served by the departments. Similarly, 58% of volunteer

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departments did not provide medical or physical evaluations to their members, compared with 22% of career departments.[14] Fire department–offered fitness support can be beneficial to firefighters.

A US-based study comparing career firefighters from 10 departments with fitness programs (annual physical examinations, access to fitness coordinators and trainers, and time allotted for fitness activities) with career firefighters from 10 departments without such program reported that firefighters from departments with fitness programs had lower odds of being obese, had five times greater odds of meeting cardiorespiratory fitness benchmark, and generally had higher mean cardiorespiratory fitness than firefighters in departments that did not have fitness programs.[15] However, fitness challenges specific to volunteer firefighters have rarely been studied in this already understudied majority of the US Fire Service.

Commonly reported barriers to fitness among career firefighters, which volunteers may also face, include inadequate rest or sleep and concern of fatigue due to exercising before a fire call.[16–18] In addition, a qualitative study exploring challenges to healthy behaviors among volunteer firefighters found that being on call and not having a set schedule were barriers to maintaining healthy behaviors like healthy eating and physical activity.[19] Improving fitness is a priority for volunteer departments, and their leadership is often interested in fire department–offered fitness programs and exercise education.[20]

US volunteer fire departments face barriers in offering their volunteers fitness-related support.[14] The 2020 US Fire Departments Needs Assessment conducted by the National Fire Protection Association,[21] a nonprofit organization that develops firefighter health and safety standards, identified that most volunteer fire departments did not provide their membership with a basic firefighter fitness program or with periodic medical or physical evaluations.[14] This inability may be attributed to financial challenges among volunteer departments to implement health promotion and prevention practices.[22] Although career firefighters may benefit from dedicated exercise spaces, health and fitness programs, and regular health examinations at the fire station during their shifts,[15,17,23] these resources may not be as readily available to volunteer firefighters through their fire department.

The US Fire Administration and the National Volunteer Fire Council identified firefighting culture, recruitment and retention challenges, funding limitations, expanding roles of firefighters, personal health, and the adoption of safety protocols as the most critical health- and safety-related issues for volunteer fire departments and their firefighters.[24] They suggest that routine health screenings and the promotion of positive lifestyle behaviors, including fitness assessments and programming, can address and manage volunteer firefighter health and safety issues.[24] However, limited research explores the unique barriers to physical fitness among volunteer firefighters that may change with their age and years of firefighting service.[25]

To better understand these factors and address the health and safety issues faced by the volunteer fire service from their own perspectives, this qualitative study explored perceived individual- and fire department–level barriers and promoters of physical activity and fitness among US volunteer firefighters.

METHODS

Participants and Recruitment

This qualitative study was conducted as a part of the Firefighter Cancer Assessment and Prevention Study (CAPS),[26,27] a substudy of the Fire Fighter Cancer Cohort Study.[28] The aim of CAPS is to characterize and measure risk factors that may be linked to increased cancer risk among volunteer firefighters. Incumbent volunteer firefighters 18 years or older (n = 569) from 41 US fire departments in nine states (Connecticut, Illinois, Kansas, Maine, Maryland, Missouri, New Jersey, Tennessee, and Washington) were enrolled in CAPS from July 2019 to January 2023 using convenience and snowball sampling. Participants completed a comprehensive enrollment survey that gathered data on demographics, fire service experience, health care access, employment history, cancer history, screening practices, and health behaviors. CAPS is approved by the University of Arizona Institutional Review Board. This qualitative study was approved by Rutgers, The State University of New Jersey Institutional Review Board.

All incumbent CAPS participants who completed the enrollment survey were eligible and received an e-mail invitation to join this study. The e-mail provided details about the study and a link to a scheduling survey. Prior to the interviews, participants completed an online consent form and a brief questionnaire, providing updated information on demographics, length of firefighter service, and physical activity. Self-reported age, sex, body mass index, and physical activity data were used to estimate firefighter cardiorespiratory fitness using a nonexercise estimation model. Physical activity data were collected through a physical activity rating, an 8-point self-rating scale of past 30-day physical activity (0–1: inactive, 2–3: moderately active, and 4–7: vigorously active).[29] Cardiorespiratory fitness was categorized as meeting the National Fire Protection Association recommendation (≥12 METs) or not (<12 METs).[30] Both the consent process and the questionnaire were hosted on REDCap, a secure survey system.[31] The interviews were scheduled between June 2021 and December 2022.

To explore whether volunteer firefighters' perspectives toward their physical activity and fitness varied across different stages of their firefighting service, interviewees were grouped based on their years of firefighting, measured as both volunteer and, if applicable, career firefighting experience, accounting for any gaps in service. Three tenure groups were created based on the distribution of firefighting service: less than 10 years, 10 to less than 30 years, and 30 years or greater. The initial enrollment target was 30 volunteer firefighters, with 10 firefighters in each tenure group, or fewer if saturation of each discussion topic was reached.

Study Procedures

Firefighters were interviewed individually or in small groups of up to three people. The interviews were conducted using Zoom Meetings, a secured virtual meeting platform, because participants resided in different states. Interviews lasted from 25 to 40 minutes and were audio- and video-recorded for transcription and analysis purposes. Interviewed participants received a $25 gift card. All participants completed the interviews.

Semistructured Interviews Guide

The semistructured interviews were conducted using an interview guide that included questioning routes and probing questions to elicit information from the participants. The questions were developed based on the current literature and guidance from qualitative researchers and firefighter health and culture experts. In each interview, questions were asked from three domains: (1) individual-level factors, (2) fire departmental–level factors, and (3) perceptions toward physical fitness (Table 1).

All interviews were moderated by the same moderator, who had no prior relationship with the participants and who was trained in moderating semistructured interviews. The CAPS principal investigator joined the interviews (with camera off) and, when needed, guided the first author in probing discussion points. The CAPS principal investigator also had no prior relationships with the participants and was introduced to the participants before the interviews began. Participants were told that there are no right or wrong answers, as the moderator was interested in their perspectives on their physical activity and fitness in the context of their personal lives, firefighting, and fire department.

Data Analysis

After an interview was conducted, the recording was transcribed to text format using Zoom Meeting's built-in transcription

TABLE 1. Domains and Topics of Semistructured Interview Discussion

Domain	Topics
Individual factors	• Exercise behavior at home or at the gym • Impact of: ○ Time management (with family, work, etc) ○ Rest or sleep ○ Being on call and/or impact of response/call length ○ Coronavirus disease 2019 (COVID-19) pandemic
Fire departmental factors	• Perception, attitude, and intent toward availability of wellness/exercise programs, workout rooms/equipment, and/or fitness assessments • Attitude regarding the fire department's role in supporting firefighter physical fitness and health
Perception toward physical fitness	• Perceived value of exercise and its components on: ○ Firefighting skills, roles, and performance ○ Health status and specific health outcomes (eg, cardiovascular disease, cancer)

tool, which was then reviewed and revised for accuracy by CAPS research team members. Transcribed interviews were then analyzed using a thematic analysis approach, a method to identify, organize, describe, and characterize interview themes (patterns in responses).[32]

A coding guide was developed based on the questions of semistructured interview guide, repeated transcript readings, and preliminary research notes from these readings. Systematic coding of the transcript text was performed based on the coding guide, using a qualitative coding software program (NVivo 14).[33] Participant responses were grouped by the codes and compared among the three firefighting tenure groups. Themes related to the promoters of and barriers to physical fitness were identified from responses based on how extensively, specifically, and consistently each of the themes and concepts were discussed. These were further grouped by whether they were attributed to participants' personal lives (eg, family, employment), their individual firefighting responsibilities, or their department characteristics. These findings were illustrated by participant quotes in the results narrative, some of which were edited for brevity and clarity.

RESULTS

Between June 2021 and December 2022, 28 CAPS participants were interviewed as the majority of the 569 incumbent CAPS volunteer firefighters (83.9%) were enrolled in 2021 or later. Among the interviewed participants, 7 were in the fire service for less than 10 years, 11 were in the service for 10 to less than 30 years, and 10 were in the service for 30 years or more (Table 2). Just under two-thirds (64.3%) of the interviewed participants were members of New Jersey volunteer fire departments. New Jersey volunteer firefighters comprised 41.5% of the overall CAPS sample. The remainder of the interviewed participants was from Connecticut, Maine, Maryland, and Tennessee.

The interviewed participants were incumbent members of their departments and were predominantly male (96.4%) and non-Hispanic White (85.7%), and half (50%) were 50 years or older. More than half (53.5%) of interviewees held nonleadership roles at their fire departments. Most interviewees (92.3%) were employed in jobs other than being a volunteer firefighter and were married or partnered (71.4%). Only 25% met the National Fire Protection Association cardiorespiratory fitness recommendation based on their questionnaire responses. With respect to other fitness characteristics, 53.6% were obese, whereas 35.7% reported routine vigorous physical activity in the past month (Table 3).

Emerging Themes

Five major themes related to the barriers and promoters of volunteer firefighter physical activity and fitness emerged from the interviews.

1. Health and firefighting performance
2. Firefighter time and availability
3. Responsibility of the fire department to support volunteer members' physical fitness
4. Fire training drills as a form of functional physical activity
5. Fitness initiatives at the department

Theme 1: Health and Firefighting Performance

Participants across each of the three firefighting tenure groups discussed the hazardous and physically demanding nature of firefighting. When asked about the importance of physical fitness concerning their health and firefighting responsibilities, several highlighted the benefits of maintaining fitness both for their current firefighting duties and for their long-term health:

"It's a physically demanding job, whether it's volunteer, career, it doesn't matter. It's the same job. You have got to be physically fit. Besides, heart attacks being the number one cause on the fire ground and cancer, later, but on the fire ground, heart attacks are the number one cause of death. So, you have to be fit to perform your job" (participant with 10 to <30 years of service).

The majority of participants emphasized the physically demanding nature of firefighting, underscoring the direct impact of fitness on crucial aspects of their firefighting duties:

"Firefighting is such a demanding job. If you're more physically fit, you're going to be able to conserve air in the SCBA longer. If you're out of breath, you're out of shape, you're going to be huffing, you're going to be puffing. You're going to be sucking air and you're going to be emptying a bottle faster than maybe your partner who you're going in the fire with. So, if that's the case, you're going to have to withdraw from the fire. So, fitness does count" (participant with ≥30 years of service).

Moreover, some participants said being a volunteer firefighter motivated their physical activity. Especially among those with less than 10 years of service, some viewed staying active to safeguard against the potential adverse effects of firefighting in the long run:

"I exercise just to continue doing this job, continue volunteering. I don't want to put stress, with me being so young as I am, on my heart, and you know damage that in the long run. I want

TABLE 2. Type of Interviews Conducted Among CAPS Participants by Years of Firefighting Service (n = 28)

	Years of Firefighting Service		
Interview Type	<10 y (n = 7)	10 to <30 y (n = 11)	≥30 y (n = 10)
Individual	4	4	5
Group (n = 2)	0	4	2
Group (n = 3)	3	3	3

Cell values represent counts of individual firefighter participants.
CAPS, Firefighter Cancer Assessment and Prevention Study.

TABLE 3. Demographic, Physical Fitness, and Firefighting Characteristics of Interviewed CAPS Volunteer Firefighters (n = 28) and All CAPS Volunteer Firefighters (n = 569)

Characteristics	Interviewed Participants (n = 28) % (95% CI)	All CAPS Participants (n = 569) % (95% CI)
Age		
18 to <35 y	25.0 (7.9, 42.1)	36.0 (32.1, 40.0)
35 to <50 y	25.0 (7.9, 42.1)	27.6 (23.9, 31.3)
≥50 y	50.0 (30.3, 69.7)	36.4 (32.4, 40.3)
Sex, male	96.4 (89.1, 100.0)	89.8 (87.3, 92.3)
Race/ethnicity, non-Hispanic White	85.7 (71.9, 99.5)	90.9 (88.5, 93.2)
Currently employed	92.3 (92.9, 100.0)	85.9 (83.1, 88.8)
Marital status, married/partnered	71.4 (53.6, 89.3)	64.5 (60.6, 68.4)
Education, some college or more	82.1 (67.0, 97.3)	75.2 (71.6, 78.7)
Met NFPA 12 METs recommendation*	25.0 (7.9, 42.1)	19.9 (16.6, 23.1)
Physical activity level		
Inactive/low	25.0 (7.9, 42.1)	24.4 (20.9, 28.0)
Moderate	39.3 (20.0, 58.6)	45.7 (41.6, 49.8)
Vigorous	35.7 (16.8, 54.6)	29.9 (26.1, 33.6)
BMI		
Healthy weight (18.5–24.9 kg/m^2)	10.7 (0.0, 22.9)	18.6 (15.4, 21.8)
Overweight (25.0–29.9 kg/m^2)	35.7 (16.8, 54.6)	38.3 (34.3, 42.3)
Obese (≥30.0 kg/m^2)	53.6 (33.9, 73.3)	43.1 (39.0, 47.1)
Years of firefighting†		
<10	25.0 (7.9, 42.1)	38.3 (34.3, 42.3)
10 to <30	39.3 (20.0, 58.6)	36.6 (32.6, 40.5)
≥30	35.7 (16.8, 54.6)	25.1 (21.6, 28.7)
Ever been a career firefighter	17.9 (2.7, 33.0)	18.5 (15.3, 21.7)
Current firefighting rank		
Firefighter	53.6 (33.9, 73.3)	64.7 (60.7, 68.6)
Company officer	25.0 (7.9, 42.1)	22.0 (18.6, 25.4)
Chief officer	21.4 (5.2, 37.6)	13.4 (10.6, 16.2)
Fire-related operations performed‡		
Interior	92.9 (82.7, 100.0)	80.0 (76.7, 83.3)
Fire-related exterior operations	85.7 (71.9, 99.5)	77.0 (73.5, 80.4)
Fire-related overhaul or investigation	82.1 (67.0, 97.3)	68.2 (64.4, 72.0)
Wildland fire	53.6 (33.9, 73.3)	49.6 (45.4, 53.7)
Rescue operations	75.0 (57.9, 92.1)	65.9 (62.0, 69.8)
Emergency medical services	39.3 (20.0, 58.6)	38.3 (34.3, 42.3)
Hazmat	57.1 (37.6, 76.7)	37.3 (33.3, 41.2)

BMI, body mass index; CAPS, Firefighter Cancer Assessment and Prevention Study; METs, metabolic equivalents; NFPA, National Fire Protection Association.

*Estimated using age, BMI, gender, and physical activity rating.

†Includes both career and volunteer experience, accounting for any possible gaps.

‡Categories are not mutually exclusive.

to keep doing this job, keep volunteering and helping out my town as long as I can" (participant with <10 years of service).

Participants across all tenure groups consistently emphasized the clear connection between fitness, their firefighting performance, and overall health. This connection was evident not only in terms of their current firefighting duties but also in its enduring impact on their health later in life.

Theme 2: Firefighter Time and Availability

Discussions across interviews underscored the close connection between perceived barriers to physical activity in both personal and firefighting contexts. Although 75% of participants reported engagement in routine moderate or vigorous physical activity, a common theme was time management as a significant barrier. Balancing employment and personal responsibilities such as caring for children, alongside the need to be available for fire calls, created a constraint on consistently engaging in physical activity behaviors. A recurrent discussion point is encapsulated in the following quote:

"You could be doing something and suddenly you got to drop everything because a call comes in. Some days are busier than others. So, you do get a little bit of time to work out, but most days it's time prohibitive" (participant with 10 to <30 years of service).

Furthermore, limited time availability posed challenges in prioritizing personal, behavioral, and firefighting responsibilities. One participant highlighted how the combination of their work and firefighting schedule moved exercising to a lower priority compared with ensuring adequate sleep:

"I am on-call typically at night and weekends. I work a full-time job during the day, so most of my calls come when I'm asleep or weekends when I'm around doing stuff. On any given week anywhere from two to four times a week I'm getting blown out of bed somewhere between 10 PM at night and 5:30 AM in the morning. For me, it's less about fitness and more about my sleep, especially for work" (participant with 10 to <30 years of service).

Most participants in the 10- to <30-year-tenure group consistently discussed that exercising was a lower priority compared with other responsibilities; however, this challenge was emphasized by those in the group with less than 10 years of service. For example, one participant reflected that when time was available alongside their work schedule, the priority was given to volunteering rather than exercising:

"You have your nine to five. [Volunteering] is the extra time instead of the gym. You could either go to the gym, or you could volunteer" (participant with <10 years of service).

Among some participants with more than or equal to 30 years of service, a notable barrier to physical activity was work-induced exhaustion, which left little opportunity for firefighters to even consider exercising:

"What keeps me from exercising, I'm much busier now than I have ever been. If my wife was on the line, she would tell you that I never stopped, except for when I come home at night [from current job], we eat dinner and I sit on the couch, I fall asleep because I am drained from the day, even though I'm not doing that physical activity like I did with [past job], I'm still mentally and physically worn out" (participant with ≥30 years of service).

In addition to work commitments, family responsibilities emerged as a significant area of priority. For instance, one participant stated:

"I have a second job, then I go to my other job, and I chase my two kids around, taking them wherever their sports are at night. I just don't have time" (participant with 10 to <30 years of service).

Despite some participants having gym memberships or exercise equipment at home, the time commitments associated with volunteering posed challenges in using these resources effectively:

"Finding the time to get to [the gym], on-duty is not always feasible, because we're always running all these calls. Like you just get up there, and you start working out, and then you have to go to a call all sweaty and gross. It's not really feasible to do it on duty" (participant with 10 to <30 years of service).

Most participants discussed this interplay between the demands of firefighting duties and personal commitments and noted it as a barrier to their physical activity and fitness.

Theme 3: Responsibility of the Fire Department to Support Volunteer Members' Physical Fitness

In response to the question whether fire departments have a responsibility to ensure the fitness of their volunteer firefighters, a consensus emerged among participants, irrespective of their length of service. They acknowledged the critical role the department plays in fitness promotion, particularly due to the physically demanding nature of firefighting and the support provided by department leadership. However, some participants noted that prioritizing fitness might pose a challenge for some departments:

"Absolutely because it's a physical job, and when you're under stress, it's horrible! It starts with leadership. We've got a new chief, and we are absorbing [another first responder department] within our town. He's got so much on his plate that the last thing he's thinking of is physical fitness and it's important" (participant with <10 years of service).

However, a few participants, particularly those who had 10 years of service or more, expressed the view that maintaining physical fitness is primarily the responsibility of the firefighter. They saw the department and leadership as facilitators rather than having a direct responsibility for volunteer membership fitness. They believe that departments could provide fitness resources, thereby fostering a mutual commitment from firefighters and acknowledging their valuable contribution to the department:

"I believe that the firefighter is ultimately responsible for his fitness, but I believe that the volunteer fire company should be able to provide the necessary means… I think it's two things, one is the willingness from the firefighters and second is the gratuitous appreciation to the firefighter for being part of [the department] and here's a reward, do whatever you want with it" (participant with 10 to <30 years of service).

A few participants, particularly those in leadership roles at the department or with more years of service, expressed that firefighter fitness extends beyond the fire department to the community. In this view, it becomes the community's responsibility to fund and ensure the fitness of its firefighters. However, participants also highlighted the considerable challenge departments face in securing funding for fitness programs or resources:

"There should be some commitment to keeping everyone fit. In the long run it is going to benefit the department and decisions. We've had discussions with the city about some incentives to get guys physically fit, but it's a monetary commitment on the city or town's part that they'd have to put up some money for fitness equipment and program and stuff. They're a little shortsighted and don't really see the benefit in it sometimes" (participant with 10 to <30 years of service).

Although most participants thought that the department has a promoting role or can influence volunteer firefighter fitness, some, especially those with more years of service, also emphasized that the optimal impact could be achieved through a collective effort involving fire departments, firefighters, and the communities they serve.

Theme 4: Fire Training Drills as a Form of Functional Physical Activity

All participants reported that their departments mandated regular meetings and training sessions, although the frequency of these gatherings varied among the participants' departments from twice weekly to approximately once per month. However, when asked about the inclusion of topics related to physical activity and fitness in routine departmental meetings, participants reported that they rarely, if ever, directly discussed these subjects. For example, when one participant was asked whether fitness-related topics were incorporated into their routine department meetings, they said:

"Not as [much as] it should be in my opinion. I mean it's not discussed. Some of the people that I know that are paid firemen, they do take physical fitness seriously to ensure that they are capable and able to do their job. But as far as the volunteers I don't feel like it is, no" (participant with ≥30 years of experience).

Also, when asked about routine department trainings, which often focused on skill refinement and practice, they indicated that explicit physical activities such as workouts or exercise were typically not included. However, participants noted that their training drills inherently involve physical activity in the context of functional tasks relevant to firefighting.

"The physical fitness is not in terms of going out there and doing burpees for couple of reps. It's not doing jumping jacks, push-ups. The physical activity is actually conducting firefighting drills, firefighting activity. That within itself, it's work. So, to be a little bit more specific: stretching a hose line that's charged with water. Water at each gallon is about eight pounds, so you can imagine a hose line with X amount of 150 gallons moving around that's activity. So, transforming it into activity that's almost like a CrossFit workout right because you're pulling then pushing" (participant with 10 to <30 years of experience).

The duration and frequency of fire training varied among the participants and their departments, as did the type of drills. One participant, who held a leadership role at the department, illustrated the comprehensive nature of the fire training their department undertook:

"At my volunteer department, I run my guys through one meeting night, one vehicle maintenance night, and then two drill nights per month, which are about three and a half hours of working on skills and stuff like that, plus we have specialty drills. That is if we want to run a weekend class, or go to a drill with another town, or we want to go to a burn facility. We probably clock in probably 15 to 20 training hours per month which are typically pretty intensive, you know, crawling around with full gear [firefighting protective equipment], getting your heart rate up and doing all those intensive activities" (participant with <10 years of service).

One participant discussed the challenge of adequate fitness training in their department, noting that although the training had physically active components, it still fell short in helping to retain firefighting skills:

"We do need to do more training. It's really hard for volunteers to do training because we work other jobs. So, if [leadership] had made a decision, hey these days you need to do this, do that, it would be a lot

better, because right now, we have no real training. But it's like doing whatever you want at your stations, and, at times, we invite other companies to come to do the training. But it's so hard that we lose some of the skills that we have learned through the years going to training" (participant with <10 years of service).

In the discussion on fire training drills, participants considered training to be physically active and even a source of physical activity. In the context of time availability, fire training emerges as a potential promoter of physical activity, albeit in a functional capacity. All participants, regardless of tenure, viewed fire drills and training as a form of functional physical activity. Although different perspectives were illustrated, no major differences were observed by tenure.

Theme 5: Fitness Initiatives at the Department

Subtheme 1: Department Gyms and Exercise Equipment

Discussions with participants regarding department resources for exercise and fitness showed varying levels of support based on a participant's department rather than tenure. Some departments offered exercise equipment or workout spaces within fire stations and, in some cases, through partnerships with external fitness centers. However, the use of these fitness resources varied among interviewed firefighters, suggesting that these resources may serve as fitness promoters for some participants but are not sufficient for others. One participant, who used their fire department gym in the past but no longer does, expressed:

"Our [department gym] isn't very good. We have two treadmills and an elliptical, but they're old and not really running that great. We do have some weights, not like a great gym" (participant with 10 to <30 years of tenure).

In contrast, another participant who also did not use their fire department's fitness facilities mentioned:

"[Fire department] actually has a gym, in a building that's close to us like walking distance. We have two folks that are on duty up there all the time, and they make pretty good use of that gym. It gets used quite a bit. I'm actually pleased with that. I personally don't use it much" (participant with ≥30 years of tenure).

Although not many participants' departments subsidized gym memberships, one participant highlighted the positive impact it had on recruiting volunteer firefighters. They stated:

"Fortunately, [department] has enabled us to have memberships at local gyms; that's one of the benefits, one of the perks they use to attract some volunteer firefighters, and it helps" (participant with ≥30 years of tenure).

We did not observe differences by tenure possibly due to the variation in the availability of fitness resources among the different participants' departments as well participants' varied use of the available resources.

Subtheme 2: Advocating for Fitness Initiatives

A recurring theme in the discussions on physical activity and fitness within the context of the fire department was the importance of having a member within the department who advocates for the fitness of fellow members, whether this person is in a leadership role or not. Many participants across all tenure groups highlighted how they personally benefited from these advocates who contributed to the overall well-being of the department:

"Our chief is very pro staying fit, and he's really been pushing forward a lot of health and wellness for us, which is great. We really need it. Then for him to get the department to pay for CrossFit, for all of us to do that, it's just even more of an incentive to go" (participant with 10 to <30 years of service).

Other participants also expressed gratitude for fitness advocates within their department. One participant mentioned:

"Our chaplain has been a big part of revitalizing the fitness room" (participant with ≥30 years of tenure).

Similarly, another participant shared:

"We have a member on our full-time staff, who is a workout fanatic, he has helped me" (participant with <10 years of tenure).

However, one participant who tried to advocate for a fitness initiative at their department highlighted the challenges associated with conveying and implementing fitness initiatives within the department, emphasizing the need for persistence, particularly in situations where a consensus is lacking:

"The chief was looking into implementing gym membership but was unsuccessful. He pursued this new, local gym, but that didn't work out. I actually helped look into it. But some members wanted membership at another gym. Next meeting someone else is going to propose revisiting what I had proposed, but just being a little bit more heavy-handed, and saying, listen, this is the gym, this is the subsidy, take it or leave it. They thought I was a little too nice about it when I proposed it. There's a lot of personalities in the fire house, and people felt strongly one way or the other" (participant with 10 to <30 years of service).

Participants' responses suggested that having a physical activity or fitness advocate within their department served as a catalyst for promoting fitness.

DISCUSSION

The purpose of this study was to explore the firefighter- and fire department–level barriers and promoters of physical activity and fitness among US volunteer firefighters across different years of firefighting service. The interviewed firefighters underscored the significance of fitness for both their firefighting performance and overall health. A notable obstacle to firefighters' engagement in physical activity was identified as competing time commitments stemming from trying to balance firefighting responsibilities, employment, and personal commitments. Volunteer firefighters also emphasized that fire training drills, as well as having fitness advocates within their department, play crucial roles in promoting physical fitness. Variations in perspectives toward the promoters of or barriers to physical activity and fitness were observed based on years of firefighting. These variations were not contradictory but rather led to similar and expanded conclusions. For example, whereas most firefighters acknowledged their fire departments' role in influencing their fitness, those with more years of service also suggested that promoting physical activity and fitness would require a collective effort involving the department, volunteers, and the community.

There is growing evidence indicating that firefighters, including volunteers, are knowledgeable and concerned about the adverse effects of firefighting on health, both acute (eg, injuries and cardiac strain) and chronic (eg, cancer and cardiovascular disease).[34,35] The participants in this study emphasized the connection between their physical fitness and the prevention or reduction of the burden of these health conditions. However, they also shared that discussions on physical fitness were not explicitly integrated into routine department meetings or firefighting training, despite firefighter health and safety being one of the six critical challenges recognized by the US volunteer fire service.[24] Incorporating fitness-related topics into these routine meetings and trainings could potentially enhance physical activity and fitness among firefighters. Participants highlighted the physically active and intense nature of their training, which could serve as a motivator to improve fitness and safety, particularly given the discussions on form and methods. It is worth noting that fire training drills may contribute to occupational physical activity, which has been reported to paradoxically reduce cardiovascular health compared with leisure or recreational physical activity due to differences in intensity, duration, recovery, and related physiological responses.[36,37] Including appropriate hydration and recovery practices in firefighting training may help promote better training and fitness outcomes.

Consistent with previous evidence, volunteer firefighters in this study identified time constraints and limited availability as major

obstacles to physical activity and fitness. This challenge arises from juggling personal responsibilities such as family and employment, along with the commitments linked to being a volunteer firefighter.[19,24] Also, although some participants had access to fitness facilities and equipment, many reported that time constraints hindered their ability to exercise routinely. To address these challenges, in addition to incorporating exercise into fire training drills, individually tailored health programs that incorporate convenience and physical activity strategies can provide exercise options for different locations, including gyms, at home, and the fire station.[23]

Participants in this study discussed the availability of fitness resources, including workout spaces, exercise equipment, and gym memberships through their departments. However, their responses pointed to a gap between resource availability and use. Participants also highlighted the crucial role their fire departments play in helping firefighters maintain fitness, emphasizing the significance of fitness advocates within the department, such as department leaders or other engaged members. Having designated personnel in the department who can advocate for and support fitness initiatives may motivate members to be more physically active. Evidence suggests that departments with two or more health and safety personnel may exhibit better adoption of preventive or positive health behaviors such as cancer screening activities.[38] As reflected by some participants in this study, fitness advocates may also motivate members to also make use of department-offered fitness resources that are generally observed to be limited among volunteer departments.[14] However, identifying or recruiting this type of personnel may be a challenge for some volunteer departments as well.

There are possible limitations to this study. First, participants were mostly non-Hispanic White men, characteristics similarly observed among the national fire service demographics.[10] However, physical activity and fitness influences could not be sufficiently discussed among female volunteer firefighters who may have different experiences compared with their male counterparts. Second, the perspectives of firefighters regarding physical activity and departmental fitness resources may vary based on the region of their department's location and the level of community service and support, and most of this study's participants were from volunteer departments in New Jersey.[14] As well, we could not capture physical activity levels of the occupations the firefighters held outside their volunteer service that may affect firefighters' perception toward their physical activity and fitness. Third, the interviews were conducted online, potentially impacting the flow of discussions compared with in-person interviews. However, the moderator received training to conduct virtual interviews and generally received active participation from all participants. Fourth, the study used both individual and small group interviews based on participant availability, introducing potential variation in the type of discussions. However, the intentional integration of interview and focus group data may enhance data richness.[39] Finally, although the same interview guide was used for all participants and the influence of the COVID-19 pandemic was discussed in the early interviews, these discussions were fewer with later interviews. Therefore, the influence of the pandemic could not be sufficiently assessed in this study.

The study also has notable strengths. The semistructured interview guide effectively probed and elicited responses from firefighters regarding perceived promoters and barriers at both individual and fire department levels, offering a multilevel framework for understanding volunteer firefighter fitness. Participants were strategically interviewed based on their years of firefighting service to provide varying perspectives on the influences of volunteer firefighter fitness. Although individual and small group interviews were conducted, stratifying focus groups by demographic or similar characteristics may enhance saturation and provide a more comprehensive understanding of the discussed topics.[40]

Conclusion

This study emphasizes the often-overlooked population of volunteer firefighters and their perspectives on physical activity and fitness. The findings underscore the critical role of fitness in firefighting performance and overall health, with participants expressing awareness of the potential adverse effects of firefighting on well-being. Time constraints emerged as a significant barrier to consistent physical activity, reflecting the intricate balance between firefighting duties, employment, and personal responsibilities. The study suggests that incorporating fitness discussions into routine department meetings and firefighting training and promoting advocates for fitness within the department could help overcome these barriers. Moreover, the study highlights the importance of addressing the gap between the availability of fitness resources and their actual use. Firefighter health researchers and fire department leadership could collaborate in exploring the impact of tailored health programs and fitness initiatives, such as incorporating fitness-related discussions into membership meetings and training sessions. Future research could also explore the identification and roles of departmental fitness advocates and assess their impact on volunteer membership fitness.

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