

Ball Sports: Helping or Hurting Firefighter Physical Fitness

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, and expressions, or writings of another.

Signed: Paul Gano

Date: 12/20/17

Abstract

Physical fitness is critical for firefighter safety. The Los Alamos Fire Department (LAFD) has had a fitness policy since 1994 which had prohibited on duty ball sports. In late 2016, LAFD began allowing its firefighters to play ball sports while on duty with some restrictions. The problem is that LAFD does not know if allowing its personnel to play ball sports while on duty enhanced firefighter physical fitness. The purpose of this applied research paper was to evaluate if on duty ball sports enhanced firefighter physical fitness. The descriptive method of research was used to answer the following research questions:

1. What are the minimum fitness requirements for firefighters?
2. What are the potential benefits of allowing firefighters to play ball sports while on duty?
3. What are the potential risks or consequences of allowing firefighters to play ball sports while on duty?
4. Which firefighter injuries have increased as a result of allowing personnel to participate in ball sports while on duty?
5. What limitations should be implemented if allowing firefighters to play ball sports while on duty?

The procedures included a literature review to gather information from various publications, an internal survey sent to all LAFD firefighters and an external survey of other fire departments to gather information on firefighter physical fitness and ball sports, and a questionnaire used to interview others on ball sports, firefighter fitness, and injuries. The results have shown that while duty ball sports do not enhance firefighter physical fitness, they do have other benefits. The results have also shown that ball sports have negative consequences. Recommendations based on the research included allowing ball sports to be played while on duty because of other

benefits they provided and to explore and implement methods as outlined in this ARP to minimize injury risks.

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Firefighting has always been a physically strenuous and demanding occupation. Although fires have decreased tremendously in the United States over the past thirty years, the number of fire department incidents has nearly tripled during this same timeframe (National Fire Protection Association [NFPA], 2017). The reason for this increased call volume is because firefighters no longer respond to just fires and are expected to respond to emergency medical calls, technical rescue incidents, hazardous materials incidents, terrorism incidents, and natural disasters to name a few. As such, fitness has continued to be a vital health component of every firefighter's ability to safely and competently respond to all types of emergencies. The methods that firefighters have used to maintain and increase physical fitness can vary tremendously. Playing ball sports is one such method that firefighters may potentially use to enhance physical fitness. As with any physical activity that can be utilized to increase fitness, the activity's potential benefit for increasing fitness should be weighed against the potential consequences such as increased injuries. The Los Alamos Fire Department (LAFD) had only recently allowed its personnel to play ball sports while on duty after decades of prohibiting such an activity while on duty. LAFD had not conducted any formal research on the benefits versus the costs of allowing its firefighters to play ball sports while on duty as a part of the organization's fitness program.

The problem is that the Los Alamos Fire Department does not know if allowing personnel to play ball sports while on duty enhanced firefighter physical fitness. The purpose of this applied research paper was to evaluate if on duty ball sports enhanced firefighter physical fitness. This applied research will use descriptive methodology including literature review, internal and external surveys, and personal interviews with questionnaires to answer the following questions:

1. What are the minimum fitness requirements for firefighters?
2. What are the potential benefits of allowing firefighters to play ball sports while on duty?
3. What are the potential risks or consequences of allowing firefighters to play ball sports while on duty?
4. Which firefighter injuries have increased as a result of allowing personnel to participate in ball sports while on duty?
5. What limitations should be implemented if allowing firefighters to play ball sports while on duty?

Background and Significance

The Los Alamos Fire Department is a fully paid organization that provides fire protection to Los Alamos County (LAC) and the Los Alamos National Laboratory (LANL) which resides within the county (Los Alamos Fire Department [LAFD], 2015). The department was established in April of 1943 with the creation of the laboratory and originally consisted of seven civilian and 25 volunteer firefighters (LAFD, 2015). Later that same year, the department was taken over by the military until the end of World War II (LAFD, 2015). After the war, the fire department was reorganized under the U.S. Atomic Energy Commission (which eventually became the Department of Energy) with all the firefighters becoming federal civilian employees (LAFD, 2015). In 1989, the fire department transitioned over to Los Alamos County with all of its current and future firefighters and support staff being county employees (LAFD, 2015). LAFD continues to provide fire protection services to LANL through a Cooperative Agreement (CA) between the Department of Energy (DOE) and LAC (LAFD, 2015). The CA is a cost-

sharing agreement in which the DOE has agreed to provide approximately 80% of the funding for LAFD in exchange for fire protection services to LANL (*Cooperative Agreement*, 2014).

LAFD is the third largest fire department in New Mexico with 139 sworn personnel and 11 civilian support staff and operates out of five fully staffed operations stations (Stations 1, 3, 4, 5, and 6), one training station (Station 2), and a fire administration office (LAFD, 2015). LAFD is a nuclear grade fire department and is an Accredited Agency through the Center for Public Safety Excellence (LAFD, 2015). Most sworn personnel work in Operations and are assigned to one of the three shifts (Shift A, B, or C). Shift personnel works a 48/96 schedule which means they work 48 hours on duty followed by 96 hours off duty. Minimum overall staffing includes 37 firefighters on duty at all times and also includes minimum staffing for the promoted (either in regular or acting status) ranks (i.e.: Chief Officer, Captains, Driver/Engineers) and specialized disciplines (i.e.: paramedics, fire investigators, technical rescue team members, and hazardous materials technicians) (Los Alamos Fire Department [LAFD], 2016). Each shift is assigned a Battalion Chief (BC) who performs the overall management of the shift and who also serves as the Incident Commander (IC) for large or complex incidents that occur during the shift. Each operations station is assigned one Captain (single company stations) or two Captains (2 company stations) per shift who manages the crew assigned to that station and serves as the IC for smaller type incidents.

LAFD provides a variety of emergency and non-emergency services to LAC and LANL. LAFD responds to approximately 1900 emergency calls a year which may include but are not limited to: structural and wildland fire protection, emergency medical services (Basic/Advanced Life Support with transport service), hazardous materials incidents, technical rescue incidents, airport fire protection, fire investigation, and motor vehicle accident responses (LAFD, 2015).

Also, LAFD provides many non-emergency services and functions which include but are not limited to: code enforcement, public education, apparatus pump testing, hose testing, ladder testing, and pre-incident planning (LAFD, 2015).

With 109 square miles, Los Alamos County is the smallest county in New Mexico with approximately 17,000 residents and is located in the mountains of Northern New Mexico (Los Alamos County Website, n.d.). With an elevation of approximately 7000 feet, Los Alamos is located in a ponderosa pine forest and has one of the largest wildland-urban interfaces in New Mexico (CWPP, 2016). Due to LANL residing within Los Alamos, the community is one of the most highly educated communities with many of its residents holding a masters' degree or Ph.D. (Los Alamos County Website, n.d.). The community has a mild, four-season climate and is characterized by its excellent school system, low crime rate, and an abundance of cultural and recreational (especially outdoor) opportunities which include skiing, hiking, bicycling, and nearby visits to Bandelier National Monument and the Valles Caldera National Preserve (Los Alamos County Website, n.d.).

Founded in 1943, the Los Alamos National Laboratory was founded as part of the Manhattan Project to design and build the atomic bomb (Los Alamos National Laboratory, 2017). Since then, LANL which is owned by the DOE continues to play a critical role in national security through its scientific research in nuclear nonproliferation, border security, energy/infrastructure security, and countermeasures to nuclear and biological terrorist threats (Los Alamos National Laboratory, 2017). With approximately 10,000 employees, 1000 buildings (13 nuclear facilities), and a budget of \$2.45 billion annually (replacement value of \$14.2 billion), LANL contributes very significantly to the economy of Los Alamos and the region. It continues to be the largest single employer in Los Alamos. The high paying jobs at

LANL has resulted in Los Alamos County having among the highest per capita personal income in the nation (LAFD, 2015).

Firefighting by its very nature is a very dangerous profession. The hazards and the situations that firefighters are put in pose extreme personal risk for injuries and even death. Firefighters are expected to respond to a variety of emergencies such as fires (i.e., structure, wildland, vehicle, etc.), hazardous materials incidents, medical emergencies, technical rescue incidents, vehicle accidents, violent incidents, and natural and human-made disasters to name a few. Many of these emergencies involve performing dangerous tasks in hazardous environments such as operating equipment and machinery, responding emergency traffic, toxic atmospheres, extreme heat or cold, etc. Non-emergency activities such as training, fitness training, operating apparatus and equipment, and other routine duties may also pose hazards to firefighters.

Using the National Fire Incident Reporting System (NFIRS), the U.S. Fire Administration (USFA) tracks job-related firefighter fatalities and injuries in the American fire service. Approximately 80-100 firefighters die in the line of duty annually (United States Fire Administration [USFA], 2016). Also, from 2012-2014 an estimated 66,200 firefighter injuries occurred performing a variety of tasks such as fighting fires, responding to incidents, non-fire related calls, training, etc. (United States Fire Administration [USFA], 2016).

The environment that firefighters work in involve extremely strenuous, physical work and as such is one of the most physically demanding of all human activities (United States Fire Administration [USFA], 2016). In 2015, 60 firefighters died due to stress or overexertion which included 54 from heart attacks and six due to strokes (USFA, 2016). Also, the leading cause (27%) of all firefighter injuries from 2012-2014 were due to overexertion and strain (USFA, 2016). Between 2005 and 2014, 485 or 48% of all firefighter line-of-duty deaths were caused by

sudden cardiac death (Smith, Jahnke, Moffatt, Roche, & Kales, 2016). Research has shown that regular exercise and adequate physical activity among firefighters can improve cardiovascular health and decrease cardiovascular disease and death (Smith et al., 2016). The National Fire Protection Association (NFPA) has recognized that the physical stress and rigors that firefighters must contend with as part of their profession require them to be medically and physically fit (National Fire Protection Association [NFPA], 2015). As such, NFPA 1583 provides the minimum requirements for a health-related fitness program for firefighters which in turn increases their ability to perform occupational activities efficiently and safely while reducing the risk of injury, disease, and early death (NFPA, 2015).

LAFD has had a fitness policy since 1994 and has been revised and updated throughout the years with the most current update being in 2015. Among other things, this policy has outlined the physical fitness training, standards, assessments and exams that all sworn (from Firefighter to Fire Chief) personnel must adhere to while employed at LAFD (Los Alamos Fire Department [LAFD], 2015). Furthermore, this policy has required that all sworn personnel participate in physical fitness related activities for a minimum of 60 minutes per 24-hour duty shift or 60 minutes three times a week if on a 40-hour week schedule (LAFD, 2015). This policy had specifically prohibited various types of contact or ball sports such as football, baseball, tennis, basketball, etc. while on duty (LAFD, 2015). However, on November 11, 2016, an email was sent out by LAFD's Safety Division Chief (with Fire Chief concurrence) to all LAFD personnel which allowed sworn personnel to participate in ball sports while on duty as long as various restrictions for this activity such as the avoidance of full body contact and collisions were adhered to during the activity (W. Servey, personal communication, November 10, 2016).

There have been various past impacts whether allowing or prohibiting ball sports at LAFD while on duty in relation to physical fitness. Ball sports had been allowed while on duty many decades ago. However, when ball sports had been allowed, it is unknown whether or not this led to more injuries and how it impacted firefighter physical fitness. Since ball sports with some restrictions have been allowed since last November, it is unknown if this has impacted the number and type of injuries associated with this activity and its effect on firefighter fitness. In short, the researcher will need to evaluate data from before ball sports being allowed to data since ball sports have been allowed.

The present impact of the problem to the organization is that sworn personnel are now allowed to play ball sports while on duty, and it does not know if this has led to enhanced firefighter physical fitness and the impact on injuries associated with these types of fitness activities. The organization does not yet know if it was a good decision to re-allow firefighters to play ball sports on duty. Also, LAFD does not know if it should continue allowing on-duty ball sports and if so what the scope should be of any restrictions that may need to be placed on this activity.

The future impact of this problem may be significant to LAFD. If the decision is made to continue allowing ball sports to be played while on duty, will this lead to increased firefighter fitness or injuries? What is the financial impact on the organization if a firefighter suffers a career-ending injury while playing ball sports on duty? Does the gain in firefighter fitness (if any) negate the potential consequences of injuries due to ball sports? If LAFD decides to again prohibit ball sports while on duty, will this negatively impact firefighter physical fitness leading to decreased efficiency and safety or even perhaps lead to other types of injuries due to decreased fitness? As with any activity that firefighters perform (with exercise being one of them), there is

always an inherent risk which must be weighed against any positive outcomes. In short, the future impact of this problem must look at all the positives or gains versus the potential risks and negative consequences.

The decision to research firefighters participating in ball sports while on duty and whether or not this enhanced physical fitness was chosen for a few reasons.

First, LAFD does not know if it was a good decision to re-allow its firefighters to start playing ball sports while on duty after prohibiting such an activity for the past few decades. LAFD does not know how ball sports positively or negatively impacted firefighter physical fitness and the potential risks or consequences of this decision.

Second, the topic of on-duty ball sports is related to the Executive Leadership (EL) course in that the adaptive challenge is ensuring that all firefighters, in particular, those at LAFD, are physically fit to safely and completely perform their jobs at the highest level. In particular, part of the EL course curriculum stressed data collection and research to identify and understand systems. While LAFD is one large system (Fire Department overall), many subsystems make up the entire organization to make it work and function. One such subsystem is physical fitness. LAFD firefighters have been required to meet various minimum fitness standards as set forth by the organization. While there have been many different methods (i.e., running, weight lifting, stretching, etc.) that firefighters have used to maintain fitness, the organization has had the responsibility of determining which methods are allowable (i.e., running) and which are prohibited (i.e., boxing). By allowing ball sports to be played while on duty as an acceptable method of maintaining fitness, LAFD needs to know whether or not this was a good decision. Research and analyzing data is the best way to evaluate this recent decision.

Also, firefighters are competitive by nature. They have had to compete to get hired as a firefighter, they have had to compete for promotions, and they have had to compete to join specialty teams (i.e., paramedic, technical rescue, etc.). As such, this competitiveness may lead to increased injuries as firefighters compete to “win” the ball sport they are participating in despite the physical contact restriction placed upon them by LAFD. If allowing firefighters to participate in ball sports, the competitive nature and culture of the fire service must be considered or even modified because firefighters may likely play to win and succeed. The competitive culture or system must be challenged if allowing ball sports to be played while on duty. The EL course discussed challenging systems and culture to make positive change.

Finally, this research directly correlates to and supports the following strategic goals of the United States Fire Administration (United States Fire Administration [USFA], n.d., p. 9):

- “Goal 1: Reduce Fire and Life Safety Risk Through Preparedness, Prevention, and Mitigation” because ensuring and promoting firefighter physical fitness can reduce firefighter deaths and injuries thus allowing them to be safer and more efficient at their jobs when mitigating emergencies.
- “Goal 2: Promote Response, Local Planning and Preparedness for All Hazards” because physical fitness training helps firefighters prepare themselves physically to perform at the highest level when responding to and to mitigate any hazardous local event they respond to.
- “Goal 3: Enhance the Fire and Emergency Services’ Capability for Response to and Recovery From All Hazards” because firefighters who are physically fit have an enhanced capability to safely and competently respond to hazardous events.

Literature Review

A literature review was conducted to gather information from current and existing publications on the subject of physical fitness overall and its relationship to ball sports in the fire service. Information was collected and analyzed from various books, journals, websites, and other documents in regards to firefighter physical fitness. Information on this topic was analyzed in regards to history, current trends, emerging theories, and best practices. Information found and analyzed was based on its relevance to this research.

The first step of this literature review was to define what physical fitness is. During this literature review, many definitions that were discovered overlapped and were developed by the various government, private, and educational organizations. The Centers for Disease Control and Prevention (CDC) defines physical fitness as:

The ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies. Physical fitness includes a number of components consisting of cardiorespiratory endurance (aerobic power), skeletal muscle endurance, skeletal muscle power, flexibility, balance, the speed of movement, reaction time, and body composition. (Centers for Disease Control and Prevention, 2015, Section Glossary of Terms).

While many definitions were found, the CDC's was the most all-inclusive and captured the key elements of the physical fitness definition. As such, this was the definition chosen which had best defined physical fitness.

A further literature review was conducted to find information as to whether or not the CDC definition of physical fitness was equally applicable to the definition of physical fitness for firefighters.

One source used to find this information was derived from the National Fire Protection Association (NFPA). The NFPA was established in 1896 whose mission was to develop codes and standards which reduced fires and other hazards (National Fire Protection Association, n.d.). It is an international nonprofit organization which conducts research, training, and education in the development of its codes and standards. NFPA is considered a leading authority on fire prevention and public safety whose goal is to minimize the risk and the effects of fire through its development of codes and standards. Also, NFPA updates its codes and standards on a regular basis, typically every five years, to keep its information current and up to date (National Fire Protection Association [NFPA], 2016). Smeby found that NFPA standards were the most professional available and that many fire services use them routinely (Smeby, 2006).

While NFPA did not have a definition of physical fitness, it did have various standards that pertained to firefighter fitness. These standards include *NFPA 1500 Standard on Fire Department Occupational Safety, Health, and Wellness Program*, *NFPA 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments*, and *NFPA 1583 Standard on Health-Related Fitness Programs for Fire Department Members*. These different standards overlapped and addressed components of an overall Health-Related Fitness Program (HRFP). Firefighter physical fitness was one of many important components of an HRFP. NFPA 1583 stated that the HRFP would include fitness assessments, exercise training, and health promotion activities (NFPA, 2015). Also, NFPA 1582 also stated that all firefighters must be medically evaluated prior participating in any training programs (including physical fitness training) or emergency response activities (National Fire Protection Association [NFPA], 2018).

The second step of this literature review was to find information on the minimum fitness requirements for firefighters. NFPA was the first source identified because (National Fire Protection Association [NFPA], 2016, p. 2):

- It is directly related to firefighters and the fire service whose purpose is to “promote science and improve...fire protection and prevention...and other related safety goals; promote education and research on these subject...establishing proper safeguards against loss of life and property.”
- Its standards are developed by more than 279 Technical Committees comprised of 8,880 volunteers.
- Its Technical Committees are made up of people from a variety of interests such as those directly involved in the fire service (i.e., firefighters, fire investigators, officers, etc.), the insurance industry, business and industry, engineers, etc.
- It advocates for consensus on standards development, research, training, and education.
- Remain current as all standards are updated every three to five years.

NFPA 1500 Standard on Fire Department Occupational Safety, Health, and Wellness Program was originally developed in 1987 and has been revised throughout the years with the most recent edition being published in 2018 (National Fire Protection Association [NFPA], 2018). Its purpose was to specify the overall minimum requirements for a fire department’s safety, health, and wellness program (NFPA, 2018). While it stated that firefighters shall be annually qualified as meeting the physical performance requirements as established by their fire department, it also went into further detail and stated that firefighters shall meet the medical requirements as per NFPA 1582 and the physical fitness program requirements as per NFPA 1583 (NFPA, 2018).

NFPA 1583 stated that all firefighters will have annual fitness assessments and must be medically cleared annually by the fire department physician as directed by NFPA 1982 to participate in these assessments (NFPA, 2015). This standard, however, was not intended to establish physical performance criteria (NFPA, 2015). While NFPA 1582 stated in great detail what must be included as part of a comprehensive medical exam, it stated in general that the medical evaluation of a candidate must include a medical history, physical examination, and any laboratory tests required to detect physical or medical condition(s) that could adversely affect his/her ability to safely perform all essential job tasks (NFPA, 2018). In other words, meeting medical fitness requirements per NFPA 1582 was a prerequisite to meet the physical fitness requirements as given in NFPA 1583. Firefighters must not have any medical conditions that would preclude them from participating in a physical fitness program and meeting fitness requirements.

NFPA 1582 stated that all firefighters would have an annual fitness assessment and the components of these assessments shall consist of the following (NFPA, 2018):

- Aerobic capacity
- Body composition
- Muscular strength
- Muscular endurance
- Flexibility.

While NFPA stated what the five fitness assessment components were and the frequency that they shall be evaluated, it did not specifically address minimum fitness requirements with one exception. NFPA required that firefighters be at or above 12 METs in regards to aerobic fitness (NFPA, 2018). At below 12 METs, the firefighter is required to be counseled on ways to

improve aerobic fitness, at below 10 METs the firefighter shall participate in a prescribed aerobic fitness program, and at below eight METs the firefighter is not only required to participate in a prescribed aerobic fitness program but should be removed from active fire suppression duties until aerobic fitness can be improved (NFPA, 2018). MET is a metabolic unit that is used to quantify the intensity of physical activity and is defined as the ratio of the metabolic rate during exercise to the metabolic rate of rest (Farlex Partner Medical Dictionary, 2012). In simple terms, a higher MET denotes a higher level of physical activity. A MET of one is equivalent to being at rest; a five is moderate exertion (i.e., walking, slow dancing, etc.), eight at peak or extreme exertion such as fast running, and so on (Farlex Partner Medical Dictionary, 2012).

NFPA recognized that the minimum fitness requirements shall be determined by the fire department's physician and is based on the firefighter's assigned functions and activities (NFPA, 2018). Also, the baseline or results from a firefighter's initial fitness assessment shall be captured to track fitness levels throughout his/her career on subsequent fitness assessments and shall not be punitive nor competitive (NFPA, 2018). Finally, NFPA allowed for various fitness assessment protocols (i.e., step test, cycle ergometer, treadmill, skinfold tests, push-ups, modified sit and reach, timed-run, etc.) based on ease of administration, safety, cost, and predictive value to be used when measuring firefighter fitness (NFPA, 2018).

Other methods had been developed over the years that measured a firefighter's minimum fitness level to perform a variety of job-specific tasks and functions. For example, the Fire Service Joint Labor Management Wellness/Fitness Initiative had developed the Candidate Physical Ability Test (CPAT) to address the need for a holistic and non-punitive approach to wellness and fitness in the fire service (IAFF Firefighters, n.d.). The International Association of

Firefighters (IAFF) and the International Association of Fire Chiefs (IAFC) partnered with various fire departments to develop the CPAT as a method to measure minimum fitness not only for current firefighters but also for firefighter candidates (IAFF Firefighters, n.d.). The CPAT was designed as a tool to fairly measure an individual's physical ability to complete critical firefighter tasks effectively and safely (IAFF Firefighters, n.d.). The CPAT is a timed physical ability test where an individual must wear a 50 lb. Weighted vest and complete eight events which are: stair climb, ladder raise and extension, hose drag, equipment carry, forcible entry, search, rescue drag, and ceiling pull (IAFF Firefighters, n.d.).

The Criterion Task Test or CTT was developed in 1976 as a physical ability test to determine whether or not an individual had the requisite physical fitness ability to perform the essential firefighter job functions (Scott Safety Firefighter Combat Challenge, 2015). Similar to the CPAT, the CTT is a timed test in which the individual wears firefighter bunker gear and SCBA and must complete five tasks which are: high-rise pack carry up flights of stairs, hose hoist, forcible entry, hose drag, and victim rescue (Scott Safety Firefighter Combat Challenge, 2015).

While the CPAT and CTT were fitness assessment tools that may be used for structural firefighting, the literature review found another fitness assessment method that was primarily used for wildland firefighting. For wildland firefighting, an Incident Qualification Card or Red Card is used as an accepted interagency certification that a person is qualified to do the required job upon arrival of an incident (National Park Service [NPS], n.d.). The National Wildfire Coordinating Group (NWCG) has established the minimum training, experience, and physical fitness requirements for personnel involved in wildland firefighting (NPS, n.d.). Those who are involved in wildland firefighting are required to have successfully completed a Work Capacity

test to ensure they are physically fit to fight wildland fires (NPS, n.d.). The most rigid of these tests is the Arduous Pack Test which requires participants to do a three-mile hike carrying a 45-pound pack within 45 minutes (NPS, n.d.).

The Los Alamos Fire Department (LAFD) has a fitness policy that applies to all incumbent (sworn personnel who have completed the LAFD fire academy) and recruits (personnel in the LAFD fire academy) (LAFD, 2015). This policy outlined the training, standards, assessments, and exams required to ensure all sworn personnel met the minimum physical fitness requirements and was based on compliance with local, state, federal law, NFPA 1500, 1582, and 1583 standards, and Department of Energy (DOE) orders (LAFD, 2015). Fire Chief's Directive (FCD) 800.13 stated that all sworn members of LAFD would cooperate with and participate in an annual occupational medical exam, an annual fitness evaluation (MicroFit), regular physical fitness training, and an annual CTT (Appendix A) (LAFD, 2015). This policy addressed the following components in regards to firefighter physical fitness and wellness (LAFD, 2015):

- All firefighters will participate in a minimum of one hour of physical fitness training each 24-hour shift.
- All firefighters will successfully complete an annual occupational medical exam.
- All firefighters will successfully complete an annual MicroFit Fitness Assessment.
- All firefighters will successfully complete the annual CTT.
- Firefighters on a specialized team may be required to demonstrate specific fitness skills to be a member of the team (i.e., Wildland Pack Test for national resource classification).

The LAFD MicroFit Fitness Assessment measures aerobic capacity, body composition, muscular strength, muscular endurance, and flexibility (LAFD, 2015). Firefighters must achieve

at least a 12 MET level and a total overall fitness score of 60% or higher to successfully achieve minimum fitness requirements for LAFD. If a firefighter fails to meet the minimum fitness requirement, he/she is placed on a prescribed fitness program (may involve directly supervised physical fitness training depending on MicroFit results) and is retested until the individual passes the MicroFit (LAFD, 2015).

Department of Energy Order 10 CFR 851 mandated that all DOE contractors and their employees such as LAFD develop and adhere to a worker safety and health program ("Worker Safety and Health Program," n.d.). However, this order did not contain any minimum physical fitness requirements for firefighters.

The third step of this literature review was to find information on potential benefits of allowing firefighters to play ball sports while on duty. There was no literature found on this specific topic. As such, the literature review had to be broadened that included the potential benefits of ball sports in general.

Numerous exercise programs have been developed that have the potential to increase firefighter fitness. One such exercise program included High-Intensity Interval Training (HIIT). The basic premise of HIIT is that it included short intervals (30-90 seconds) of very high-intensity exercise such as sprinting mixed with short intervals of low-intensity exercise such as walking (Moore, 2016). Moore concluded that HIIT was an excellent form of exercise for firefighters because it mimicked the physical activity that firefighters do on emergencies and better prepared them physically for their jobs by increasing cardiovascular endurance and muscular fitness (Moore, 2016). Smith agreed with Moore and said that HIIT should be included in a firefighter fitness program because it not only mimicked actual energy expenditure on emergencies, but it improved endurance and increased anaerobic threshold and capacity (Smith,

2011). Sorace went further and said that HIIT might be superior to other more traditional steady-state exercises such as jogging because it improved maximal aerobic capacity, blood pressure, cardiac contractility, insulin signaling, and substantially burned more calories which increased fat loss (Sorace, 2009). The American College of Sports Medicine also stated that the benefits of HIIT had been shown to improve “aerobic and anaerobic fitness, blood pressure, cardiovascular health, insulin sensitivity, cholesterol profiles, and abdominal fat and body weight while maintaining muscle mass” (“ACSM,” 2014, p. 1). Finally, a research study showed that nearly one-third of firefighters reported that they participated in HIIT while on duty and as a result were half as likely to be obese compared to those who either did not train at all or participated in another form of exercise and were twice as likely to meet the accepted aerobic capacity standard of 12 METs (Hahnke et al., 2015).

One benefit of certain ball sports is that this type of exercise can be argued as a type of HIIT (Scott, 2015). For example, basketball is a form of HIIT because players alternate between periods of short bursts of high-intensity training such as sprinting to get into position to guard opponents and short bursts of lower intensity training such as jogging from one end of the court to the other (Scott, 2015). Other ball sports such as football, soccer, and tennis are examples of HIIT because they involve bursts of high-intensity training with bursts of lower intensity training mixed in (Scott, 2015). It is important to note that some ball sports such as baseball and golf would not be considered HIIT due to the lack of or infrequency of high-intensity training (Scott, 2015).

Ball sports have other benefits as well. For example, they address at least one component (cardiovascular endurance, muscle endurance, muscle strength, flexibility, and body composition) of physical fitness with many addressing most if not all of them (Scott, 2015).

Other benefits included improved mental and emotional well-being, decreased the frequency of becoming ill, and decreased recovery following an illness (Scott, 2015). The St. Clairsville Fire Department in Ohio had allowed its firefighters to play pickleball while on duty to supplement its regular fitness regimen and realized the following benefits of this type of exercise ("Firefighters Try Pickleball for Fitness," 2017):

- This exercise engaged participants which made it more enjoyable leading them to stick with the program.
- Firefighters stayed moving because it was fun, accessible, social, accountable, appeals to a wide range of ages and physical abilities, and safe.
- Enhances team-building and camaraderie.
- The firefighters are participating in this form of exercise on a regular basis.
- Gives firefighters an additional option for physical fitness.

Further review of the literature found information on the benefits of workplace team sports which was not specific to any one industry. The literature found many of the same benefits already noted above and also included improved health outcomes such as cardiorespiratory health, musculoskeletal function, and psychological well-being for the individual (Brinkley, Freeman, McDermott, & Munir, 2017). Also, there may be positive organizational health outcomes including increased productivity, reduced sick absences, and workability (Brinkley et al., 2017). Finally, there may also be additional social benefits in allowing employees to participate in team sports while at work including positively influenced relationships, communication, and team cohesion within the workplace (Brinkley et al., 2017).

The next step of this literature review was to find information on the potential risks or consequences of allowing firefighters to play ball sports while on duty.

One risk of ball sports, in general, was that firefighters could sustain injuries including multiple ones while playing ball sports on duty (Fortington, Van der Worp, Van den Akker-Scheek, & Finch, 2017). Scott agreed and said, “Due to the physical nature of sports, playing them comes along with the risk of injury” (Scott, 2015, p. 43).

Another consequence of firefighters playing ball sports while on duty is that these activities are only designed for fun and competition and as such are not useful for firefighters in maintaining physical fitness (Hayford, 1996). Furthermore, playing ball sports was not an effective use of a firefighter’s physical fitness time while on duty because it will not get the individual in shape and may lead to over-aggressiveness with someone getting needlessly hurt (Hayford, 1996). Other literature review disagreed with Hayford and said that playing sports while on duty was fun and a great way to stay in shape (“TACFIT,” 2011). However, this literature agreed with Hayford in some respects and said that ball sports might lead to higher risk for injury due to the competitive nature of firefighters and certain uncontrollable aspects of some sports (“TACFIT,” 2011).

Injuries due to ball sports, especially when played on duty, have led to financial consequences to fire departments, municipalities, states, and the federal government. For example, the federal government and each state have workers’ compensation benefits for employees who are injured on the job (FindLaw, 2017). While these workers’ compensation laws and benefits may vary somewhat from state to state in regards to who and what is covered, the basic premise is that the employee cannot sue the employer for injuries sustained at work (with the exception of pain and suffering) and provides compensation to the worker for medical care for the injury, replacement income, costs for retraining, compensation for any permanent injuries, and survivor benefits for employees killed on the job (FindLaw, 2017). As such,

firefighters who are injured on the job as a result of playing ball sports are entitled to workers' compensation benefits especially if on duty physical fitness training is required and when ball sports are allowed as part of this training (FindLaw, 2017). However, if a firefighter sustains an injury as a result of playing ball sports while on duty and this form of exercise was prohibited by the department, he or she may not be entitled to workers' compensation benefits because the employee engaged in an activity prohibited by the organization (FindLaw, 2017).

Also, fire departments have other financial costs and consequences if a firefighter sustains an injury while playing ball sports on duty. These included: increased sick time used, increased overtime costs to cover for injured firefighters, and career-ending injuries causing the fire department to hire and train replacement firefighters (Dolan, 2017).

This literature review also sought information as to which types of firefighter injuries had increased as a result of allowing personnel to play ball sports while on duty. Some studies had shown that exercising while on duty were responsible for about one-third of all injuries and were the leading cause of all firefighter injuries (Jahnke, 2015). No literature was found as to which types of firefighter injuries increased due to ball sports. However, there had been research as to which types of injuries are commonly found in individuals who play ball sports.

While there were vast amounts of literature found on ball sports injuries, this literature review will briefly cover some of the types of injuries that may be caused by ball sports. While some injuries are common amongst different ball sports, others are more common to specific ball sports depending on the way the sport is played (i.e., types of movements, amount of physical contact, etc.). Some injuries may be relatively minor while others can be much more severe to include being fatal. Injuries that may be sustained in ball sports included: bruises, muscle strains (or pulled muscles), torn anterior cruciate ligaments (ACL) in the knees, stress fractures,

sprained ankles, tennis elbow, lower back pain, and in more severe cases traumatic brain injuries (TBI) such as concussions ("OnHealth," 2016). The military had found that the leading cause of injuries in soldiers (i.e., muscle, joint, tendon/ligament, and bone injuries) were in exercise-related activities such as basketball as opposed to actual combat (Hauschild, 2015). As a result, these injuries have resulted in temporary or even permanent disability of soldiers, costing millions of dollars annually due to medical costs and restricted duty days, and limited the physical capability of thousands of active-duty service members each year (Hauschild, 2015).

The final step in this literature review was to find information on any limitations that should be implemented if allowing firefighters to play ball sports while on duty. Before participating in any physical fitness program and regardless of whether ball sports are included, NFPA stated that all firefighters must be medically cleared by the fire department physician per NFPA 1582 (NFPA, 2015). Also, NFPA 1583 stated that all firefighters shall participate in annual fitness assessments (NFPA, 2015).

While no literature specifically was found on ball sports limitations by on-duty firefighters, information was discovered that included general exercise limitations for firefighters and ball sports safety for anyone participating in these types of activities. One aspect that firefighters must always adhere to when exercising while on duty is that they must maintain response readiness at all times and avoid exercising at such a high intensity that would physically compromise their ability to respond ("TACFIT," 2011). In other words, an on-duty firefighter should avoid playing basketball to the point of total exhaustion rendering him or her physically unable to perform response tasks. This limitation would apply to all on-duty firefighters and all types of physical fitness activities (i.e., ball sports, running, HIIT, etc.).

Another limitation for participation in ball sports as well as any exercise activity is that participants should adequately hydrate themselves and stretch muscles before the physical activity (Scott, 2015). Stretching muscles improves flexibility and helps to minimize injuries (i.e., muscles strains, tears, etc.) while playing ball sports (Scott, 2015). Adequate hydration before playing ball sports helps minimize the risk of the body overheating, strengthens the immune system, and improves stamina (Scott, 2015). NFPA and the IAFC agreed with Scott when it came to hydration but went one step further and stated that firefighters should drink at least one gallon of water per day to keep properly hydrated (International Association of Fire Chiefs and National Fire Protection Association [IAFC and NFPA], 2014).

Ball sports by itself should not be utilized as the sole means for firefighter physical training (Hayford, 1996). To become physically fit to perform firefighting tasks, firefighters must conduct various forms of physical training such as stretching, strength conditioning, and aerobic exercise to get into shape before playing ball sports (Hayford, 1996). In short, one exercises to become fit enough to play ball sports, not play ball sports to become physically fit. As such, a limitation for firefighters who play ball sports on duty is that they must do other forms of exercise and not solely rely on ball sports to get them into physical shape.

Information was also sought as to whether there should be any limitations on ball sports that should be allowed or prohibited while on duty. This was broken down into two questions. First, do some ball sports provide an adequate fitness benefit for firefighters to count as physical training? Second, were some ball sports more inherently dangerous for firefighters to participate in while on duty and cause a greater amount of risk for injuries than others?

To answer the first of these questions, literature was sought to find information on ball sports that would provide an adequate amount of physical fitness benefit for firefighters. Most

ball sports have an aerobic component (i.e., an activity that requires lots of oxygen and works out the heart and lungs) and an anaerobic component (i.e., an activity that does not require much oxygen such as sprinting or weight lifting) with some sports requiring more than the other (Scott, 2015). If a department allows its firefighters to play ball sports while on duty with the goal of helping them to improve their physical fitness, ball sports that have a high aerobic component should be promoted while those that do not have a high aerobic component should be prohibited. If one only looked at the high level of aerobic training that certain ball sports could provide, sports such as basketball, football, soccer, and tennis would be examples of activities that warranted consideration for allowing firefighters to play while on duty (Scott, 2015). Other ball sports that provide a high level of aerobic training included volleyball and racquetball (Ashe-Edmunds, n.d.). In contrast, sports such as baseball and golf do not provide a high level of aerobic training and should be avoided for firefighters wishing to improve fitness while on duty (Scott, 2015).

The second question sought information on ball sports that may have had a higher injury risk to players due to the nature of the sport. The CDC stated that all sports involved some risk to those who play it (Centers for Disease Control and Prevention, 2015). However, collision or contact sports such as football, basketball, and soccer have higher injury rates when compared to other non-contact or non-collision sports (Centers for Disease Control and Prevention, 2015). One study showed that tackle football had the highest number of injuries per 100 participants at 18.8 whereas soccer, basketball, and tennis respectively each had 9.3 injuries, 7.6 injuries, and 2.5 injuries per 100 participants (*Total Injuries Ranked by Sport*, 2006). Also, not only did football have the highest rate of injuries overall among various ball sports, but it had the highest severe injury rate as well (Comstock, 2009).

The literature review showed that on-duty firefighters should be prohibited from playing certain ball sports. This would be considered a limitation and was based on the ball sport's ability to provide a physical training benefit and the high-risk nature of the ball sport. In summary, ball sports such as football, baseball, and golf would be examples of sports that on-duty firefighters should be prohibited from playing while on duty because they either do not provide an adequate fitness benefit or have a high risk for injury.

Fire departments should implement other limitations if allowing firefighters to play ball sports while on duty. For example, fire departments should implement the following when allowing its firefighters to play ball sports while on duty (Centers for Disease Control and Prevention, 2015):

- Firefighters should not be allowed to play ball sports while on duty unless there is an experienced or trained coach present who understands and enforces game rules, especially for contact sports such as basketball.
- Limit play to playing fields which are safe and well-maintained (i.e., free of tripping hazards, holes, broken glass, etc.).
- Wear proper protective gear if appropriate (i.e., proper footwear, goggles, etc.).
- Do not allow firefighters to play if they are experiencing pain due to an injury.
- Firefighters should learn skills to prevent injuries specific to the sport being played.

The above recommendations or limitations applied to anyone participating in ball sports.

The literature review revealed that physical fitness was a critical component in firefighters' ability to safely and effectively perform their jobs. Firefighting by its very nature is a very dangerous and a physically strenuous type of profession. Research has shown that approximately half of all firefighter line of duty deaths were the result of sudden cardiac events

(i.e., heart attacks) due to physical stress and overexertion. Also, firefighters sustain over 66,000 injuries per year performing a variety of firefighting tasks. Studies have shown that regular exercises and adequate physical activity can improve cardiovascular health and decrease cardiovascular disease and death among firefighters.

While the NFPA had established minimum standards for firefighter medical and physical fitness standards, it also stated that each fire department was responsible for developing its fitness standards and exercise programs based on expected job tasks. Although NFPA outlined various components of a health-related fitness program and went into great detail for medical requirements for fire departments to follow, it did not establish specific standards for organizations to follow in achieving firefighter physical fitness. NFPA simply stated that once firefighters were medically cleared to perform their job duties, the organization would have to implement an overall health-related fitness program and other than the 12 MET requirement, left it up to the organization to determine the physical fitness levels for its firefighters and how its firefighters would achieve the department's required fitness levels. Specifically, NFPA did not address on-duty ball sports in relation to firefighter physical fitness.

A further literature review revealed very little in regards to on-duty ball sports in relation to firefighter physical fitness. While an inordinate amount of literature was found in regards to firefighter physical fitness and ball sports, literature tying these two topics together was virtually nonexistent and had to be looked at as two separate topics. The focus of this ARP was tying these two areas together. In summary, the researcher used the concepts, standards, ideas, and the research of others as found in this literature review as the foundation for this ARP and to guide the research towards finding out if allowing LAFD firefighters to play ball sports while on duty enhanced their physical fitness.

Procedures

The purpose of this research was to evaluate if on duty ball sports enhanced firefighter physical fitness. This topic was chosen because up until November 2016, LAFD had prohibited its firefighters from playing all ball sports while on duty. Beginning in November 2016, LAFD had allowed its firefighters to play ball sports while on duty with some limitations such as ball sports may be played as long as there was no intentional physical contact, ball sports can only be played after 3:30 PM or during regular physical training hours, play will be in an area (i.e., court, field, etc.) appropriate for the activity, and people within the community will have priority over LAFD when using play areas (W. Servey, personal communication, November 10, 2016). LAFD had not conducted any research on whether or not ball sports truly enhanced its firefighters' fitness, risks, and costs associated with this activity, and what limitations or safeguards if any should be implemented.

To accomplish the purpose of this paper, the descriptive research method was used to answer the five research questions. The procedures used to answer these questions involved three components.

The first component involved the literature review process and was used to obtain information that provided insight of what others said to help answer all five research questions. The topic of this research was identified a few days after the researcher returned from the Executive Development (ED) course at the National Fire Academy (NFA) in August 2017. Information found during the literature review, and that was used in this ARP are shown in the references section.

Upon returning from the NFA, the first step to find literature for this ARP involved using the Google website search engine to find websites, online articles (including scholarly), and

potential books that had information related to ball sports and firefighter physical fitness. The search included the following keywords: ball sports, firefighter fitness, firefighter fitness standards, firefighter exercise, fitness, physical fitness, firefighter injuries, ball sports injuries, benefits of firefighters playing ball sports, and risks or consequences of firefighters playing ball sports. Also, relevant information found in local or organization specific (LAFD, DOE, and LANL) documents (either online or hard copy) such as LAFD's policies and procedures were also utilized in this ARP.

The Learning Resource Center (LRC) at the NFA was also utilized to find information related to firefighters playing ball sports while on duty and physical fitness. The researcher sent an email to the LRC requesting assistance in finding information related to this topic. LRC staff replied and found very little information on this topic but did send a few links to articles which had information on military service personnel physical fitness and ball sports, firefighter message boards, and one older article related to on-duty ball sports for firefighters. Also, a search to find other online ARPs located at the NFA's LRC yielded no results that directly pertained to on-duty ball sports and firefighter physical fitness.

LAFD's training academy library and the local library's interlibrary loan program was utilized to find and obtain books that could be used to provide information for the literature review. Although various books were found using these two libraries, nothing could be found that had information that tied ball sports and firefighter fitness directly together. Information from the literature review for these topics (firefighter fitness and on duty ball sports) was distinctly separate and would need to be tied together during the research for this ARP.

The second component used in gathering information involved using online surveys. The survey instrument used was SurveyMonkey which is a private online survey services company.

Two different surveys were used to obtain information to answer research questions two, three, and five. However, some of the survey questions were not directly tied into answering the research questions. These questions were asked to increase the validity of the survey participants' responses. Responses to these questions will be discussed in the Results section of this ARP. Both surveys were scheduled to be closed after approximately two weeks. However, both surveys were officially closed after approximately four weeks to give potential respondents more time to complete them.

The first type of survey was an internal survey that was sent via email to all LAFD firefighters (Appendix B). This survey sought feedback from LAFD firefighters in regards to on-duty ball sports and firefighter physical fitness. Specifically, this survey asked participants how often they played ball sports while on duty, which ball sports they played, fitness level changes since playing ball sports, amount of time spent on fitness, benefits, and drawbacks of playing ball sports while on duty, ball sport limitations or safeguards, and whether or not ball sports should be allowed for on-duty firefighters. The total number of internal surveys sent out was 137 of which 58 were completed.

The second type of survey was an external survey that was used to gather information from individuals who worked for other fire departments. This survey was sent out to two groups and sought feedback from participants on both ball sports and firefighter physical fitness in general and relative to their departments. While this survey was similar in some respects to the internal survey that was sent to LAFD firefighters, some differences should be noted. The main differences were that this survey asked participants to answer certain questions for their respective organizations versus as individuals and whether or not their fire departments allowed on duty ball sports. Specifically, this external survey asked participants whether or not their

organizations allowed on duty ball sports and if so which types, impact ball sports have on their firefighters' overall physical fitness, injuries directly associated with ball sports, limitations or safeguards for their firefighters playing ball sports if any, benefits and drawbacks of playing ball sports while on duty, reasons why their departments do not allow on-duty ball sports if applicable, and whether or not they felt that on-duty ball sports should be allowed.

The first group that this survey was sent to were fire chiefs of career or combination (organizations with paid and volunteer firefighters) fire departments in New Mexico. Volunteer fire departments were excluded because the focus of this ARP was related to firefighters playing ball sports while on duty and in paid status. This focus group was chosen because it was important to collect information on this ARP topic in the researcher's home state and region. Many of these fire departments are similar to LAFD in size (4-7 fire stations) and makeup (structure and wildland fire protection, BLS and ALS response, hazardous materials, urban interface mix, etc.), although one (Albuquerque Fire Department) was the only large fire department with over 20 stations and a few were small 1-2 fire station departments. The names and email contact information for this group was mostly obtained from LAFD Deputy Fire Chief (DC) Steve Dawald. DC Dawald had this information because in his position he meets with the various fire chiefs throughout New Mexico on a somewhat fairly regular basis. He did not have some contact information for a few of the fire chiefs. In these cases, the researcher utilized the internet to find the names and email contact information for the remaining fire chiefs. It was important to note that while New Mexico is a large state geographically, it has a small population relative to its geographic size and most fire departments are completely volunteer with only a handful that have any career firefighters. This survey was sent via email to the fire chiefs in NM (Appendix C). The total number of surveys sent to this focus group was 13.

The researcher's EFO classmates were the second group that this survey was sent to. This focus group was chosen because it was important to collect information from fire departments from the various regions throughout the country. The EFO peers comprised of individuals from not only every region of the United States (including Alaska and Hawaii) but also included an individual from a fire department in Canada which gave a little bit of an international perspective on the ARP topic. This survey request was also sent via email (Appendix D). The total number of surveys sent to this focus group was 56.

The total number of external surveys sent out was 69 of which 29 were returned. The total number of internal and external surveys sent out was 206 of which 87 were returned. The cumulative participation rate for both surveys was 42%. The survey questions and collective results are shown in Appendices E and F.

The third and final component used to gather information included two interviews with questionnaires. Though the surveys provided a broad perspective for on-duty ball sports and physical fitness, interviews were used to capture more specific and detailed information that could not be obtained solely through the use of surveys. Personnel selected to be interviewed were Adam Martinez and LAFD's Acting Safety Division Chief Joseph Baca.

Adam Martinez was interviewed because he is the Wellness Center Program Lead and manages the Surveillance Fitness Program for LAFD. Mr. Martinez's general job duties included overseeing and facilitating the LANL Wellness Center Facility and Group Exercise Programs. Specifically for LAFD, Mr. Martinez managed its Surveillance Fitness Program and included the development of health, fitness, nutrition, and injury prevention for the firefighters. Also, Mr. Martinez was responsible for administering annual fitness testing for all firefighters and serving as a fitness trainer. Mr. Martinez has a Bachelor of Science Degree in Exercise

Science and a Master of Science Degree in Exercise Science/Sports Administration. Mr. Martinez also had numerous other qualifications, and this was shown in his responses to question two as found in Appendix H. Questions for Mr. Martinez and his responses are shown in Appendix H. During his interview, Mr. Martinez provided fitness evaluation results for LAFD which are shown in Appendix G.

Joseph Baca was interviewed because he is the Acting Safety Division Chief for LAFD and as such manages its Health and Fitness Program of which physical fitness is an integral part of. Questions for Division Chief (DC) Baca and his responses are shown in Appendix I. DC Baca did not have information readily available to him to answer two of his interview questions. DC Baca recommended that the researcher contact Steven Klepeis who is the Los Alamos County Risk Manager and LAFD Payroll to find information to answer two of his interview questions. Mr. Klepeis provided information to answer one of DC Baca's interview questions, and this is shown in Appendix J. LAFD Payroll also provided information to answer the other interview question, and this information is shown in Appendix K.

A series of interview questions with questionnaires were developed to gain opinions and data from subject matter experts within their respective areas of responsibility. While each interview had a couple of similar questions, most questions were based on the expertise that each interview could provide within his area of responsibility. For example, questions for Mr. Martinez focused more on firefighter fitness levels, minimum fitness requirements, the process used to measure fitness, and on ball sports' ability to enhance firefighter fitness while keeping the risk of injuries to a minimum. Questions for DC Baca focused on specific firefighter injuries at LAFD due to ball sports and its impact on the organization. However, both interviews asked whether or not any limitations should be implemented for the firefighters playing ball sports on

duty and whether or not on duty ball sports should be allowed to continue. The interviews with questionnaires were used specifically to address all five research questions.

In conducting the surveys and interviews, it was assumed that all of the respondents would understand and answer the questions honestly and to the best of their abilities.

There were three limitations encountered while conducting this ARP. The first limitation was the six-month timeframe allowed for completion of this ARP as set forth by the National Fire Academy.

The second limitation discovered during this research was that there was very little literature in regards to firefighters playing ball sports while on duty and its impact on physical fitness. As such, the surveys and interviews played a much more significant role in answering the research questions. It became apparent that very little research had been conducted in the fire service on this topic.

The third limitation was the ability to distribute numerous external surveys while ensuring that only a single participant of any fire department would answer the survey questions. The external survey was based on the assumption that only a single participant would answer for the entire organization. Multiple participants from any single fire department would skew the survey results rendering them less valid. As such, the researcher could not post the surveys onto a fire department message board requesting survey participants. While this would most likely have resulted in much more surveys sent out along with more participants, the research would have been flawed due to the potentially skewed results with having more than one participant responding for the organization. It should be noted however that this was considered a minor limitation since the methods used to disseminate and collect answers helped to ensure that only one respondent would participate from each organization.

Results

The results of this research were obtained through extensive literature review, external surveys sent to fire departments, internal surveys sent to LAFD firefighters, and through two interviews with questionnaires. This research was used to address the purpose of the ARP and answer the five research questions. Finally, the results of this research have provided information for the organization to make informed decisions when allowing firefighters to play ball sports while on duty.

The first research question asked what the minimum fitness requirements for firefighters are. Literature review and interviews were utilized to answer this research question.

The first step in answering this question involved reviewing the information found in the literature review. In this case and many others, a reliable source of information came from NFPA standards. These standards included *NFPA 1500 Standard on Fire Department Occupational Safety, Health, and Wellness program*, *NFPA 1582 Standard on Comprehensive Occupational Medical Program for Fire Departments*, and *NFPA 1583 Standard on Health-Related Fitness Programs for Fire Department Members*.

These standards overlapped in many cases and were tied together to address various components of an overall Health-Related Fitness Program (HRFP). Firefighter physical fitness was found to be one of many critical components of an HRFP. These components all tied together, and a fire department following the NFPA standards would have had to meet all the standards to meet the minimum physical fitness requirements for its firefighters. Disregarding one of these NFPA standards (or even certain components of a standard) would have precluded meeting fitness requirements. For example, NFPA 1582 stated that all firefighters must be medically evaluated and cleared by the fire department physician before participating in any

physical fitness programs (NFPA, 2018). This standard went into detail of what must be included in the medical exam and included medical history, a physical examination, and any laboratory testing necessary to detect physical or medical conditions that could affect a firefighter's ability to perform required job tasks (NFPA, 2018). In short, firefighters must not have any medical conditions that would preclude them from participating in a physical fitness program and meeting fitness requirements.

With one exception, NFPA did not provide any specific minimum physical fitness requirements for firefighters. This exception was the 12 MET standard. MET is a metabolic unit that is used to quantify the intensity of physical activity and is defined as the ratio of the metabolic rate during exercise to the metabolic rate of rest (Farlex Partner Medical Dictionary, 2012). The higher the MET, the higher level of physical activity. NFPA required that firefighters be at or above 12 METS in regards to aerobic fitness capacity (NFPA, 2018). In regards to fitness requirements for firefighters, NFPA stated each fire department must set its minimum fitness requirements as determined by the department's physician based on its firefighters' assigned functions and activities (NFPA, 2018). Furthermore, fire departments must obtain baseline results from each firefighter's initial fitness assessment and track fitness levels through subsequent fitness assessments throughout his or her career and shall not be punitive or competitive (NFPA, 2018). Finally, NFPA allowed for various fitness assessment protocols to be used based on ease of administration, safety, cost, and predictive value (NFPA, 2018).

The literature review also revealed that various other methods had been developed and utilized to measure a firefighter's minimum fitness level to perform a variety of job-specific tasks and functions. One such method included the Candidate Physical Ability Test or CPAT that was developed by the Fire Service Joint Labor Management Wellness/Fitness Initiative to

address the need for a non-punitive approach to wellness and fitness in the fire service (IAFF Firefighters, n.d.). The CPAT was a tool designed to measure minimum fitness for current firefighters and firefighter candidates based on their ability to complete critical firefighting tasks safely and effectively (IAFF Firefighters, n.d.). The CPAT is a timed physical ability test where individuals wear a 50 lb. weighted vest and complete eight events such as a stair climb, hose drag, etc. (IAFF Firefighters, n.d.).

Another method used to measure a firefighter's fitness level was the Criterion Task Test or CTT. Developed in 1976, the CTT was similar to the CPAT in that it measured a firefighter's physical fitness ability and required participants to complete five firefighter related tasks while wearing firefighter bunker gear within a set amount of time (Scott Safety Firefighter Combat Challenge, 2015).

Firefighters who fight wildland fires also have a fitness assessment tool that had been developed primarily for them. An Incident Qualification Card or Red Card is used as an accepted interagency certification that shows that the firefighter is qualified to do the required job upon arrival of an incident such as a wildland fire (NPS, n.d.). The National Wildfire Coordinating Group (NWCG) has established the minimum training, experience, and physical fitness requirements for personnel involved in wildland firefighting (NPS, n.d.). Those who are involved in wildland firefighting are required to have completed a Work Capacity test to ensure they are physically fit to fight wildland fires (NPS, n.d.). The most rigid of these tests is the Arduous Pack Test which requires participants to do a three-mile hike carrying a 45-pound pack within 45 minutes (NPS, n.d.).

Since NFPA stated that each fire department was responsible for the development its physical fitness requirements for its firefighters, LAFD had developed a fitness policy that

applied to all its firefighters (LAFD, 2015). This policy outlined the training, standards, assessments, and exams required to ensure all sworn personnel met the minimum physical fitness requirements and was based on compliance with local, state, federal law, NFPA 1500, 1582, and 1583 standards and Department of Energy (DOE) orders (LAFD, 2015). Fire Chief's Directive (FCD) 800.13 stated that all sworn members of LAFD would cooperate with and participate in an annual occupational medical exam, annual fitness evaluation (MicroFit), regular physical fitness training, and an annual CTT (Appendix A) (LAFD, 2015). This policy addressed the following components in regards to firefighter physical fitness and wellness (LAFD, 2015):

- All firefighters will participate in a minimum of one hour of physical fitness training each 24-hour shift.
- All firefighters will complete an annual occupational medical exam.
- All firefighters will complete an annual MicroFit Fitness Assessment.
- All firefighters will complete the annual CTT.
- Firefighters on a specialized team may be required to demonstrate specific fitness skills to be a member of the team (i.e., Wildland Pack Test for national resource classification).

The LAFD MicroFit Fitness Assessment measures aerobic capacity, body composition, muscular strength, muscular endurance, and flexibility (LAFD, 2015). Firefighters must achieve at least a 12 MET level and a total overall fitness score of 60% or higher to successfully achieve minimum fitness requirements for LAFD. If a firefighter fails to meet the minimum fitness requirement, he/she is placed on a prescribed fitness program (may involve directly supervised physical fitness training depending on MicroFit results) and is retested until the individual passes the MicroFit (LAFD, 2015).

Finally, the literature review discovered that Department of Energy Order 10 CFR 851 mandated all DOE contractors and their employees such as LAFD to develop and adhere to a worker safety and health program ("Worker Safety and Health Program," n.d.). However, this order did not contain any minimum physical fitness requirements for firefighters. In other words, this order stated that LAFD will have a worker safety and health program but did not specify details on what should be included in this program.

The other method used to answer the first research question involved an interview with Adam Martinez. Question three of his interview asked what the minimum physical fitness requirements for LAFD firefighters were. Mr. Martinez stated that LAFD followed NFPA 1582 and NFPA 1583 in regards to the minimum physical fitness requirements for its firefighters and its physical fitness program. For example, he stated that LAFD followed NFPA 1582, Section 5.1 which stated that the fire department shall evaluate 13 essential job tasks as outlined in this section against the types and levels of emergency services it provides to the local community. LAFD looked at all 13 of these essential job tasks and evaluated its firefighters' ability to carry out these tasks. He went further and stated that LAFD also followed the Wellness Fitness Initiative 4th Edition which outlined the components of an overall wellness/fitness system for firefighters.

Mr. Martinez stated in part of his response to Question five of his interview that LAFD firefighters must have an overall fitness score of at least 60 and obtain at least 12 METs during their annual fitness assessments. Mr. Martinez provided documentation as shown in Appendix G that Microfit Assessment components included instruments which measured a firefighter's body fat, VO2 Max, MET level, back flexibility, bicep strength, and push-ups which when calculated together gave an overall total fitness score.

Mr. Martinez was also asked how LAFD firefighter fitness levels are measured. This was Question four of his interview. This was important information for this ARP because it was equally critical to demonstrate that LAFD not only has minimum fitness requirements for its firefighters, but it also has a reliable method to ensure that its firefighters meet these requirements. Mr. Martinez stated that the Wellness Center was responsible for conducting annual fitness assessments for all firefighters. Microfit was the software program used to conduct fitness assessments and was objective and validated fitness assessment tools that had been validated by the American College of Sports Medicine. This assessment measures a firefighter's body composition, VO2 max, flexibility, muscular strength, and muscular endurance. Furthermore, Mr. Martinez stated that the assessment might include the use of a VO2 Max Assessment using indirect calorimetry for occasions where there is difficulty in getting a true assessment of a firefighter's MET and aerobic fitness levels. Finally, Mr. Martinez stated that although LAFD required all of its firefighters to pass the CTT annually, this tool was more of an assessment that ensured firefighters could perform various firefighting duties rather than a true fitness assessment. In other words, no research has shown that a firefighter who passed the CTT within the 6 minutes and 59 seconds timeframe met the 12 MET minimum requirement as set forth by NFPA.

The results of the research conducted to answer the first research question have shown that each fire department is responsible for establishing the minimum physical fitness requirements for its firefighters. No laws or regulations were found that established firefighter fitness requirements. However, various NFPA standards were found that addressed firefighter physical fitness with the only absolute minimum fitness requirement for all firefighters being at least 12 METs. Furthermore, NFPA provided standards that fire departments must adhere to in

regards to its overall health and safety programs which included firefighter physical fitness. These standards addressed how a fire department established the minimum medical and fitness requirements for its firefighters and gave guidance on how and what should be assessed in regards to firefighter physical fitness. While assessment tools such as the CPAT, CTT, and Red Card have been used to determine a firefighter's ability and fitness to perform certain firefighting-related tasks, their usefulness to determine a firefighter's fitness level is limited. Objective and validated tools such as the Microfit should be used to determine whether or not a firefighter meets the minimum fitness requirements as established by the organization. Finally, through the literature review and an interview, the research has shown that LAFD had established minimum fitness requirements which were based on NFPA standards. In summary, LAFD firefighters must meet NFPA standards in regards to physical fitness in addition to obtaining a minimum overall fitness score of 60 and a minimum of 12 METs during their annual fitness assessments.

The second research question asked what the potential benefits of allowing firefighters to play ball sports while on duty are. Literature review, surveys, and interviews were used to answer this research question.

The literature review for this particular research question yielded no specific information for this question. Consequently, the literature review was expanded that included the potential benefits of ball sports in general for all participants regardless of whether or not they were firefighters. Literature was discovered on types of exercise programs that could improve firefighter fitness and could be tied into ball sports.

High-Intensity Interval Training (HIIT) was found to be an excellent type of exercise for firefighters because it mimicked the physical activity that firefighters do on emergencies and

prepared them physically for their jobs by increasing cardiovascular endurance and muscular fitness (Moore, 2016). HIIT involved short intervals (30-90 seconds) of very high-intensity exercise such as sprinting mixed with short intervals of low-intensity exercise such as walking (Moore, 2016). Also, HIIT also improved anaerobic threshold and capacity for participants (Smith, 2011). Other sources stated that HIIT might be superior to other more traditional steady-state exercises such as jogging because it improved maximal aerobic capacity, blood pressure, contractility, insulin signaling, and substantially burned more calories which increased fat loss (Sorace, 2009). The American College of Sports Medicine stated that HIIT improved “aerobic and anaerobic fitness, blood pressure, cardiovascular health, insulin sensitivity, cholesterol profiles, and abdominal fat and body weight while maintaining muscle mass” (“ACSM, 2014, p. 1). Finally, a research study showed that nearly 1/3 of firefighters reported that they participated in HIIT while on duty and as a result were half as likely to be obese compared to those who either did not train at all or participated in another form of exercise, and were twice as likely to meet the accepted aerobic capacity standard of 12 METs (Hahnke et al., 2015).

Scott stated that one benefit of certain ball sports was that they were a type of HIIT (Scott, 2015). Ball sports such as basketball, football, soccer, and tennis were all types of HIIT because they involved bursts of high-intensity training with bursts of lower intensity training mixed in (Scott, 2015). However, some ball sports such as golf or baseball would not be good candidates for HIIT because they lacked high-intensity training (Scott, 2015).

Ball sports also addressed at least one component (cardiovascular endurance, muscle endurance, muscle strength, flexibility, and body composition) of physical fitness with many addressing most if not all of them (Scott, 2015). Other benefits included improved mental and emotional well-being, decreased the frequency of becoming ill, and decreased recovery

following an illness (Scott, 2015). The St. Clairsville Fire Department in Ohio had allowed its firefighters to play pickleball while on duty to supplement its regular fitness regimen and realized the following benefits of this type of exercise ("Firefighters Try Pickleball for Fitness," 2017):

- This exercise engaged participants which made it more enjoyable leading them to stick with the program.
- Firefighters stayed moving because it was fun, accessible, social, accountable, appeals to a wide range of ages and physical abilities, and safe.
- Enhances team-building and camaraderie.
- The firefighters are participating in this form of exercise on a regular basis.
- Gives firefighters an additional option for physical fitness.

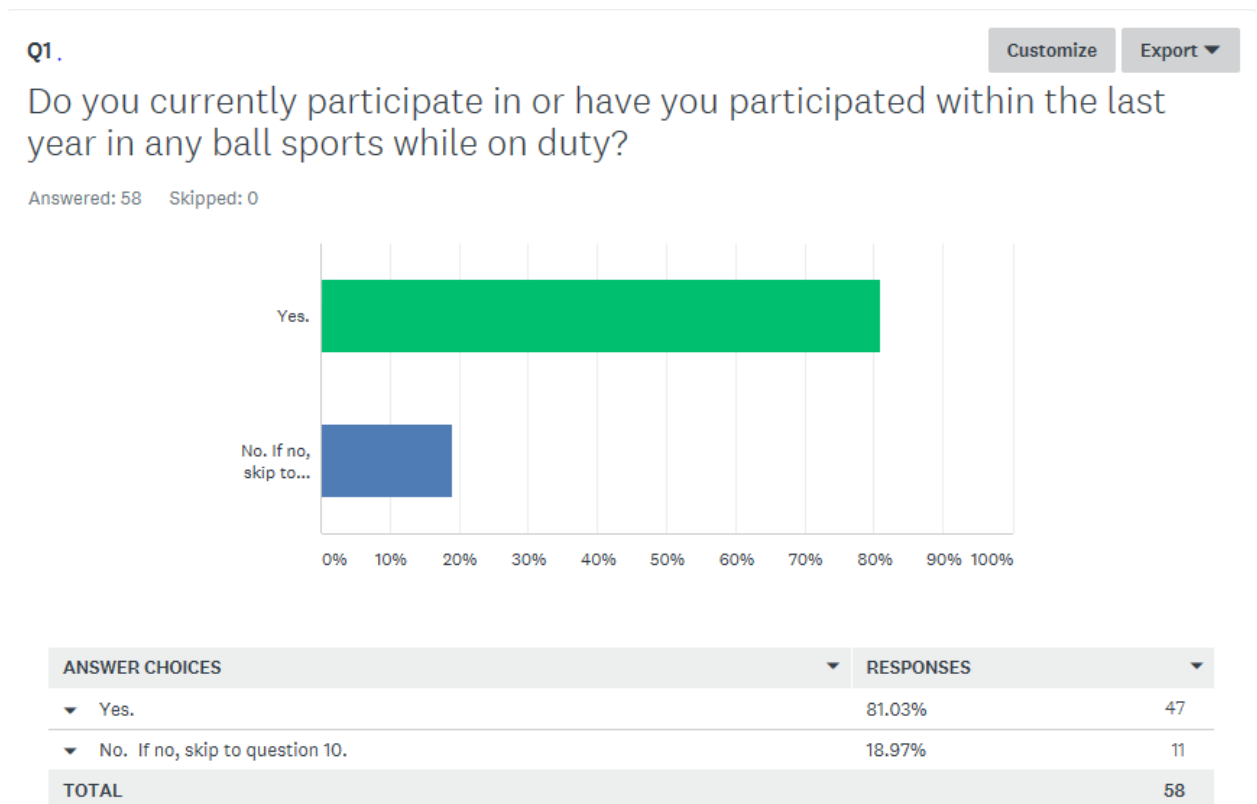
Further review of the literature found information on the benefits of workplace team sports that was not specific to any one industry. The literature found many of the same benefits already noted above and also included improved health outcomes such as cardiorespiratory health, musculoskeletal function, and psychological well-being for the individual (Brinkley, Freeman, McDermott, & Munir, 2017). Also, there may be positive organizational health outcomes such as increased productivity, reduced sick absences, and workability (Brinkley et al., 2017). Finally, there may also be additional social benefits in allowing employees to participate in team sports while at work including positively influenced relationships, communication, and team cohesion within the workplace (Brinkley et al., 2017).

Information obtained from both the internal and external surveys were also used to answer the second research question. Both surveys asked participants what they felt were the potential benefits of allowing firefighters to play ball sports while on duty. Also, both surveys

asked some questions that did not directly tie into any of the research questions. This was important to help establish increased validity to the responses from survey participants. The results of the participants' responses to these questions are shown below.

Question 1 of the internal survey asked participants if they currently and have participated in ball sports while on duty. Results of this question are shown in Figure 1 below.

Figure 1. LAFD Participation in On Duty Ball Sports

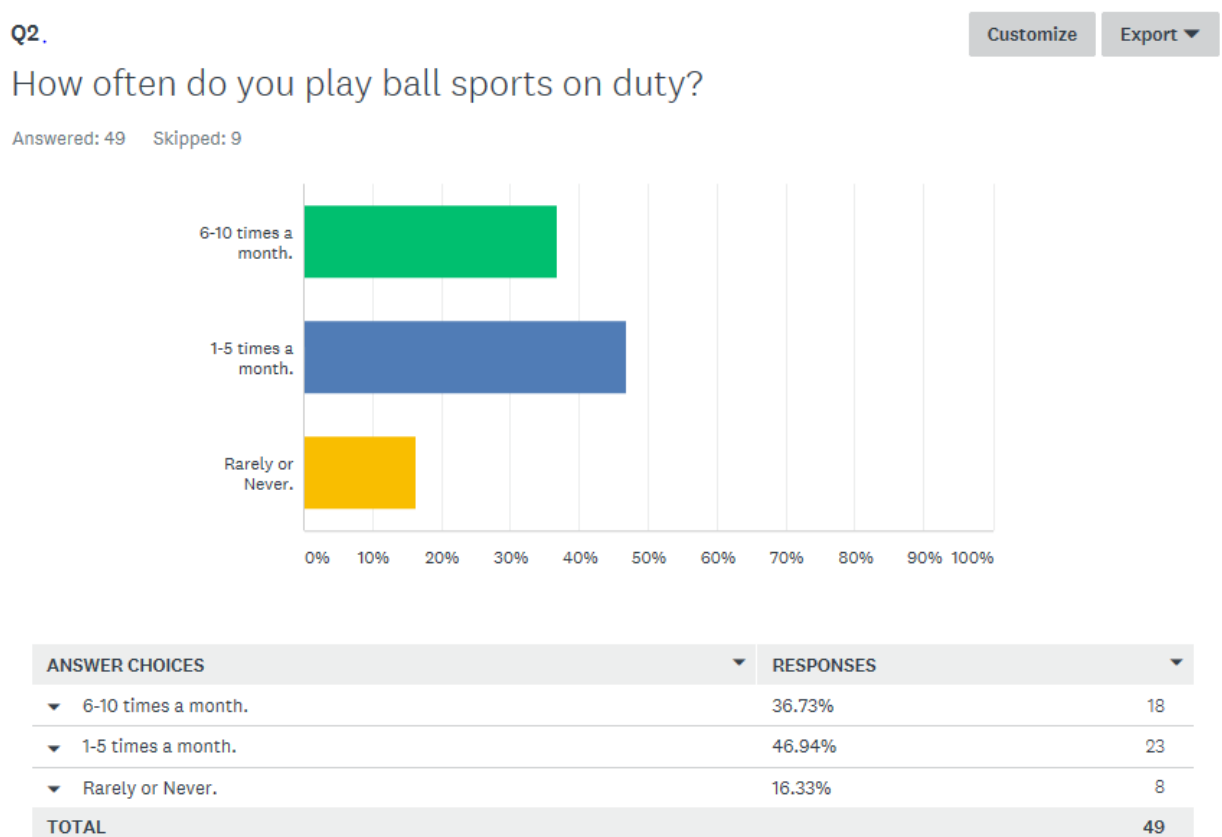


81% of participants said they currently or in the past have participated in ball sports while on duty. Those who responded no were asked to skip to question ten because questions two through nine applied only to those who play ball sports. This question helped establish the validity of this survey because it showed that the majority of the firefighters currently or have in the past played ball sports while on duty which helped them answer questions two through nine. Had very few firefighters played ball sports while on duty, this would have limited the amount of data

collected for responses to the other questions in this survey. Finally, the results of this question also showed that ball sports were a popular form of exercise for firefighters while on duty.

Question 2 of this survey built upon question 1 as it asked participants how often they played ball sports while on duty. Figure 2 shows these results.

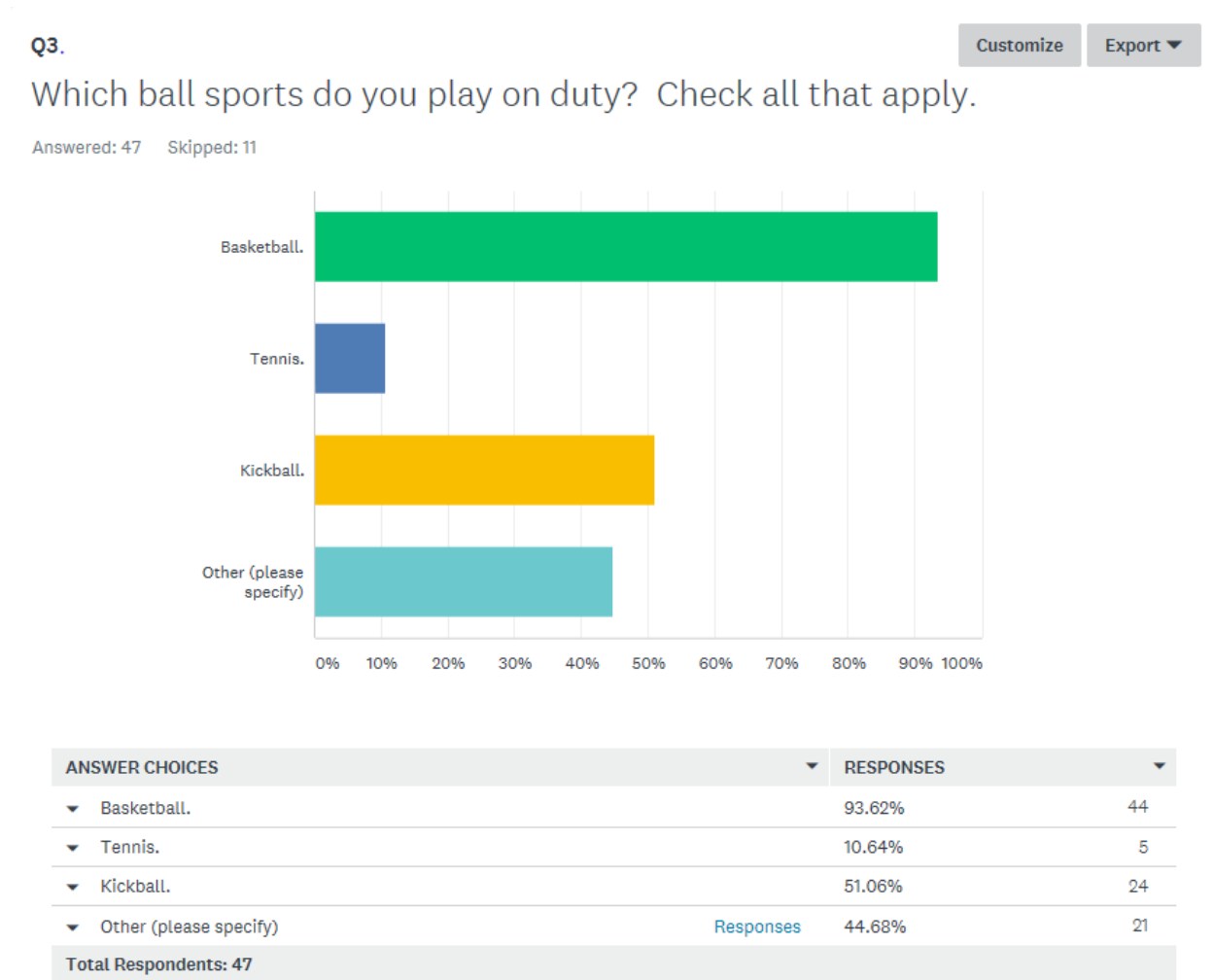
Figure 2. Frequency of Ball Sport Participation



The results showed that nearly 37% of participants played ball sports six to ten times a month or about each day they are on shift. 47% stated one to five times a month which is about every other shift while 16% said rarely or never. The results of this question were important to help determine how often firefighters played ball sports while on duty and helped to reinforce the results of the first survey question which showed that ball sports were a popular form of exercise while on duty.

The third survey question asked which ball sports were played while on duty and are shown in Figure 3.

Figure 3. Ball Sports Played While On Duty

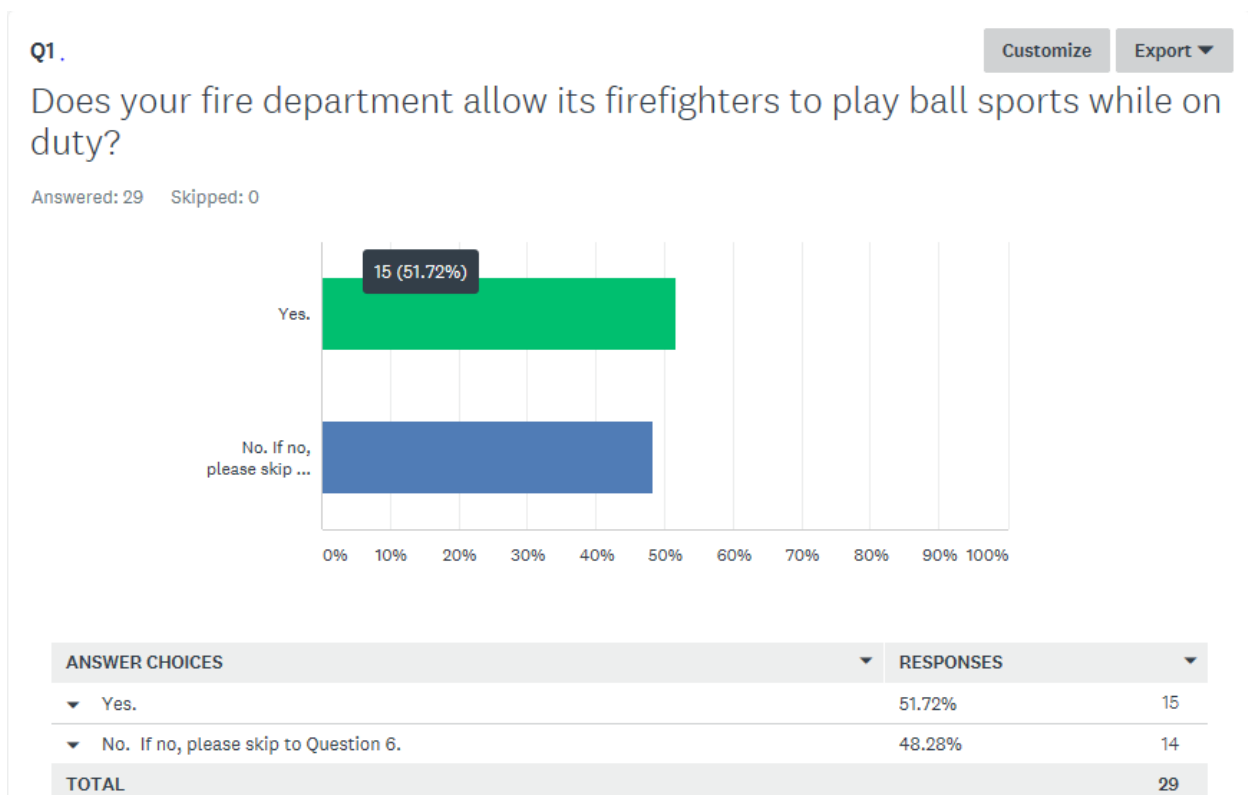


Participants were given the option of selecting more than one answer. The results showed that basketball at 94% was by far the most commonly played ball sport. Other sports that were commonly played and listed in “Other” included football (two-hand touch and flag), soccer, and volleyball. The responses to this question were important because they typically showed that the ball sports being played were a form of HIIT which was found in the literature review to be a good form of exercise for firefighters. However, at 51%, kickball was a fairly commonly played

ball sport which would not be a form of HIIT. Based on the literature review, the ball sports that were commonly played could have the potential to increase firefighter physical fitness.

As in the internal survey, the external survey that was sent out to other fire departments also asked questions which helped establish the validity of participants' responses. Question one in this survey asked participants whether or not their respective departments allowed its firefighters to play ball sports while on duty. Figure 4 shows the results to this question.

Figure 4. Percent of Fire Departments that Allow On Duty Ball Sports



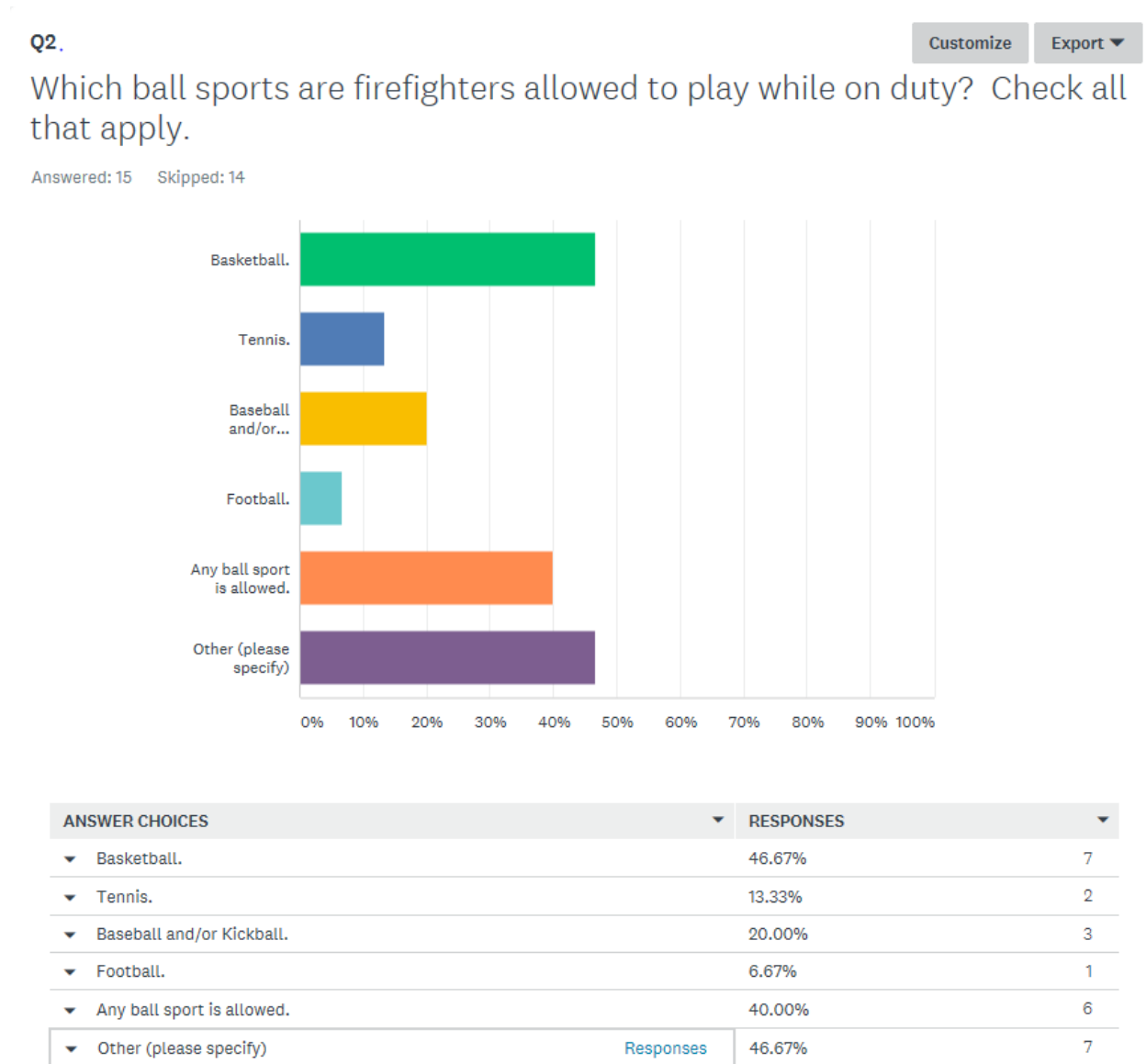
At 52%, just over half of the respondents to this survey stated that their respective organizations allowed its firefighters to play ball sports while on duty. Those who answered no were asked to skip to question six because questions two through five pertained only to departments that allowed ball sports while on duty. This results to this question were important to get data on

how many departments allowed on duty ball sports as this affected the number of responses for questions two through five.

Question two asked which ball sports were allowed to be played while on duty.

Participants were given the option to select more than one choice, and the results are shown in Figure 5.

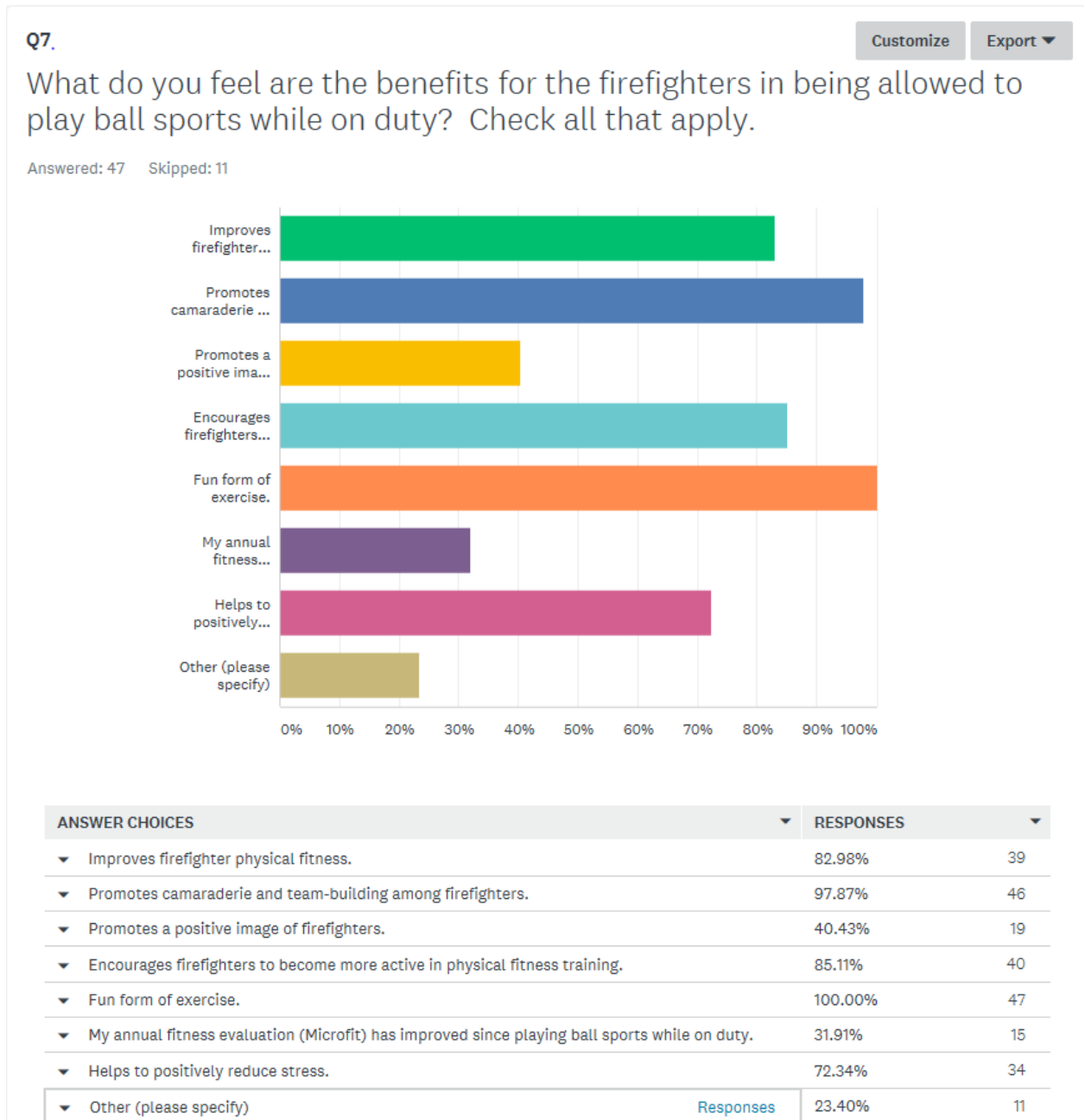
Figure 5. Allowable Ball Sports While On Duty



As with the internal survey and at 47%, basketball was the single most commonly played ball sport. Responses, as listed in the “Other” answer choice, included handball, volleyball, paddle tennis, soccer, and racquetball. It was also important to note that 40% of the participants stated that any ball sport is allowed. As in the internal survey, many of the most commonly played sports were a form of HIIT.

Both surveys asked participants what they felt were the potential benefits of allowing firefighters to play ball sports while on duty. Question seven of the internal survey asked participants about the benefits of ball sports with the results shown in Figure six below.

Figure 6. Benefits of Playing Ball Sports-Internal Survey

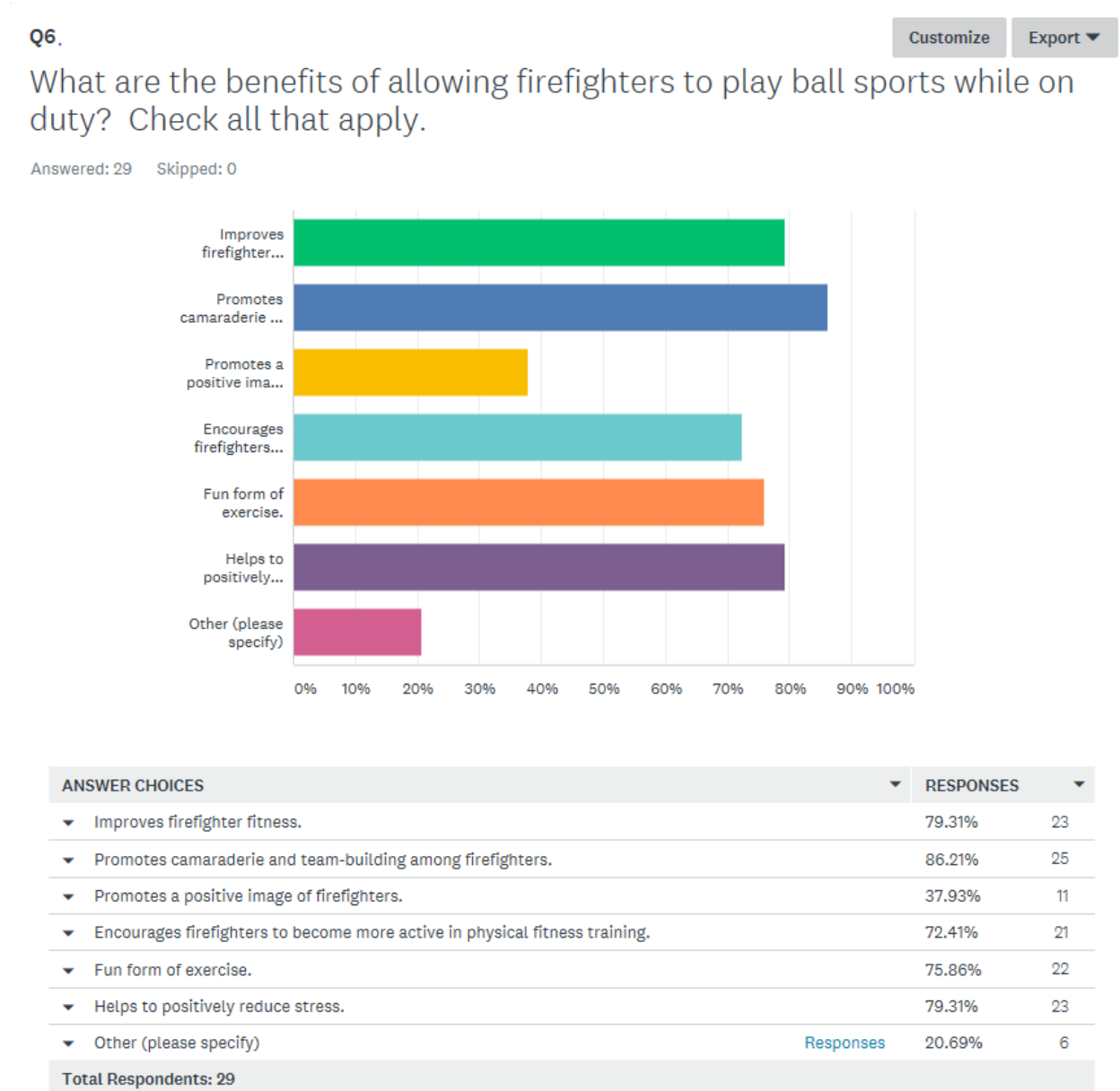


Participants were allowed to choose more than one choice. All participants who answered this question stated that ball sports were a fun form of exercise. Other benefits of ball sports which had high selection rates included: promoted camaraderie and team-building (98%), encourages firefighters to be more active in physical fitness training (85%), improves firefighter fitness

(83%), and helps to remove stress (72%) positively. Only 40% stated that ball sports promoted a positive image of firefighters and only 32% stated that they improved their annual fitness assessments. In the “Other” category, participants stated that benefits of ball sports included more interaction with the public, encouraged longer exercise sessions, engaged stabilizer muscles, increased motivation to stay fit, and improved cardio.

Question six of the external survey also asked participants what they felt were the benefits of ball sports. The results are shown in Figure seven below.

Figure 7. Benefits of Playing Ball Sports-External Survey



Participants were also allowed to select more than one choice. The results showed that five out of the seven categories rated very high (at least 72%) with promoting camaraderie and team-building being the highest (86%). Only 38% of the participants stated that ball sports promoted a positive image of firefighters. Responses in the “Other” category included an increased workout by pushing limitations and good community involvement.

Both surveys showed very similar responses among LAFD and non-LAFD participants. For example, participants in both surveys felt that benefits of ball sports included improved firefighter fitness, promoted camaraderie and team-building, encouraged firefighters to become more active in exercising, were a fun form of exercise, and helped to reduce stress positively. All of the above were commonly seen as benefits of ball sports with the lowest selection rate being 72% for any of the choices given. Both surveys were also similar in that participants, in general, did not feel that ball sports promoted a positive image of firefighters. This choice was only selected about 40% of the time which was by far lower than any of the other choices excluding the “Other” category.

The only unexpected and surprising result from either of these surveys came from the internal survey. One of the answer choices that participants were given was whether their annual fitness assessments had improved as a result of ball sports. While 83% of the participants stated that ball sports improved firefighter fitness, only 32% stated that their annual fitness assessments have improved since playing ball sports while on duty which seemed to contradict each other.

Other questions asked in both surveys had potential to provide more data on the benefits of playing ball sports while on duty. This was dependent on how participants answered these questions as to whether or not there was a potential benefit of ball sports.

For example, question four of the internal survey asked participants if ball sports were the only form of exercise they did while on duty. 96% of participants stated no while 4% stated yes. While 4% is a very low percentage, it can be argued that ball sports may encourage at least a small handful of firefighters to do some form of exercise while on duty. This was found to be a benefit of ball sports because some form of exercise is probably better than no exercise at all

while on duty. In other words, ball sports encouraged a few firefighters to exercise while on duty whereas they normally would not.

Question five of the internal survey asked participants what best described the amount of time they spent on physical fitness while on duty since ball sports had been allowed. Figure eight below showed the results of this question.

Figure 8. Time Spent on Physical Fitness While on Duty

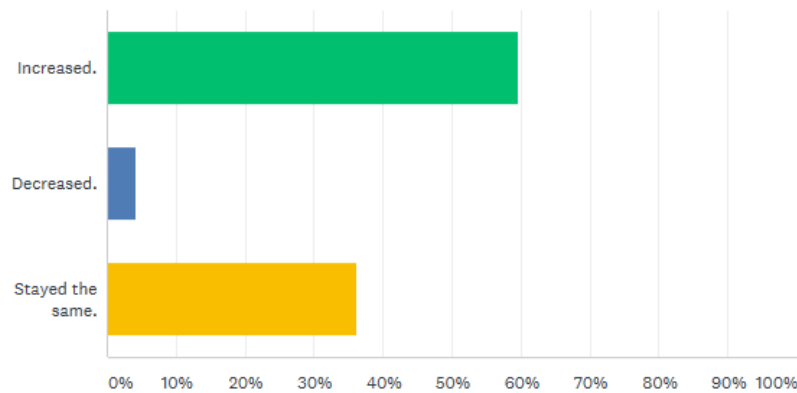
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Which best describes the amount of time you spend on physical fitness training since ball sports were allowed to be played while on duty?

Answered: 47 Skipped: 11



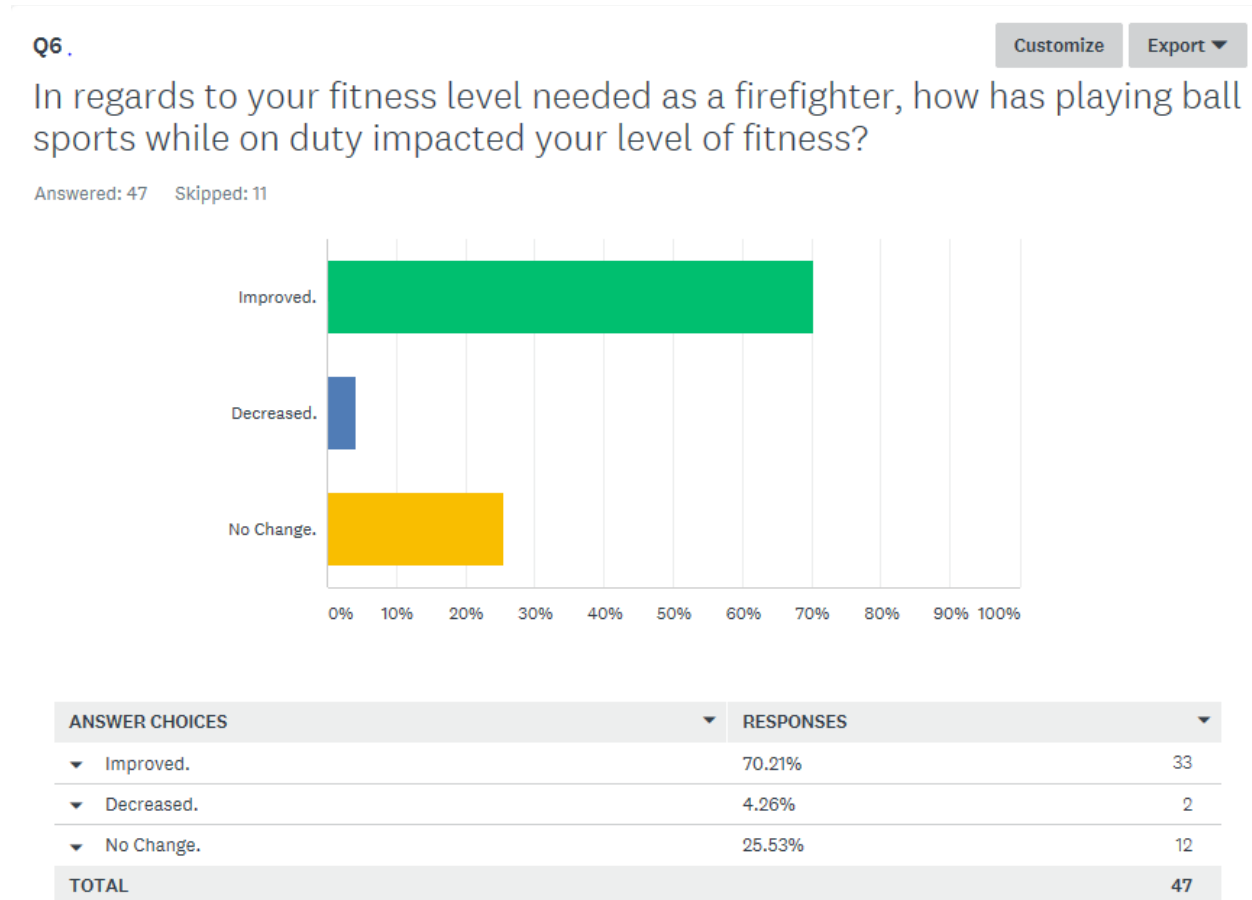
ANSWER CHOICES	RESPONSES	
Increased.	59.57%	28
Decreased.	4.26%	2
Stayed the same.	36.17%	17
TOTAL		47

The results of this survey question showed that 60% of the participants stated that the amount of time spent while on duty on physical fitness training had increased as a result of them being allowed to play ball sports. Only 4% stated that time spent on physical fitness training had decreased while 36% stated no change in the amount time spent on fitness training while on

duty. The results of this question have shown that another potential benefit of on-duty ball sports was that firefighters might increase the amount of time they spend on physical fitness.

Question six of the internal survey asked participants how the playing of ball sports has impacted the level of fitness they needed as a firefighter. The results are shown in Figure nine.

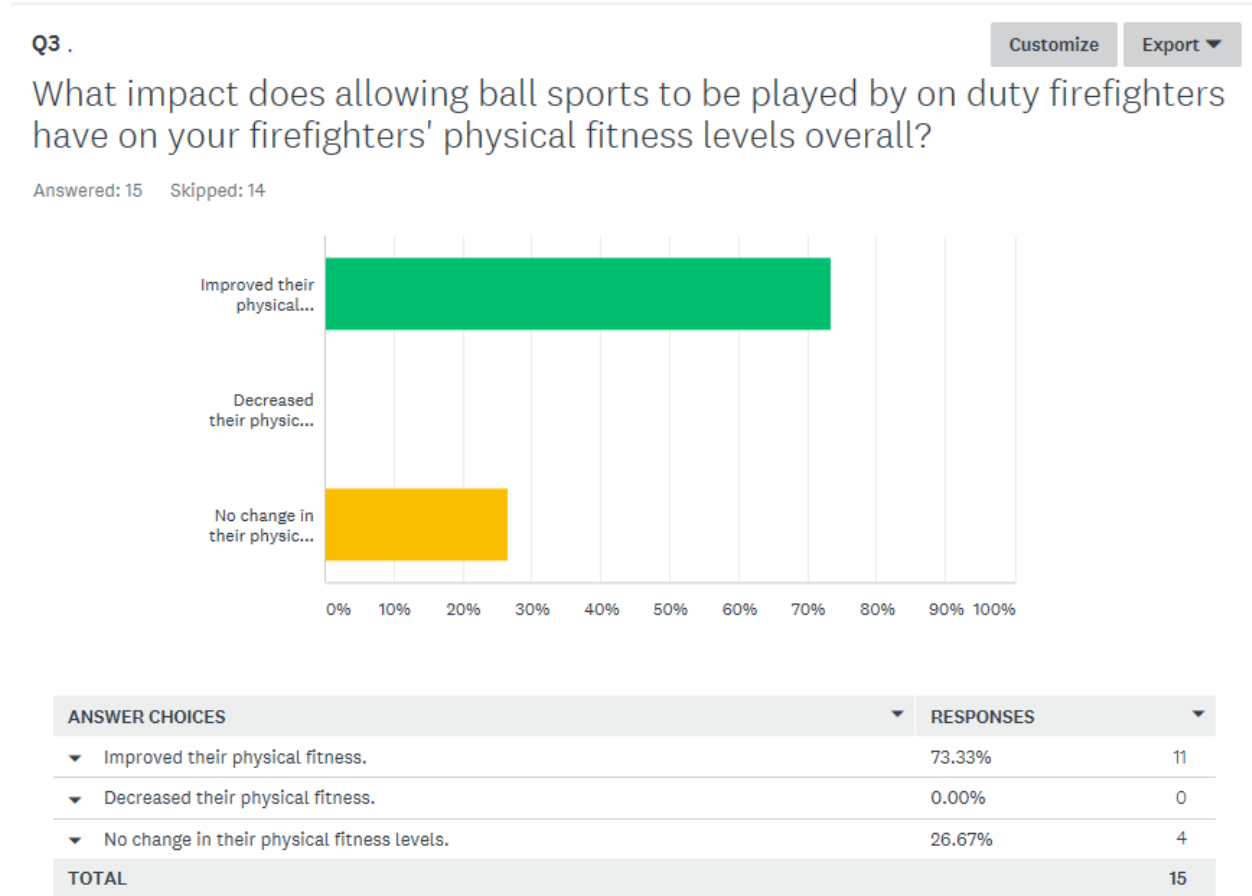
Figure 9. Ball Sports Impact on Physical Fitness-Internal Survey



70% of the participants stated that their fitness level had improved as a result of playing ball sports while on duty. Only 2% stated their fitness level decreased while 25% stated there was no change in their fitness level.

Question three of the external survey asked participants how allowing ball sports while on duty impacted their respective organization's firefighter fitness levels overall. Figure ten showed those results.

Figure 10. Ball Sports Impact on Physical Fitness-External Survey



73% of participants stated that ball sports had improved their organization's firefighter fitness. No participants stated that ball sports had decreased firefighter fitness while 26% stated that fitness levels had not changed.

The final method used to help answer the second research question was an interview with Mr. Martinez. Question five asked how LAFD firefighters' fitness levels have changed since ball sports have been allowed. Question seven of this interview asked how on-duty ball sports could be utilized by firefighters to increase their physical fitness and what criteria if any should be followed. Mr. Martinez's full response to these questions are shown in Appendix H. While Mr. Martinez did state certain ball sports such as basketball or soccer could potentially provide some benefit in increasing physical fitness, he went further and stated that they would have to be

played with a high enough intensity to allow any aerobic fitness to kick in. Furthermore, Mr. Martinez stated that ball sports do not improve various components of fitness such as strength development and mobility and flexibility. Mr. Martinez also stated that there had been no noticeable changes in the firefighters' fitness levels based on the objective fitness assessment data since ball sports have been allowed to be played while on duty. Finally, Mr. Martinez stated that the only potential benefit of on-duty ball sports was that the playing of ball sports as some form of physical fitness training was better than no fitness training at all. In summary, based on Mr. Martinez's responses and the annual fitness assessment data of LAFD firefighters, ball sports have not helped nor hurt firefighter fitness.

Mr. Martinez also provided fitness assessment data to support his for LAFD to support his conclusions which are shown in Appendix G. For example, the first page of this appendix showed that the number of firefighters who failed their initial annual fitness assessments decreased from 18 in 2016 to 12 in 2017. However, Mr. Martinez attributed this to other factors beyond firefighters being allowed to play ball sports. One such factor was attributed to weight gain. The data had shown that weight gain and weight loss has a direct impact on MET levels. When LAFD's firefighters gain weight from one year to the next, the MET levels typically decrease and vice versa for weight loss (or at least a smaller weight gain). Also, Mr. Martinez stated that the firefighters have become much more proactive in requesting to be put on a prescribed fitness program a couple of months before taking their annual fitness assessments. In other words, firefighters, especially those who have historically struggled in passing the annual fitness assessments on their first attempt, are now participating in a prescribed exercise program months before their fitness assessments. Finally, Mr. Martinez stated that the Wellness Center

could utilize a VO2 Max Assessment tool to help determine if an individual's true MET value when a submaximal assessment is suspect of an invalid assessment.

The second page of Appendix G also showed that average total fitness score had only increased one point from 2016 (77) to 2017 (78). On duty ball sports had been authorized in November of 2016. Also, the average total fitness score for all LAFD firefighters from 2010 to 2017 was 78. As stated prior, the total fitness score in 2017 was 78 which was also the average score for the past eight years. The third page of Appendix G was a bar graph and clearly showed that all components of the annual fitness assessments for all LAFD firefighters on average had remained consistently at about the same level. The data in this bar graph not only showed total fitness score results but also showed the results of body fat, VO2 Max mL/kg. min., METS, back flexibility, bicep strength, and push-ups. All of these had remained consistent over the last eight years and most importantly showed minimal change if any from 2016 to 2017 which was the period that on-duty ball sports had been allowed.

According to the interview results with Mr. Martinez and the data he provided (Appendix G), the potential benefit of playing on duty ball sports to increase firefighter physical fitness is minimal at best and may only be beneficial in encouraging inactive firefighters to become more active in their physical fitness.

The results of the research conducted to answer the second research question have shown there are potential benefits in allowing firefighters to play ball sports while on duty. However, some of these results have provided mixed data. For example, some portions of the literature review had found that ball sports can enhance physical fitness for firefighters. Also, both the internal and external survey results had also shown this to be the case as well. Many survey participants felt that ball sports do indeed improve physical fitness. However, when looking at

the hard data as provided in appendix G the physical fitness benefit of ball sports are minimal at best. According to LAFD Fitness Assessment results, the data has shown that ball sports do not improve LAFD firefighter physical fitness. Improved physical fitness can be seen as a tangible benefit that can be objectively measured, and in this case, the data did not show this as a clear benefit. However, other intangible benefits of ball sports were discovered. The results showed that these intangible benefits included an increased camaraderie amongst firefighters, encouraged firefighters to become more physically active while on duty, a positive method to reduce stress, may promote a positive image of firefighters, and provided a fun form of exercise for firefighters.

The third research question asked what the potential risks or consequences of allowing firefighters to play ball sports while on duty are. Literature review, surveys, and interviews were used to answer this research question.

The first method used to help answer this research question was the literature review. This review found that due to the physical nature of sports, the inherent risk of being injured was always present (Scott, 2015). Also, firefighters also had the risk of sustaining multiple injuries when ball sports are played on duty (Fortington et al., 2017).

Another consequence of firefighters playing ball sports while on duty is that these types of activities are designed for fun and competition and as such are not necessarily useful for firefighters trying to maintain or improve physical fitness (Hayford, 1996). Furthermore, on duty ball sports may not be an effective use of a firefighter's time to improve fitness because it will not only not get the individual into shape but may lead to over-aggressiveness with someone needlessly getting hurt (Hayford, 1996). However, other literature found disagreed with this and stated that playing sports while on duty was a great way to stay in shape ("TACFIT," 2011).

Other consequences of ball sports included financial impacts to the organization and government. Injuries due to ball sports, especially when played on duty, have led to financial consequences to fire departments, municipalities, states, and the federal government. For example, the federal government and each state have workers' compensation benefits for employees who are injured on the job (FindLaw, 2017). As such, firefighters who are injured on the job as a result of playing ball sports are entitled to workers' compensation benefits especially if on duty physical fitness training is required and when ball sports are allowed as part of this training (FindLaw, 2017).

Also, fire departments have other financial costs and consequences if a firefighter sustains an injury while playing ball sports on duty. These included: increased sick time used, increased overtime costs to cover for injured firefighters who cannot work on-duty due to their injuries, and career-ending injuries causing the fire department to hire and train replacement firefighters (Dolan, 2017).

Both surveys also provided information that could help answer the third research question. Both the internal and external surveys asked participants for feedback on drawbacks (risks or consequences) of allowing firefighters to play ball sports while on duty. Figure 11 showed the results of the internal survey and Figure 12 showed the results of the external survey.

Figure 11. Drawbacks of On Duty Ball Sports-Internal Survey

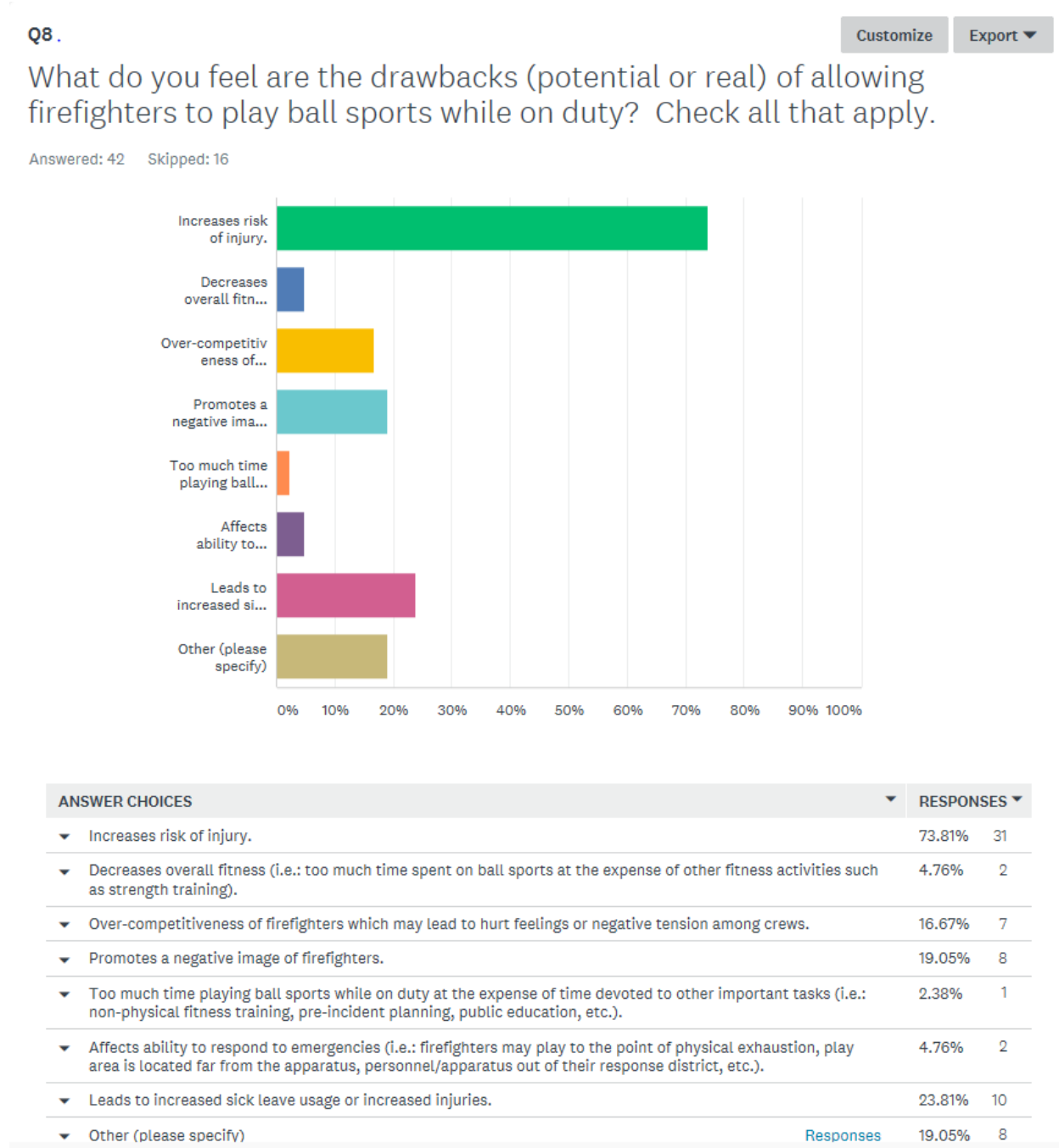
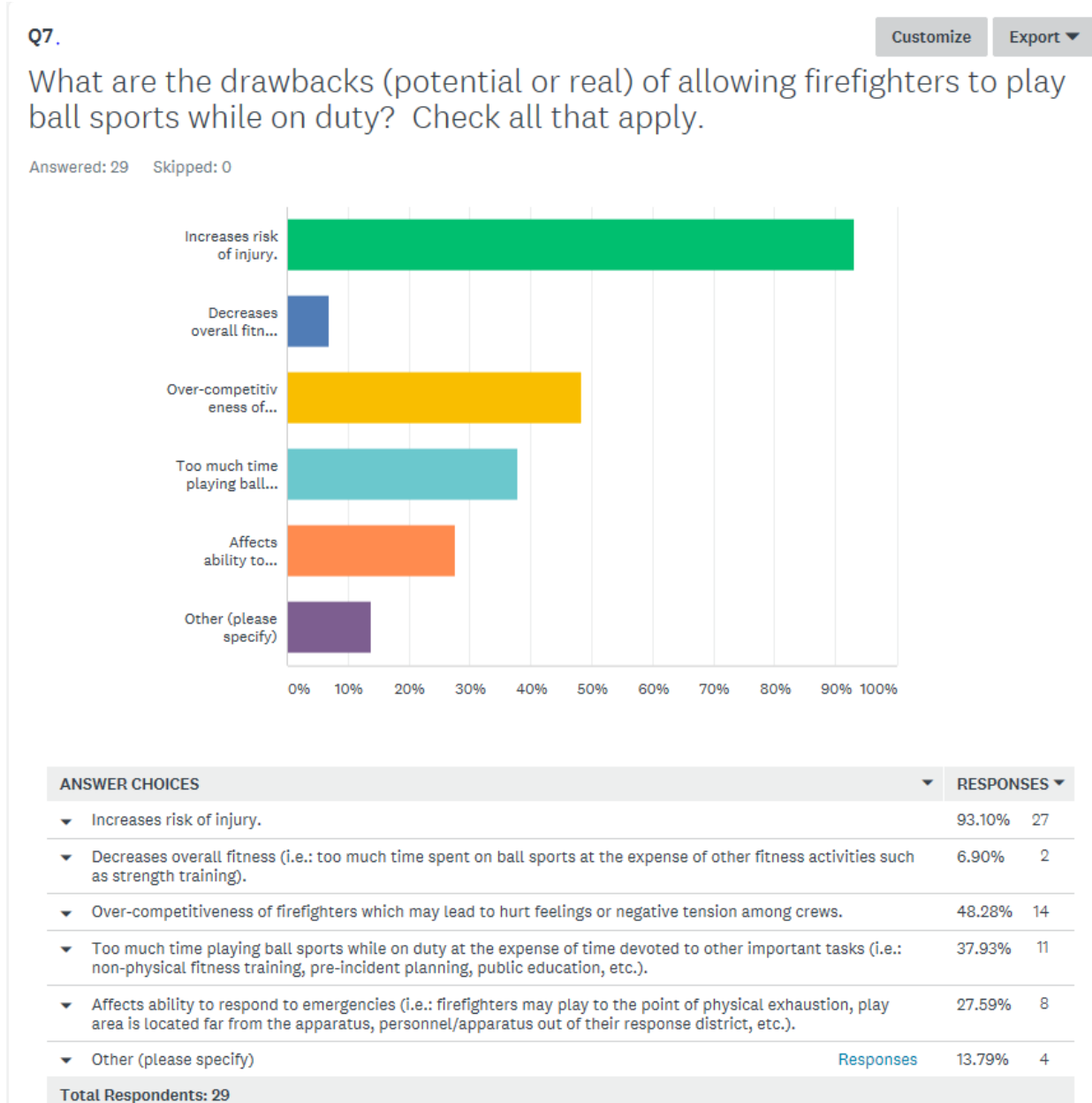


Figure 12. Drawbacks of On Duty Ball Sports-External Survey

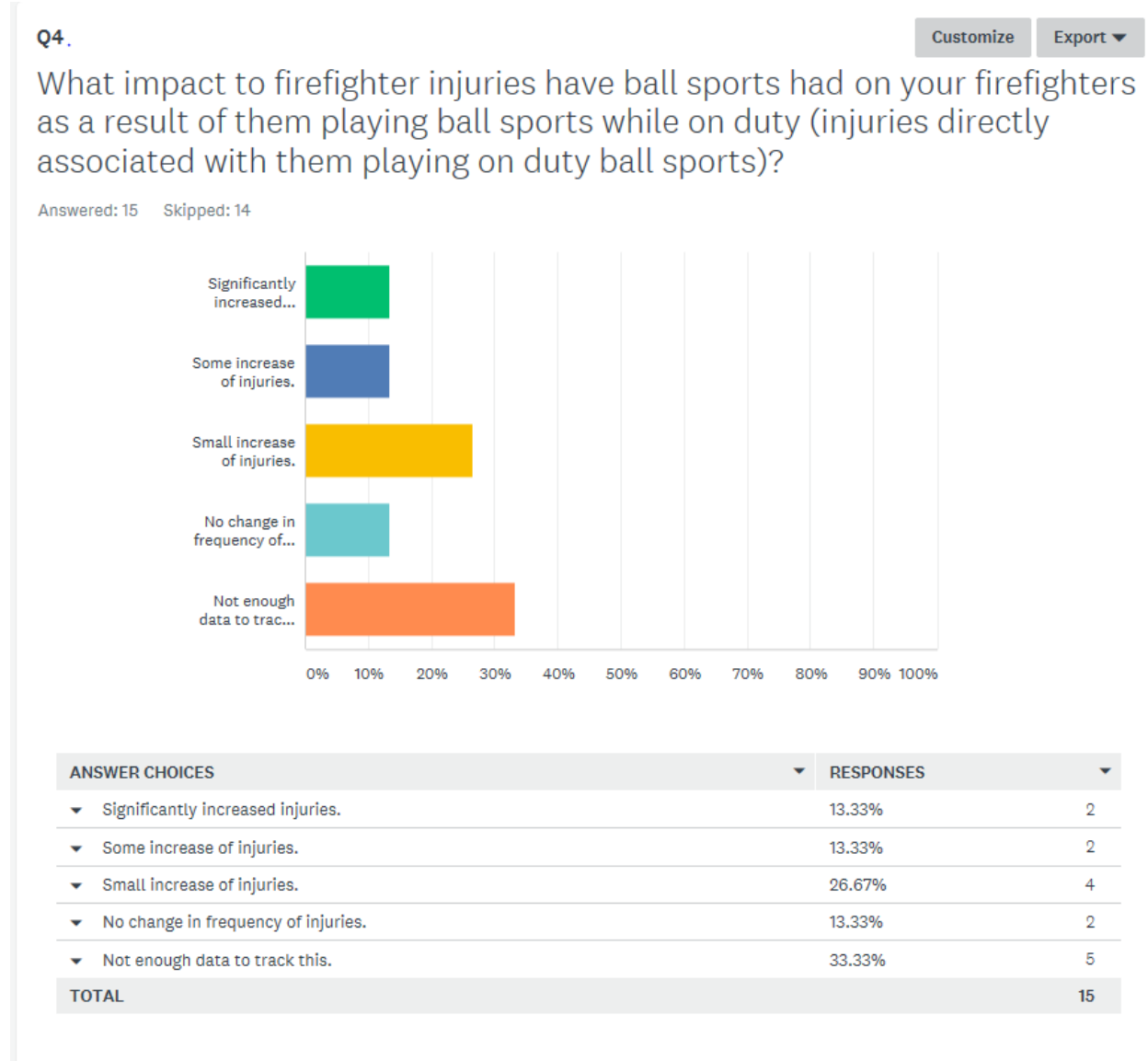


Both survey results showed that the most frequently selected drawback of ball sports was that they increased the risk of injuries with 74% of LAFD firefighters selecting this answer choice and 93% of non-LAFD firefighters selecting this answer choice. At 24%, LAFD firefighters felt that ball sports led to increased sick leave usage and injuries. At 48% and 38% respectively, external survey participants felt that other consequences included hurt feelings or tension

amongst crews may arise as a result of ball sports and that ball sports may take away their firefighters' time spent on other important tasks such as pre-incident planning and public education. This contrasted with LAFD firefighters as only 17% and 2% selected these choices respectively. 28% of external survey participants also stated that ball sports affected their firefighters from being able to respond to emergencies while only 5% of LAFD firefighters selected this answer choice as a drawback. External survey participants stated in the "Other" category that other consequences included negative public perception and workers compensation issues and long-term absences resulted from on-duty ball sports. Internal survey participants did not provide usable information in the "Other" category, but the results are shown in Appendix E for reference.

The external survey asked participants about the impact to firefighter injuries for their respective fire departments that could be directly associated with them playing on duty ball sports. Results for this question are shown in Figure 13.

Figure 13. Impact to Firefighter Injuries Directly Associated with Ball Sports



The results showed that 43% of respondents stated that injuries have increased due to ball sports with 13% who stated that there was a significant increase in injuries. The results of have shown that injuries have been a direct consequence of ball sports for other fire departments that allow this type of activity. It was surprising however that one-third of the participants stated their respective organizations do not have enough data to track this statistic accurately. The high

response rate to this answer choice was unexpected and leads one to wonder how can an organization minimize injuries if it does not track how its firefighters are injured.

The external survey also asked participants why their respective fire departments do not allow on-duty ball sports. This led to further insight into consequences of ball sports. The results showed that in addition to the risks and consequences already shown prior, other consequences included negative public perception, firefighters abusing this privilege, and confrontations and bullying among the firefighters.

Both interviews were also used to help answer the third research question. While this research question on its own was not asked for either interviewee, their responses to other questions in each of their respective interviews provided some direct insight as to what are some of the risks or consequences of on-duty ball sports.

For example, Mr. Martinez stated the most severe injuries that he had seen in 2017 had been a direct result of firefighters playing ball sports while on duty. This will be discussed in more detail when answering research question four. Also, Mr. Martinez stated that a few firefighters have reported to him off the record that they had sustained some injuries as a result of ball sports but did not report these for fear that the organization may once again prohibit its firefighters from playing ball sports while on duty. Finally, Mr. Martinez stated that the risk for injuries outweighed the potential fitness benefits for firefighters. In summary, not only is there a potential risk of injuries as a result of ball sports, but another consequence may be that firefighters may not report some injuries due to ball sports.

Division Chief (DC) Baca's interview responses also provided some information to help answer the third research question. DC Baca had also stated that there had been some documented injuries due to on-duty ball sports. This will also be discussed in more detail when

answering research question four. However, some additional consequences are directly tied to these injuries. First, DC Baca stated that there had been some increased sick leave usage that had been directly associated with ball sports injuries. DC Baca did not have the specifics on sick leave usage during his interview and advised the researcher to work with LAFD Payroll to obtain this information. LAFD Payroll provided this information, and it showed that a total of 160 hours of sick leave had been used by firefighters who were injured as a result of playing ball sports while on duty. This information is shown in Appendix K. Also, three firefighters have been assigned to Alternative Work Assignments (AWA or light duty) as a result of injuries they sustained while playing ball sports. These firefighters had been pulled off shift and assigned to fire administration to perform related clerical tasks. These AWA assignments ranged from two months to at least nine months. Whenever a firefighter is assigned to AWA, the potential consequence to LAFD is that the overtime budget increases to pay for firefighters to work on shift to ensure minimum staffing is met. Other financial costs included medical treatment and workers compensation for the firefighters injured as a result of ball sports. Information obtained from Steven Klepeis showed that ball sports had cost \$35,820.56 in Workers' Compensation costs (Appendix J). Two of the three firefighters who had sustained severe injuries as a result of ball sports submitted claims.

The results of the research conducted to answer the third research question have shown there are potential risks and consequence of allowing firefighters to play ball sports while on duty. The research had shown that the biggest risk of ball sports was firefighter injuries. A significant consequence of these injuries was financial. Injuries lead to increased sick leave usage, increased overtime costs to pay for personnel to work for injured firefighters, medical costs, and workers compensation costs. Also, personnel may avoid reporting injuries as a result

of ball sports for fear of this benefit being taken away. This can lead to disciplinary action against the employee for failure to report all work-related injuries and can lead to injuries becoming worse if not properly treated. Other consequences may also include a reduction in time spent on other important tasks (i.e. public education) while on duty, negative public perception of firefighters, over competitiveness which can lead to hurt feelings, negatively affect ability to respond to emergencies, confrontations or bullying, firefighters abusing this privilege, and can lead to decreased physical fitness (i.e.: not enough time spent on strength training).

The fourth research question asked which firefighter injuries had increased as a result of allowing firefighters to play ball sports while on duty. Literature review and interviews were used to answer this research question. The answer to this research question was broken down into two parts. First was the potential types of injuries as found in the literature review and the second was the actual injuries LAFD firefighters had sustained while playing ball sports and was derived from the interviews and internal LAFD data.

The literature review did not find any specific data on firefighter injuries as related to ball sports. However, information was discovered on potential injuries due to ball sports. For example, some ball sports injuries are common among many ball sports while some are more limited to the type of sport being played. Injuries can range from being minor to very significant including fatal. For example, injuries that may be sustained in ball sports included: bruises, muscle strains (or pulled muscles), torn anterior cruciate ligaments (ACL) in the knees, stress fractures, sprained ankles, tennis elbow, lower back pain, and in more severe cases traumatic brain injuries (TBI) such as concussions ("OnHealth," 2016). Some of the literature found revealed some surprising information in regards to exercise-related injuries and the military. The military had found that the leading cause of injuries in soldiers (i.e., muscle, joint,

tendon/ligament, and bone injuries) were due to exercise-related activities such as basketball rather than in actual combat (Hauschild, 2015).

Both interviews had provided information on specific injuries that LAFD firefighters had sustained as a result of playing ball sports. Mr. Martinez stated that the most severe injuries he had seen in 2017 were as a direct result of ball sports. These three injuries included one firefighter with a broken ankle and two firefighters who sustained anterior cruciate ligament (ACL) injuries. DC Baca confirmed these injuries during his interview but also provided information on two other less severe injuries that had been sustained due to firefighters playing ball sports. One firefighter had been hit in the eye with a ball and another firefighter had strained a calf muscle while playing ball sports.

The actual LAFD injury data had supported the findings of the literature review in regards to injuries that can occur as a result of playing ball sports. The literature review had found that potential injuries included torn ACLs, muscle strains, and bone fractures. LAFD had experienced all three types of these injuries as a result of its firefighters playing ball sports while on duty. The results not only showed there were injury risks but had also shown that these injury risks were realized by LAFD firefighters.

The fifth and last research question asked what limitations should be implemented if allowing firefighters to play ball sports while on duty. Information derived from the literature review, both surveys, and both interviews were used to answer this question.

The first limitation as found in the literature review was that firefighters shall be medically cleared by the fire department physician before participating in any physical fitness program regardless of whether or not ball sports are being played (NFPA, 2015). Also, all firefighters shall participate in annual fitness assessments (NFPA, 2015). In other words, one

limitation that should be implemented is prohibiting firefighters from playing ball sports until a physician has cleared them to do so.

Another limitation found in the literature review was that firefighters should avoid exercising and playing ball sports at such a high intensity that it would compromise their ability to physically respond to an emergency (“TACFIT,” 2011). In other words, firefighters should limit the intensity that they play ball sports so that they avoid playing to the point of physical exhaustion.

Firefighters should also adequately hydrate themselves and stretch muscles before playing ball sports (Scott, 2015). Limiting ball sports prior to the completion of these two tasks can help minimize injury risk and overheating (Scott, 2015).

Another limitation of ball sports included not relying on them as the sole means to improve firefighter physical fitness (Hayford, 1996). In other words, it is critical for firefighters to participate in various forms of exercise to get into shape not only to participate in ball sports but to perform other firefighting duties as well (Hayford, 1996).

The literature review also found that certain types of ball sports should be prohibited from being played while on duty. In other words, ball sports should be limited to certain types and should be based on the sport’s ability to provide an adequate fitness benefit and weighed against the potential risk of injury. For example, sports that do not provide a high aerobic fitness component such as baseball and golf should be prohibited if the goal was to improve physical fitness (Scott, 2015). While all sports involved some injury risk, collision sports had higher injury rates than non-collision sports (Centers for Disease Control and Prevention, 2015). Of these collision sports, one study had shown that tackle football had the highest number of injuries per 100 participants (18.8) whereas soccer, basketball, and tennis respectively had 9.3 injuries,

7.6 injuries, and 2.5 injuries per 100 participants (*Total Injuries Ranked by Sport*, 2016).

Football also had the highest severe injury rate as well (Comstock, 2009). As a result, tackle football was found as a type of sport that should be prohibited due to the high risk of injury.

Finally, the literature review found that fire departments should implement other limitations in regards to ball sports. These limitations included (Center for Disease Control and Prevention, 2015):

- Ball sports should not be played unless an experienced or trained coach is present who understands and enforces game rules.
- Limit play to playing fields which are safe and well-maintained.
- Appropriate protective gear and equipment should be used (i.e., proper footwear, goggles, etc.).
- Limit firefighters from playing ball sports if they are experiencing pain due to injury.
- Limit firefighters from playing ball sports until they have learned the skills needed to prevent injuries specific to the sport being played.

Both surveys also asked participants which limitations should be implemented (internal survey) or have been implemented (external survey) when firefighters play ball sports while on duty. Figure 14 showed the results to this question for the internal survey while Figure 15 showed the results of the external survey.

Figure 14. Limitations That Should Be Implemented for LAFD-Internal Survey

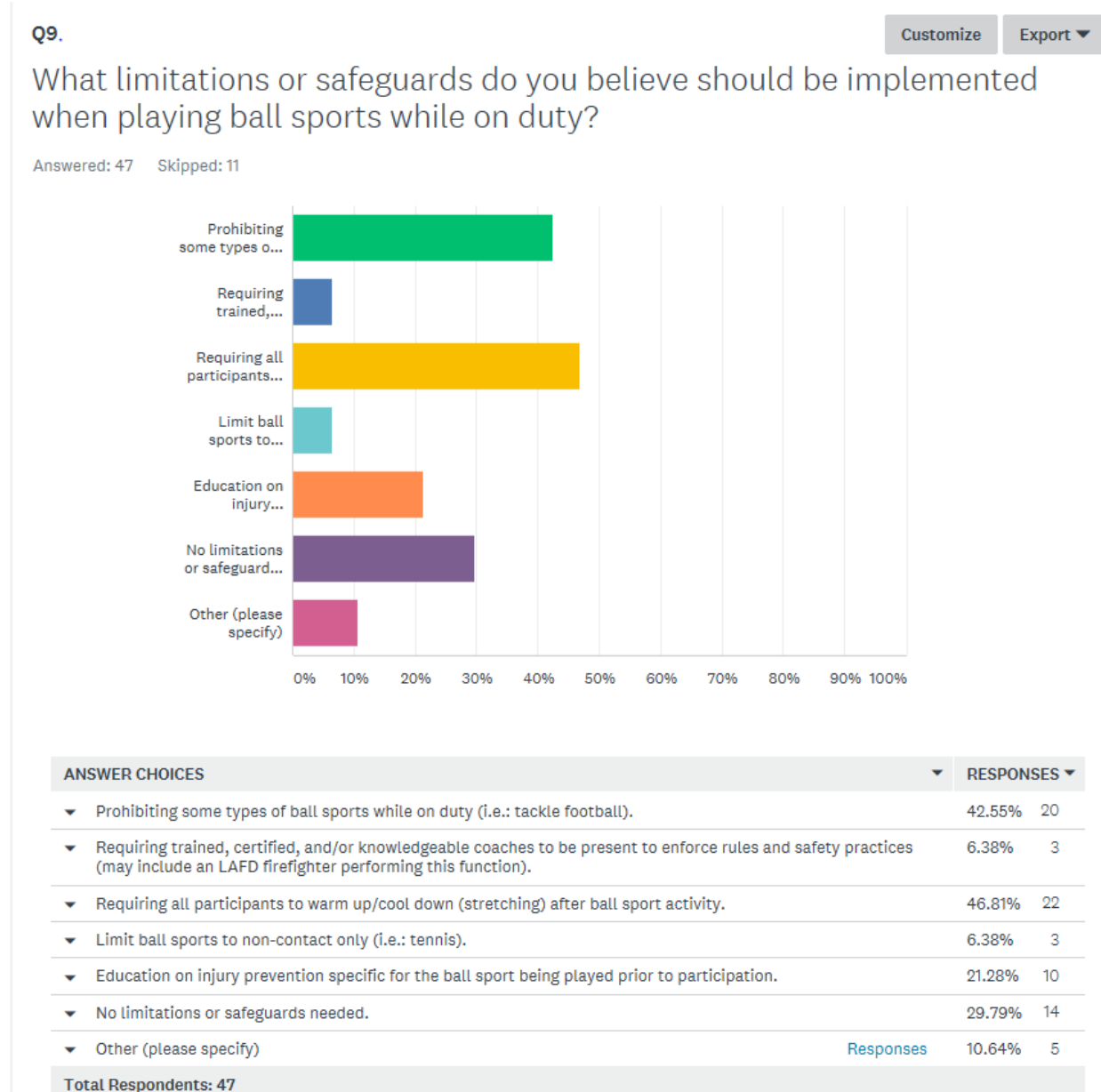
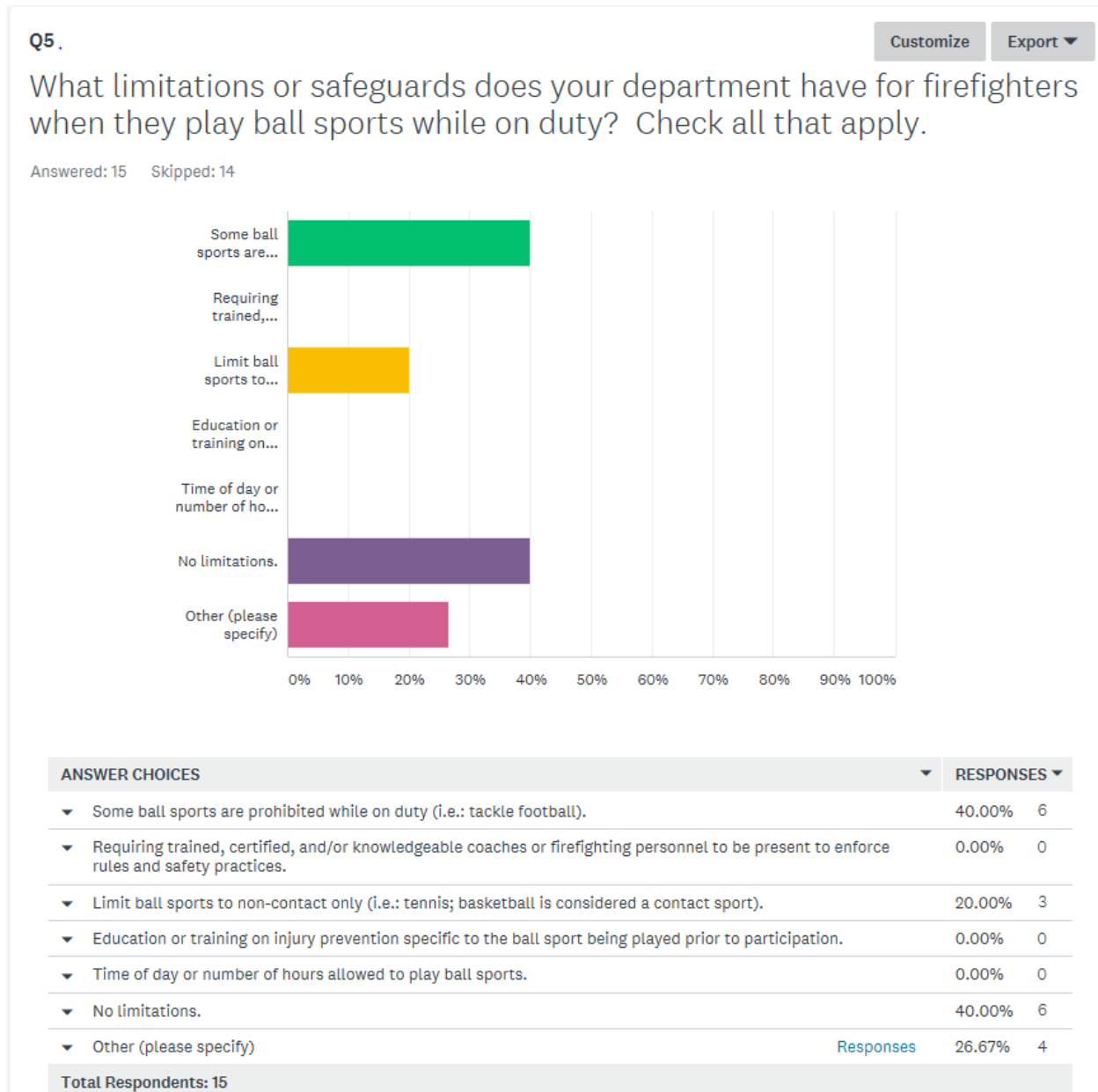


Figure 15. Limitations That Have Been Implemented-External Survey



Some of the results for the responses for both surveys were very similar while others were vastly different. For example, one similarity in the results showed that 43% of LAFD firefighters and 40% of the fire departments that participated in this survey felt that some ball sports should be prohibited from being played while on duty. Another somewhat similar response rate was that 30% of all LAFD survey participants and 40% of the fire departments that participated in this

survey stated that there should be or are no limitations on ball sports being played while on duty. The responses for this question showed very different outcomes in that many respondents either felt there should be or there were some limitations on ball sports while others felt there should not be or are no limitations on ball sports. Very few respondents (6% for the internal survey and 0% for the external survey) believed that referees or coaches should be present while firefighters are playing ball sports to ensure rules are being followed and enforce safety practices. However, 21% of LAFD firefighters felt that personnel should be educated on ball sports injury prevention while no participants in the external survey had this as a safeguard for their respective departments. Limiting ball sports to non-contact only (6% for LAFD and 20% for other fire departments) also was not a frequently selected answer choice. It should also be noted that 47% of LAFD firefighters felt that participants should be required to warm up and cool down (stretching) before and after playing ball sports (this was not an answer option for the external survey). Both surveys were given an “Other” option to select and could list their responses as well (see Appendices E and F). The only noteworthy information included in this answer selection included ball sports participants wearing appropriate personal protective equipment for the activity and Captains intervening when tensions arise amongst the players, or the game becomes too competitive.

Both interviews also provided information to help answer this research question. Mr. Martinez stated that the best limitation or safeguard that should be implemented was to ensure that a referee or safety officer was present to enforce the rules and control the nature of the game while it is being played to minimize injuries. DC Baca also agreed with this safeguard. Mr. Martinez also stated that appropriate protective equipment should be worn while playing sports and was the most obvious and realistic safeguard. Footwear was a specific example of this.

Examples he had given included basketball shoes to provide proper ankle support when playing that sport and cleats to provide traction on a grassy field when playing soccer. Finally, both Mr. Martinez and DC Baca stated that certain ball sports should be limited to being played while on duty. Mr. Martinez went further in his response and stated that ball sports that either do not provide a high level of fitness benefit and that pose a high risk of injury such as football should be prohibited.

In summarizing the results to answer the final research question, the results have shown that there should be some limitations that are implemented if allowing firefighters to play ball sports while on duty. This is especially true if the goal of firefighters playing ball sports while on duty is to improve their physical fitness and minimize the potential for injuries. First, the results showed ball sports should be limited to certain types based on the physical fitness benefit they provide and the degree of injury potential they pose. Training and education should be provided to firefighters on how to safely play any ball sports that are allowed while on duty. As with any form of exercise, it is important for firefighters to warm up and cool down by stretching before and after playing ball sports. The game should be moderated by an individual to ensure that all the game's rules are being followed and enforced. Appropriate equipment (i.e., footwear) should be worn while the game is being played. Ball sports should be played in a safe and an appropriate venue for the sport being played. Fire departments must ensure that their firefighters are medically and physically able to participate in ball sports before them being played. Finally, firefighters should always ensure that their ability to respond is not compromised whenever playing ball sports (i.e., not playing to the point of physical exhaustion).

Discussion

The results of this applied research project (ARP) has allowed the researcher to evaluate whether or not on duty ball sports enhanced firefighter physical fitness. The results of the original research conducted for this ARP supported some of the opinions found during the literature review. Also, this research has discovered new information that could not be found during the literature review to help answer the research questions. While some of the results were expected, some were somewhat surprising. Finally, some results that were discovered during the literature review, surveys, and interviews were mixed in some areas and were contradictory.

Research for this ARP was conducted to find out if on duty ball sports enhanced firefighter physical fitness. While this may have appeared to be a simple yes or no question, the research has shown various shades of gray when answering this question. Furthermore, if ball sports does enhance firefighter physical fitness, to what degree does it do so and at what costs? Finally, the research has given insight as to the tangible and intangible benefits of on-duty ball sports along with some disadvantages for this type of fitness activity.

Firefighters work in an environment that is extremely strenuous and physical and as such is one of the most physically demanding of all human activities (USFA, 2016). 60 of the firefighter fatalities in 2015 were attributed to stress or overexertion of which 54 were heart attacks, and six were due to strokes (USFA, 2016). 48% of all firefighter line-of-duty deaths between 2005 and 2014 were caused by sudden cardiac death (Smith et al., 2016). NFPA has recognized that the physical stress and rigors that firefighters must face as part of their profession required them to be medically and physically fit (NFPA, 2015). As such, it is imperative for all firefighters to exercise regularly to improve cardiovascular health and decrease cardiovascular

disease and death (Smith et al., 2016). LAFD has recognized the importance of its firefighters being physically fit and has a policy in place to ensure firefighter physical fitness (LAFD, 2015). There is little doubt as to the importance of firefighters needing to be physically fit and the potential consequences they face if they fail to do so.

Numerous exercise programs are available for firefighters to increase their physical fitness. High-Intensity Interval Training (HIIT) was an excellent type of exercise for firefighters because it involved short intervals of very high-intensity exercise mixed with short intervals of low-intensity exercise which mimicked the physical activity that they do on emergencies (Moore, 2016). Research by others has shown that HIIT was a popular form of exercise among firefighters and those that did this form of physical fitness training were half as likely to be obese and twice as likely to meet the 12 MET standard as compared to firefighters who did not do HIIT (Hahnke et al., 2015). This was important because certain ball sports such as football, soccer, and tennis could be considered a type of HIIT (Scott, 2015).

The results of the internal survey also provided some valuable insight as to ball sports and their impact on firefighter fitness. For example, 81% of all LAFD firefighters who participated in this survey stated that they currently play or have played on duty ball sports. Also, nearly half stated they played ball sports one to five times a month and over one-third stated they played six to ten times a month. This showed that ball sports are a popular form of exercise for LAFD firefighters. 94% of the LAFD firefighters who participated in this survey stated that they played basketball on duty which was by far was the most popular single ball sport that was played. Also, 60% also said that the time they devote to physical fitness training had increased as a result of being allowed to play ball sports while on duty. Finally, 70% of the

survey participants stated their physical fitness had improved because of ball sports, and 83% said that ball sports improved firefighter physical fitness.

The external survey results also provided more insight on ball sports and firefighter physical fitness. Over half of these survey participants stated that their fire department's allowed on duty ball sports. Of these departments that allowed on duty ball sports, 73% of these participants believed that ball sports had improved their firefighters' physical fitness. Finally, 79% of all the participants in this survey felt that ball sports improved firefighter physical fitness.

The cumulative results of the literature review, internal survey, and the external survey has shown to this point that ball sports may have the potential to improve firefighter physical fitness. However, these did not show how much ball sports had improved physical fitness if any. To obtain information on this, internal LAFD data had to be used. This data was extrapolated from the LAFD annual fitness assessment results and had to be objective and measurable. This information was obtained from Mr. Martinez during his interview and was derived from what he said and the data he provided which is shown in Appendix G. Finally, this information was used not only to help determine if ball sports improved firefighter fitness but if so to what degree.

Mr. Martinez stated during his interview that ball sports had not improved nor decreased LAFD firefighter fitness. This was based on the results from the annual fitness assessments of all LAFD firefighters as shown in Appendix G. The second page of Appendix G showed that the overall fitness scores for all LAFD firefighters ranged from 77 to 80 from 2010 to 2017 with the average being 78. The average fitness score in 2017 was 78 and was up only one point from 2016. On duty ball sports had been allowed since late 2016. However, the first page of Appendix G had shown that 18 firefighters failed their initial fitness assessment whereas only 12 firefighters failed their initial fitness assessment in 2017. While this does seem to present an

argument for ball sports improving firefighter physical fitness, 30 firefighters had failed their initial fitness assessment in 2015. This showed a downward trend over the past three years of firefighters failing their fitness assessments. Ball sports had not been allowed between 2015 and late 2016. The answer to this decreasing trend must lie elsewhere.

Mr. Martinez stated that there were a few factors which probably accounted for fewer firefighters failing their fitness assessments. First, weight gain or loss has a profound effect on fitness assessment results, especially on MET levels. When weight gain is less (or when weight loss occurs) from one year to the next, MET levels tend to increase and vice versa. The data showed that the firefighters gained less weight from 2015 to 2016 and again from 2016 to 2017. Second, Mr. Martinez stated that he has additional tools available to measure true MET level when traditional means fail to capture MET accurately. Finally, Mr. Martinez stated that firefighters are more proactive in working with the Wellness Center to be put on an exercise program to improve fitness before taking their annual fitness assessments.

Another interesting result found on the internal survey was that while 83% of these participants stated that ball sports improved firefighter physical fitness, only 32% of these same participants stated that their annual fitness assessments had improved as a result of on-duty ball sports. This appeared to lend further support to Mr. Martinez's argument that ball sports have not significantly improved LAFD firefighter physical fitness.

More information was discovered on ball sport's impact on firefighter physical fitness during the interview with Mr. Martinez. Mr. Martinez made a few arguments against ball sports' ability to significantly improve firefighter physical fitness. First, while certain ball sports such as basketball and soccer would probably be the best ones to improve fitness, they would have to be played with a high enough intensity for aerobic fitness to kick in. Scott partially supported this

argument in that ball sports such as basketball and soccer have a high enough aerobic component to improve physical fitness (Scott, 2015). Second, ball sports have not provided enough training stimulus for various components needed to increase physical fitness. Ball sports do not help with strength development or mobility/flexibility. Scott disagreed and stated that ball sports addressed at least one component of physical fitness (cardiovascular endurance, muscle endurance, muscle strength, flexibility, and body composition) with many addressing most if not all of them (Scott, 2015). Mr. Martinez also had said that ball sports do not have regular periodization and progressive overload to provide the necessary training stimulus to adapt and improve fitness. Finally, there is a risk that LAFD's overall physical fitness would decline if the firefighters choose to rely on ball sports as their only form of physical fitness. In summary, Mr. Martinez stated that based on the evidence from the annual fitness assessments and his knowledge on physical fitness in general, ball sports do not adequately improve firefighter physical fitness especially when looking at the risks this type of activity poses to firefighters.

The researcher had to evaluate all the results from the literature review, surveys, and interviews to determine whether or not ball sports improved firefighter physical fitness and if so to what extent. While much of the literature review and the survey results showed that ball sports had the potential to improve firefighter physical fitness, some of the literature review and all of the LAFD annual fitness assessment data had shown otherwise. For example, Hayford stated that ball sports were only designed for fun and competition and as such were not useful for firefighters in improving or maintaining their physical fitness (Hayford, 1996). The annual fitness assessment results for LAFD firefighters supported his argument. For example, the average fitness score for all LAFD firefighters in 2017 was 78 which was up only one point from 2016. Also, the eight-year average (2010-2017) of fitness scores for LAFD was 78.

However, there were a couple more pieces of information that were looked at to help determine ball sports' ability to improve firefighter physical fitness. First, Mr. Martinez had stated during his interview that some physical fitness training is better than no exercise at all. If ball sports encourage firefighters to do some form of exercise while on shift, then that would be preferable than doing no exercise at all. Also, the internal survey showed that 4% of participants chose ball sports as their only form of exercise while on shift. While this percentage is low, ball sports at least encouraged these firefighters to take part in some form of exercise while on duty. Second, Mr. Martinez had stated that weight gain or loss has a profound effect on MET levels which also affected overall fitness scores. This was important because the information found during the literature review stated that ball sports as a form of HIIT substantially burned more calories which increased fat loss as compared to other more traditional steady-state exercises such as jogging (Sorace, 2009). If LAFD firefighters were burning more calories while playing ball sports as opposed to other forms of exercises which led to less weight gain or even weight loss from one year to the next, then this supported the argument that ball sports can definitely improve firefighter physical fitness thereby increasing their MET levels and improving their overall annual fitness assessments. However, further research would need to be conducted to ascertain whether or not ball sports were directly tied to LAFD firefighters' weight gain or loss from one year to the next.

In analyzing the results of the literature review, both surveys, an interview, and LAFD fitness assessment data, the research has shown that on-duty ball sports have not enhanced firefighter physical fitness. While some of the authors in the literature review and many participants in both interviews felt that ball sports enhanced physical fitness, the LAFD fitness assessment results have shown otherwise. However, it cannot be definitively argued that ball

sports do not improve firefighter fitness in any way whatsoever. Some of the data did show that ball sports have the potential to improve firefighter fitness in a couple of areas. First, ball sports may encourage firefighters to participate in some form of exercise whereas they would otherwise not. Second, ball sports may also help firefighters burn more calories versus other types of traditional exercises resulting in less weight gain or even weight loss. These two factors alone show that there may be some fitness benefit for firefighters who played ball sports. However, the results have shown that the fitness benefit of on-duty ball sports for firefighters to be minimal at best.

Other benefits of ball sports were explored for this ARP. As such, ball sports were found to have other benefits.

Various sources in the literature review found that ball sports encouraged team building and camaraderie amongst participants. The St. Clairsville Fire Department found that allowing its firefighters to play pickleball while on duty enhanced team-building and camaraderie ("Firefighters Try Pickleball for Fitness," 2017). Research conducted by others agreed and also found that the social benefits of ball sports while at work positively influenced relationships, communication, and team cohesion (Brinkley et al., 2017). The internal survey found a similar result in that 98% of all LAFD firefighters participating in this survey also agreed that ball sports promoted camaraderie and team-building among firefighters. 86% of the firefighters in the external survey said the same thing. Finally, Mr. Martinez agreed and stated in his interview that ball sports could be very good at team building amongst firefighters.

Another benefit of ball sports found in the literature review is that they improved mental and emotional well-being (Scott, 2015). Research conducted by others also stated that ball sports improved the psychological well-being of the individual (Brinkley et al., 2017). The surveys

showed that 72% of LAFD firefighters and 79% of firefighters surveyed from other fire departments believed that ball sports helped to reduce stress positively.

The research also showed that ball sports were a fun form of exercise and encouraged firefighters to become more active in physical fitness. The St. Clairsville Fire Department found that pickleball was a fun form of exercise for its firefighters and encouraged them to exercise on a regular basis ("Firefighters Try Pickleball for Fitness," 2017). According to the internal survey of LAFD firefighters, 85% said that ball sports encouraged firefighters to become more active in physical fitness training in general while all of them said that ball sports were a fun form of exercise. Also, 60% of the LAFD firefighters who participated in ball sports while on duty stated that the amount of time they spent on fitness training had increased. External survey results showed that 72% of these participants believed that ball sports encouraged firefighters to become more active in physical fitness training and 76% stated that they were a fun form of exercise. To summarize, results of both surveys strongly supported the findings of others in the literature review which said that ball sports were a fun form of exercise and encouraged firefighters to be more active in physical fitness.

Research for this ARP was expanded to other areas as related to ball sports and firefighter physical fitness. This ARP also explored the risks or consequences of allowing firefighters to play ball sports while on duty.

One risk of ball sports that seemed obvious was the risk of injuries to firefighters who played them. Scott stated, "Due to the physical nature of sports, playing them comes along with the risk of injury" (Scott, 2015, p. 43). Also, there was also the risk of firefighters sustaining multiple injuries while playing ball sports on duty (Fortington et al., 2017). The risk of injury is further compounded as ball sports may lead to over-aggressiveness among players (Hayford,

1996). Firefighters tend to have a very competitive nature which can lead to increased risk of injury when playing ball sports (“TACFIT,” 2011).

Firefighter injuries sustained while playing ball sports on duty may also lead to financial costs for the fire department, municipality, state, and federal government. For example, the federal government and each state have workers’ compensation benefits for employees who are injured on the job (FindLaw, 2017). As such, firefighters who are injured on the job as a result of playing ball sports are entitled to workers’ compensation benefits especially if physical fitness training is required and when ball sports are allowed as part of this training (FindLaw, 2017). Other financial costs included: increased sick time used, increased overtime costs to cover for injured firefighters who cannot work on-duty due to their injuries, and career-ending injuries causing the fire department to hire and train replacement firefighters (Dolan, 2017). Three LAFD firefighters had sustained severe injuries due to ball sports with two of them receiving workers’ compensation benefits. The cost for workers’ compensation for these two firefighters was \$35,820.56 which showed how costly these claims could be (Appendix J). Injuries due to ball sports had led to 160 hours of increased sick leave usage among LAFD firefighters (Appendix K). This has shown that ball sports have negatively impacted sick leave usage for LAFD.

Some studies had shown that exercising while on duty were responsible for about one-third of all injuries and were the leading cause of all firefighter injuries (Jahnke, 2015). Certain injuries were found to be more common in ball sports. Bruises, muscle strains (or pulled muscles), torn anterior cruciate ligaments (ACL) in the knees, stress fractures, sprained ankles, tennis elbow, lower back pain, and in more severe cases traumatic brain injuries (TBI) such as concussions were found to be some of the more common injuries sustained while playing ball

sports (“OnHealth,” 2016). Even the military had found that the leading causes of injuries in soldiers were due to exercise-related activities such as basketball than in actual combat (Hauschild, 2015). The literature review had found that exercising, including ball sports, was often more hazardous to firefighters than emergency activities such as fighting fires.

Both surveys had shown similar results of the literature review and also identified injury risk as the single most often selected risk or drawback of on-duty ball sports. 74% of internal survey participants felt that injury risk was a risk of ball sports while 93% of external survey participants felt the same. Also, 27% of external survey participants stated their respective organizations had seen a small increase of injuries to firefighters as a result of ball sports while 13% stated there had been some increase of injuries and finally 13% stated that injuries had significantly increased. Finally, 52% of external survey participants stated that one of the reasons their respective organizations prohibit on duty ball sports was due to safety reasons or injury risk. This last statistic was only applicable to those fire departments that prohibit ball sports while on duty.

Both interviews had also found information as related to LAFD firefighter injuries as related to ball sports. Mr. Martinez stated during his interview that the most severe firefighter injuries that he had seen in 2017 have directly been the result of ball sports. These three injuries included one broken ankle and two anterior cruciate or ACL injuries. The literature review had found that these two types of injuries were common types experienced in ball sports (“OnHealth,” 2016). Also, Mr. Martinez stated that a few firefighters advised him off the record that they had sustained injuries while playing ball sports but did not report them for fear that ball sports would again be prohibited by LAFD. If this was true, then the problem with LAFD firefighters sustaining injuries as a result of playing ball sports while on duty is under-reported

and may be a bigger issue than previously thought. The consequence of this is two-fold. First, firefighters may knowingly violate department policy in not reporting all work-related injuries. Any violation of organizational policy could lead to disciplinary action to the firefighter or their supervisor if caught. Second, injuries associated with ball sports may not be adequately treated and may get worse over time since they may not necessarily be reported.

The interview with DC Baca confirmed Mr. Martinez's statements on the three firefighter injuries as discussed above. Also, however, DC Baca had stated there have been a total of five firefighter injuries that were documented as a result of on-duty ball sports. The other two injuries were relatively minor. One injury involved a firefighter who strained a calf muscle, and the other injury was a firefighter who was hit in the eye with the ball. DC Baca had referenced LAFD's firefighter injury file to provide this information.

As a consequence of the three firefighters who experienced the severe injuries due to ball sports, DC Baca stated in his interview that all three of them were assigned to Alternative Work Assignments (AWA) or light duty at fire administration until they were medically cleared to return to duty. The duration of these AWA assignments ranged from two months to nine months. The firefighter who was on AWA for nine months is still on light duty and will remain so into the foreseeable future (estimates predict up to 11 or 12 months total). The researcher was unable to find information on overtime costs to cover for these three firefighters by other shift firefighters while they were assigned on AWA.

Finally, it is important to note that the firefighters who sustained injuries due to ball sports could be injured participating in other non-ball sports types of exercise such as Cross Fit, jogging, weight lifting, etc. Though impossible to prove, this is a consideration when looking at injuries as a result of ball sports. A firefighter could sprain an ankle while jogging just well if he

or she were playing basketball. However, certain injuries were found to be more common in ball sports than in other types of exercise.

While injuries or risk of injuries were found to be the single biggest risk or consequence of ball sports, both surveys provided some insight as to other potential consequences of ball sports. Although the survey results did not show these other consequences as frequently selected risks of ball sports, they are worth mentioning since some participants felt they were a risk nonetheless. Other risks of on-duty ball sports included: decreased fitness, over-competitiveness may lead to hurt feelings or tension amongst crews, negative image of firefighters, time spent playing ball sports may take time away from other important tasks such as pre-incident planning, affects the ability to respond to emergencies, abuse of this privilege, and bullying.

The research was also conducted to find information on any limitations that should be imposed if an organization allowed its firefighters to play ball sports while on duty.

The first limitation was that firefighters must be medically cleared to participate in any form of exercise including ball sports (NFPA, 2015). A firefighter who is not fit enough (medically or physically) to participate in an exercise program faces higher injury and medical risks if they do participate in one. Another limitation is that firefighters must maintain response readiness at all times and avoid exercising at such a high intensity that would physically compromise their ability to respond ("TACFIT," 2011). In other words, firefighters should avoid playing ball sports to the point of physical exhaustion. Firefighters must hydrate and stretch muscles before playing ball sports (Scott, 2015). Ball sports should not be the only form of exercise that firefighters perform on duty (Hayford, 1996). Certain ball sports should be prohibited from being played while on duty. This is based on the potential fitness benefit the ball sport can provide for the firefighter and the degree of injury risk that the ball sport poses. Ball

sports such as baseball and golf should not be played because they do not provide much fitness benefit if any (Scott, 2015). Football was one sport that should be prohibited since it had a very high injury rate as compared to other sports (*Total Injuries Ranked by Sport*, 2006). Contact sports such as basketball and soccer also had higher injury rates as compared to non-contact sports (Centers for Disease Control and Prevention, 2015). However, the injury rates were not as high as football and should not necessarily be prohibited as they may provide some fitness benefit. Finally, the CDC also provided some limitations or safeguards that should be followed when playing ball sports. These included (Centers for Disease Control and Prevention, 2015): having a trained coach present to enforce rules, limit play to fields or play areas that are safe and well-maintained, wear proper protective equipment for the sport being played, prohibit play for firefighters currently have an injury, and players should learn skills to prevent injuries common for the sport being played.

The survey results supported much, but not all, of the information found during the literature review. For example, 47% of LAFD firefighters felt that participants should be required to stretch before and after playing sports. 43% also felt that certain ball sports should be prohibited. However, only 21% felt that education on injury prevention specific to the ball sport was important. Surprisingly, 30% of LAFD firefighters felt that there should be no limitations at all for ball sports. The external survey results were somewhat similar. 40% of the external survey participants felt that certain types of ball sports should be prohibited and 20% went further and felt that ball sports should be limited to non-contact only. None of these survey participants felt that education on injury prevention or having knowledgeable coaches present should be a limitation. Also surprising, 40% felt that there should be no limitations at all for firefighters who played ball sports while on duty.

Both interviews also provided information on ball sports limitations. Mr. Martinez agreed with information found in the literature review and stated during his interview that the best way to minimize injury risk was to have referees present to enforce rules and monitor play. Also, he stated that proper protective equipment should be worn while playing ball sports and was probably the most realistic safety measure. Finally, Mr. Martinez stated that certain ball sports should be prohibited because they either would not provide enough fitness benefit or provide too high of an injury risk. DC Baca also agreed with Mr. Martinez and stated that someone (preferably the Captain) should serve as the safety officer or referee to make sure all the players are following the rules of the game. Also, he also felt that certain ball sports such as tackle football should be prohibited.

The results of the literature review, surveys, interviews, and LAFD injury data has shown that there should definitely be some limitations on ball sports. The most obvious is that certain ball sports should be prohibited based on inability to potentially provide an adequate fitness benefit and a higher risk of injury. Play should be limited to appropriate areas of play and participants should use the appropriate protective equipment. For example, firefighters playing basketball should not be allowed to wear flip-flops as these do not provide adequate ankle support or protect the foot at all if it gets stepped on. Someone not involved in playing the sport should monitor the game and players to ensure rules are being followed (i.e., calling fouls in basketball). Players should be educated on techniques to minimize the risk of injury. This may include how to stretch before and after playing a ball sport properly. Finally, all injuries due to ball sports should be reported no matter how slight. This ensures that LAFD policy is being followed and ensures appropriate treatment for the injury.

Based on research and what has been discussed thus far, this has allowed the researcher to provide an overall analysis of the results. First, the research has shown that firefighters work in an environment that is physically strenuous and as such must be physically fit. Regular exercise was found to be an important component of physical fitness.

Second, firefighters have many forms of exercise to choose from when deciding which types to participate in when trying to maintain or improve physical fitness. Ball sports were found as one type of exercise that can potentially increase fitness. However, the results showed ball sports most likely do not provide an adequate fitness benefit for firefighters if the sole purpose of playing ball sports was to increase physical fitness, especially when looking at the potential risk of injuries. Other types of exercise are more beneficial for firefighters who needed to maintain their physical fitness levels.

Third, ball sports provided other benefits for firefighters beyond the sole purpose of improving fitness. Ball sports were found to be a fun type of exercise and may encourage firefighters who do not actively participate in any exercise program while on duty to at least do some form of exercise. Also, firefighters who do exercise on duty may exercise more when allowed to play ball sports while on duty. Ball sports also provided another means for firefighters to reduce stress levels and improve camaraderie amongst crew members.

Negative consequences of ball sports were also discovered during the research for this ARP. Injuries and their financial impact were found to be the single biggest consequence of allowing firefighters to play ball sports while on duty. Poor public perception of firefighters, bullying, tension, and over-competitiveness were found to be other potential consequences of ball sports.

Finally, fire departments should have some limitations for its firefighters if allowing them to play ball sports while on duty. First, certain ball sports should be prohibited. Second, fire departments must take appropriate steps to minimize the risk of injury to its firefighters. Some of these steps should include ensuring protective equipment is worn, assigning a knowledgeable individual to ensure rules are being followed, and training for injury prevention.

The research for this ARP has provided some organizational implications for the Los Alamos Fire Department. The research has clearly shown that LAFD must further evaluate its policy on allowing its firefighters to play ball sports while on duty. The organization should carefully weigh the benefits versus the consequences when deciding whether or not to continue allowing its firefighters to play ball sports. Based on the research, LAFD may decide to once again prohibit on duty ball sports. At the very least, the organization may need to find ways to ensure that ball sports are providing the highest possible level of fitness training to its firefighters while ensuring that injury risks are minimized. Based on the research, the organization may decide that ball sports do not provide enough of a fitness benefit to justify the injuries and the financial costs that accompany them. Finally, the results of this research may be used to guide many of the decisions as related to on-duty ball sports.

Recommendations

The research conducted for this ARP has provided information to make recommendations pertaining to on-duty ball sports for firefighters. The research focused primarily on the physical fitness benefit of on-duty ball sports for firefighters. This included determining what the minimum firefighter fitness requirements were and if ball sports enhanced their physical fitness. This research also provided valuable information in other areas such as secondary benefits of ball

sports, consequences of ball sports, and limitations that should be implemented for firefighters who play ball sports while on duty. Specific recommendations are as follows:

- LAFD needs to reevaluate its decision made in November 2016 that allowed its firefighters to play ball sports while on duty. This evaluation should look at the benefits versus the risks or consequences when deciding whether or not to allow on-duty ball sports. This decision should be based on objective data and use the research within this ARP as a guide.
- If the primary purpose of allowing firefighters to play ball sports while on duty was to enhance their physical fitness, then ball sports should be prohibited. This recommendation was based on the LAFD fitness assessment data that showed ball sports had not improved its firefighters' fitness levels. While most of the literature review and survey results made an argument that ball sports improved fitness, the objective data provided by the Wellness Center has shown otherwise. Also, LAFD has had documented firefighter injuries due to ball sports and the fitness benefit (or lack thereof) does not justify the injuries or risk of injuries that ball sports have.
- The researcher recommends that LAFD continue to allow its firefighters to play ball sports while on duty. This recommendation was based on the other "intangible" benefits of ball sports. Although the research has not shown the physical fitness benefits for firefighters who play ball sports while on duty, this was not to say that ball sports should be prohibited altogether. Other benefits of ball sports such as improved camaraderie amongst firefighters, stress reduction, enhanced enjoyment of exercise, burning more calories, and encouraging firefighters to be more physically active warrants consideration in continuing to allow on-duty ball sports. The literature review, survey results, and

interviews strongly supported the argument that ball sports provided the above “intangible” benefits.

- If LAFD continues to allow its firefighters to play ball sports while on duty, then the following recommendations apply. These recommendations are based on ways to enhance the benefits of ball sports and methods to reduce injuries or risk of injuries.
 - Certain types of ball sports should be explicitly prohibited. Ball sports that provide minimal fitness benefits such as baseball and golf or pose significant injury risks such as tackle football should be prohibited. LAFD needs to develop a comprehensive list of ball sports that will be allowed to be played while on duty.
 - LAFD and Wellness Center staff should coordinate efforts in researching to find ways to improve the physical fitness benefits of ball sports that are allowed. This will help to maximize the physical fitness benefits of ball sports.
 - LAFD and Wellness Center staff should coordinate efforts to minimize injury risks due to ball sports. This should include injury prevention training for all firefighters specific to the ball sports that they play while on duty. An example may include how to stretch before playing a ball sport properly and how to cool down after play appropriately.
 - LAFD should ensure that a safety officer is assigned to each game and is not playing in the game. This safety officer acts as a referee to ensure all the game rules are being followed and prohibits unsafe acts. Also, this safety officer should be knowledgeable about the game rules and should enforce all limitations or safeguards. Limitations or safeguards may include: ensuring all protective

equipment is being worn, the field of play is appropriate and safe for the sport, and ensure all players stretch before and cool down after the game.

- Proper protective equipment should be worn by all players specific for the sport being played. Proper footwear would be one example (i.e., cleats and shin guards if playing soccer, basketball shoes if playing basketball, etc.). LAFD may not have funds to provide all protective equipment and as such the firefighters may need to provide this equipment as part of personal expenses.
- All injuries need to be reported following LAFD procedures.
- Firefighters should not limit ball sports as their only form of physical fitness training while on duty.
- LAFD should continuously track all ball sports injuries. If injuries and costs become excessive and cannot be minimized despite best efforts, LAFD should prohibit ball sports.
- Finally, LAFD should update its physical fitness policy as outlined in Fire Chief's Directive 800.13 if it continues to allow its firefighters to play ball sports while on duty. This policy should specifically state which ball sports are allowed and any limitations or safeguards that must be followed. All personnel should be expected to follow this policy and supervisors are responsible for its enforcement.

The results of this ARP has allowed the researcher to provide general recommendations for other organizations who allow or may in the future allow its firefighters to play ball sports while on duty. As with many tasks that firefighters are called upon to do, ball sports involve some risks to personnel. A risk analysis should be conducted and weighed against any potential benefits. Fire departments should utilize fitness assessment data for their firefighters in

researching whether or not ball sports enhance physical fitness. Also, fire departments should track injuries as a result of playing ball sports and evaluate the financial impact to the organization. Finally, fire departments must establish safeguards or limitations when allowing firefighters to play ball sports while on duty to maximize benefits while minimizing the negative consequences and their impact on the organization.

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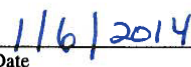
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Appendix A

Fire Chief's Directive 800.13

*LAFD Fire Chief's Directives**Division 800 Article 13***LAFD FITNESS POLICY****Effective Date: 12/07/94****Revised Date: 09/97; 01/08; 10/10; 1/6/15**


Fire Chief's Signature



Date
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Purpose

This directive outlines training, standards, assessments and exams to accomplish fitness requirements for Los Alamos Fire Department (LAFD). The scope of this policy builds on assisting the department with compliance to local, state and federal law as well as DOE orders (CBA Article 21, NFPA 1500, 1582 and 1583, and DOE 10 CFR 851).

Responsibility and Procedure

This fitness policy applies to all incumbent uniformed members. All new hire, candidates or recruit physical fitness responsibilities and standards will be defined in FCD 700.1 LAFD Academy Directive under new hire testing.

The Safety Division Chief is assigned the responsibility of managing the health and fitness program, including coordination of evaluations and examinations. The Safety Division Chief, as Health and Safety Officer (HSO) shall be certified and act as liaison between the fire department and LANL Occupational Medicine/Medical Director, which will be referred to as LANL-LAFD designated Physician or designee for the remainder of this FCD.

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Confidentiality

All medical record keeping shall comply with the requirements of 29 CFR 1910.1020. No fire department personnel, other than the Physician and or associated medical staff shall have access to another member's medical records without written consent of that member. Limited medical/fitness

evaluation data is held confidential by the Safety Division Chief. Exception: Annual Criterion Task Test (CTT) recorded times are not confidential.

Routine Annual Assessments

All uniformed members of the department will cooperate with and participate in an annual occupational medical exam (Phase I and II), annual fitness evaluation (MicroFit) regular physical fitness training, and an annual CTT, as outlined in this directive and other fitness assessments as determined by LANL-LAFD designated Physician and or Wellness Center staff. Certain fitness assessments may be used to demonstrate skill for a specialized team, for example a Wildland Pack test for national resource classification, or a claustrophobia screen for confined space duty on the Technical Rescue Team. A department fitness program success relies on 100% participation of all members including all chief officers. Fitness levels and program participation are evaluated during the employee's Performance, Planning & Appraisal (PPA) process for that year.

Routine Physical Fitness (PT) Training

Captains should schedule and allow for 60 minutes per 24-hour duty shift of required physical fitness (PT) time. If a uniformed member is assigned to a 40-hour week schedule (not a PEP), a minimum of 60 minutes (3 times a week) shall be required. Administrative Chief Officers should block time in their work schedule to allow for at least (3) one-hour workout sessions per week. If assigned to a 40 hour week as a uniformed member, or an Administrative Chief blocked time as above should be given priority in the work schedule. Group fitness and or attending fitness class is recommended when possible to encourage others, and to sustain camaraderie. Be aware when working out as a group, be considerate of others using the facilities. Approved department PT gear will be worn. The use of electronic devices is prohibited off site of fire stations. PT time should not interfere with training and response requirements and shall be allowed daily at the Captain's discretion.

Contact sports that emphasize physical contact or limited collision sports are prohibited when on-duty. Examples are: football, hockey, baseball, boxing, tennis, ultimate Frisbee, basketball, etc.

Medical Exam and Requirements (PHASE I and PHASE II)

From NFPA 1582 A.7.2.2 (5) "Universal agreement exists that wellness, fitness and risk reduction for cardiovascular disease, pulmonary disease, and cancer can be reduced by tobacco abstinence, regular exercise, and control of weight, hypertension, cholesterol, and blood sugar." The annual medical evaluation should serve as one of the many opportunities in the fire department to modify these risk factors."

Employees are to cooperate, participate with the medical evaluation process and to provide accurate information to Occupational Medicine or to report any occupational exposure to include exposure to

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hazardous material, toxic substance or infectious or contagious disease, as well as report any condition that would interfere with the performance of duty safely, such as an illness or injury, use of prescription or nonprescription drugs or pregnancy.

An exams (Phase I and Phase II) will be performed annually by LANL-LAFD designated Physician or designee at LANL Occupational Medicine. Once completed, individual members will receive a Notification of Completed Occupational Medicine Evaluation (Form 012.E11) documenting compliance with the recommended certification and surveillance program standards. Form (042.E1), Medical Certification to perform Fire Fighter Duties, will also be completed, documenting medical clearance or restrictions from pertinent essential firefighting tasks.

The components of the annual occupational medical exam (Phase I and Phase II) shall include a medical history, (including exposure history), physical examination, blood tests, urinalysis, vision tests, audiograms, spirometry, chest x-ray (as indicated), ECG as indicated, cancer screening (as indicated) and immunizations and infectious disease screening, as indicated (NFPA 1582 7.4.3).

Phase II part of the medical exam is given by the LANL-LAFD designated Physician or designee during which test results are reviewed with the employee. A re-schedule of a Phase I and or Phase II is only allowed once respectively per appointment. If either appointment requires a re-schedule more than once, not due an operational response, a coaching action may be initiated by the immediate supervisor.

An employee is considered out of compliance with NFPA 1582 if annual physical examination date is not within one year, with a tolerance of three months.

A medical exam will also be required to return to work after an illness with more than 48 hours of sick leave used for an individual; and a return to work after an injury/surgery or rehabilitation period. (Circumstances excluded may include sick family members). See referenced FCD 800.16

A medical exam shall also be initiated from LANL Wellness due to a blood pressure reading of over 140/90 for pre-MicroFit testing. Also, a medical exam evaluation will be warranted from the fire department due to an on-the-job injury/illness, pre CTT BP - over 160/100, or an unsuccessful (1) CTT attempt

MicroFit Fitness Assessment & Fitness Levels of Supervision

A MicroFit fitness assessment is conducted during the second quarter of the year by the LANL Wellness (HFC) Health Fitness Coordinator. LANL-LAFD designated Physician has oversight of LANL Wellness. All employees shall be cleared for participation in the fitness assessment evaluation by LANL-LAFD designated Physician or designee through the medical evaluation process. The MicroFit will be postponed if an acute medical problem or newly acquired chronic medical condition is documented by LANL Occupational Medicine prior to the scheduled MicroFit.

The annual MicroFit fitness assessment consists of the following components: Aerobic capacity, body composition, muscular strength, muscular endurance, flexibility in addition to blood pressure. Individual LAFD members will verify that all data entered by Wellness Center staff is correct before the MicroFit is initiated.

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The Safety Division Chief will coordinate in conjunction with the Health Fitness Coordinator (HFC) of Wellness staff and operational BCs as to availability of testing times and personnel. The goal of scheduling is to notify the employee of the MicroFit fitness assessment at least one tour in advance of test date. The employee and his or her Captain will be responsible of employees' ability to make the set date/time and to notify chain of command if a scheduling conflict occurs. Direct employee rescheduling of the MicroFit with the Wellness Center staff is directly prohibited. These requests must be made through the chain of command, notify the Safety Division Chief who will then act as a liaison for that employee with the Wellness Center. Missing a scheduled MicroFit and rescheduling more than once not due to an emergent operational response can result in coaching (CANDO) given by the immediate supervisor.

MicroFit Fitness assessments are mandatory and are not punitive or competitive and shall be conducted annually as part of an individualized program (NFPA 1582 8.2.1).

At levels below 12 METs, and/or a total fitness score of below 60% the firefighter shall be scheduled for an evaluation with a LANL-LAFD designated Physician or designee for a medical follow-up. During that evaluation, medical and health and fitness information will be reviewed to ensure the firefighter doesn't have a medical condition that warrants further evaluation and treatment. The LANL-LAFD designated Physician or designee will also review form (042.E1) Medical Certification to perform firefighter duties. The firefighter will be counseled on how to improve their fitness and wellbeing, and will be recommended for certain levels of fitness supervision.

The levels of fitness program supervision include: minimal supervision, limited supervision, or direct

supervision. A classification of minimal supervision results in a continuation of the member's independent fitness program. A classification of limited or direct supervision results in a 6-week personal exercise plan (PEP). During that six-week period, fitness log sheets must be filled out per workout, signed by the employee and his or her immediate supervisor. The completed Fitness Log Sheets will then be handed to the HFC fitness coordinator conducting Micro Fit retest on the scheduled date. The six-week personal exercise plan period, workouts and fitness log sheets are to be completed by the employee to document fitness trends and to adjust workout loads as necessary.

After completion of the six-week PEP, a re-test Micro Fit test will be performed in its entirety. When the member shows improvement in his or her own fitness levels, cooperation with a six-week PEP program cycle(s) and completes all the required documentation the cycles of rehabilitation will continue. Steps will be taken to motivate and counsel the employee in proactive manner. The employee will be moved within levels of fitness classification/supervision based on his/her participation in the program and his/her changes in fitness level.

If the member's METs fall below 12 and/or total fitness score falls below 60% the member will return to the LANL-LAFD designated Physician for another medical follow-up for further evaluation and recommendations.

If during the six-week period, employee actions demonstrate a failure to cooperate by not filling out fitness log sheets, and or missing scheduled fitness workout times with wellness staff on a consistent basis, and or does not complete entire program six-week program as designed, and or shows action of not actively participating with reasonable effort in a program this action(s) may result in a subsequent six-week supervised PEP, a move to another fitness level up to and including a 40-hour work week

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schedule change as needed, and a coaching and/or disciplinary action may be initiated by the immediate supervisor.

A classification of direct supervision can be either shift based, or on a 40-hour work week schedule and requires no fitness log sheets. Exception: if at or below 8 METs the employee will be assigned directly to a 40-hour work week (PEP).

At levels at or below 8 METs the employee will automatically report to LANL-LAFD designated Physician for a medical evaluation and placed in a directly supervised fitness program and the AHJ shall be advised to consider restriction from essential job tasks, 1, 2, 4, 5, 6, 7, 8, 9 and 13. The employee will be assigned to alternative work week of a 40 hour schedule to allow them every opportunity for immediate rehabilitation.

Personal Exercise Plan

A personal exercise plan (PEP) is designed to assist the member with improving fitness levels and to allow time for continued rehabilitation. The six-week cycles allows for reasonable rehabilitation time after which measurable improvements in fitness levels can be measurably seen.

After each Micro Fit resulting in less than 12 METS and/or 60% total fitness score, the employee will follow the Micro Fit retest protocol to include; a Medical follow-up with LANL-LAFD designated Physician, and follow six-week PEP intervals cycles, and complete fitness log sheets as stated in the Micro Fit Fitness Assessment section of this directive.

An individual will be placed on a PEP for a CTT attempt not meeting requirements for a pass during a recorded annual timed running or after a return to work injury performance of the CTT, or for fitness level at or below 8 METs on a Microfit. The employee cannot attempt to retest for the CTT until medically cleared by LANL-LAFD designated Physician, and complete the prescribed PEP plan to prepare for CTT retest. See details in the CTT section below for timeframes and standard information.

Rehabilitation

All component results of the mandatory fitness evaluation shall be used to establish an individual's baseline, or measured against the individual's previous assessments and not against any standard or norm. Annual medical/fitness evaluations consists of medical exam (Phase I and II), a fitness assessment (MicroFit), and if necessary periods of medical exam follow-ups/consults and retest MicroFit as arranged by the LANL-LAFD designated Physician or designee.

The fitness assessment (MicroFit) shall be performed after appropriate medical evaluation (Phase I and II) earlier in the year. After medical evaluation of the member, the LANL-LAFD designated Physician will recommend restrictions relating to those specific job tasks that cannot be safely performed by the member given his/her current condition of health. The LANL-LAFD designated Physician or designee will notify the Safety Division Chief, who will notify the Operational Battalion Chief and the Fire Chief.

The fire department then shall determine possible accommodations for members restricted from certain job tasks. If a health condition is identified that requires restrictions from certain essential tasks, it may not necessarily result in a blanket prohibition of performing all essential tasks, or an automatic retirement or separation from Los Alamos FD. The authority having jurisdiction (AHJ) (the Fire Chief),

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shall determine if the employee can remain in his or her current position or be moved to another position that the individual can perform (NFPA 1582-21 9.3.1-9.3.5).

If an individual does not actively participate in processes described within the FCD, each situation will be handled on a case-by-case basis involving individual consultations with the Safety Division Chief and LANL-LAFD designated Physician, and decided by the AHJ, the Fire Chief. The Fire Chief may form a committee to include the Fire Chief, Safety Division Chief, LANL-LAFD designated Physician, and two

Health and Safety Committee Members with one Union Representative and the employee. *It is the department's and labor's position to find with the employee a workable solution when possible, and to use rehabilitation periods to improve employees' present fitness levels.*

Return to Work Assessments:

All uniformed members of the department will follow the policy as referenced in FCD 800.16 Accident, Injury, Illness Worker's Compensation and Return to Work Procedures. This applies to individuals in a return-to-work status from leave as defined as being away from normal assignment for more than 90 calendar days. An individual must have a release from their treating physician and/or specialist and bring that documentation to LANL Occupational Medicine. The LANL-LAFD designated Physician will evaluate the member in conjunction with the member's treating physician and specialist's recommendations in order to determine their safety to return to work, recommend any appropriate restrictions from essential tasks, and recommend a rehabilitative program if indicated. During the RTW medical exam, a fitness assessment (MicroFit) can be ordered at that time, or after an appropriate period of rehabilitation, depending on the identified health condition and the health status of the member. The LANL-LAFD designated Physician or designee will document any recommendations regarding return to work activity and/or rehabilitation program and communicate them in a timely manner to the member as well as to the Safety Division. Once the member has been determined to be medically safe to RTW without restrictions, the individual must then successfully pass the CTT test before returning to active duty. See referenced in FCD 800.16.

Criterion Task Test (CTT) Physical Performance Standard

LAFD contracted Health Metrics/ARA Human Factors, Inc., to provide a validated test site and test for the functional firefighter standard named the Criterion Task Test (CTT). There are no adjustments to this standard for age, gender or duty-position.

It is mandatory requirement for all uniformed personnel to complete an annual CTT for recorded time usually between September and November of each calendar year. Each member must test not more than 60 days after their previous year's recorded testing date. The mandatory required department performance time for successful completion is less than seven minutes. Once a member starts the test, it

is officially counted as their attempt for the year. The Safety Division Chief will provide the Operational BCs and CTT Coordinators with appropriate materials and information to start testing for that year. Record-keeping will be the responsibility of the Safety Division Chief, while the Operations BC is to ensure all of his or her personnel have tested for that year as required. The Operations BC will be in charge of getting records to the Safety Division Chief. All CTT recorded times are not considered confidential health information. The Safety Division Chief will arrange a day testing time for command staff personnel to run the course with appropriate CTT Coordinators and medical stand-by available.

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Division 800 Article 13

If an individual is not cleared medically to take the CTT test due to LANL-LAFD designated Physician recommendation, they will not be allowed to test until they are medically cleared to do so and will be considered in a rehabilitation phase.

If during shift and/or testing for record, an individual doesn't meet the time criteria for the CTT they will be removed from full active duty if applicable, and immediately evaluated by LANL-LAFD designated Physician or designee. If this event occurs during hours when the Occupational Medicine is closed if Operations assigned, the individual will be placed on sick leave and will be evaluated by LANL-LAFD designated Physician or designee as soon as possible. If Administration staff assigned, they will return to fire administration duties, and arrange to be evaluated by LANL-LAFD designated Physician or designee that day, but will be restricted for any operational response and use of response gear (bunkers, SCBA, wild land gear, etc.). The Safety Division Chief shall be notified of such action who will notify the Fire Chief. In both cases mentioned it is the employee's responsibility to be seen at LANL Occupational Medicine Clinic as soon as possible to start the evaluation and rehabilitation process.

After six weeks, the member then will be re-evaluated to include; medical clearance exam from LANL, and a Micro Fit. The medical exam determination for CTT retest may happen sooner within the six week period if LANL-LAFD designated Physician grants medical clearance to do so, along with a MicroFit completion. Once medically cleared a CTT retest will be scheduled as soon as CTT coordinators are available for a retest according to CTT administration guidelines. If medical clearance doesn't happen, the member will continue six-week rehabilitation cycle along with the re-evaluations as stated earlier in the paragraph. If an employee extends 180 days from their first CTT testing date – the AHJ, the Fire Chief, and or committee as mentioned earlier in this directive at the Fire Chief's request will meet with employee to determine further action which may be up to and including termination for not meeting the CTT Physical Performance Standard.

Since this standard is a condition of employment for operational staff, the employee will be considered 'not in good standing' and will not be eligible for any favorable personnel action (FCD 100.3) - until the standard is met. Administration staff may be restricted from non-essential training and future conference opportunities. A period of rehabilitation will be considered priority for operational and administration staff to demonstrate healthy productive workforce initiatives.

During CTT rehabilitation, assistance to the member can be provided to include a peer CTT coordinator on shift and or assisting the member in working with Wellness Center staff to receive an individualized workout program. During this time practice CTT sessions can be arranged and fitness log sheets will be utilized as necessary.

After completion of a successful CTT within the 180-day period, the member will be released to full duty and be re-instated to good standing within the department.

*LAFD Fire Chief's Directives**Division 800 Article 13***Criterion Task Test (CTT) General Administration Guidelines**

CTT guidelines for the CTT Fitness Coordinators for the annual recorded CTT will be provided to the CTT Coordinators each year via email or handout prior to the test. Each annual CTT requires two CTT Coordinators to administer along with a dedicated ambulance for medical standby.

In general, as defined in the CTT coordinators guidelines any "yes" response on the PAR-Q, a blood pressure equal to or greater than 160/100, or a score above 31 on RSKO pre-test questionnaire requires immediate evaluation at LANL -Occupational Medicine Physician. If blood pressure is 140/90 but under 160/100 the individual can complete the CTT test if other RSKO scores are low and no responses exist on the PAR-Q, however they also need to be evaluated afterwards at Occupational Medicine.

If the individual's BP remains 160/100 or greater the member will be immediately placed on a non-response status and the operational BC will be notified who will notify the Safety Division Chief. The individual should be evaluated by the standby EMS medical team who are to follow standard of care/medical protocols and should include immediate evaluation at LANL Occupational Medicine Clinic if during their operating hours. The employee's health and welfare should be our concern and they should be escorted by either an Ops BC, Safety Division Chief or officer designee to their next destination.

References

8.50 x 11.00 in

Any change to this FCD may require updates to the Accreditation Self-Assessment Manual, Criterion 7G Wellness/Fitness Programs.

Appendix B

Ball Sports Survey Email Sent to LAFD Firefighters



Wed 10/11/2017 3:59 PM
Grano, Paul
Survey Request

To  Fire All Chiefs;  Fire - Shift A;  Fire - Shift B;  Fire - Shift C

All,

I am working on an Applied Research Project (ARP) for the Executive Fire Officer Program. The purpose of my research is to find out if allowing firefighters to play ball sports while on duty enhanced their physical fitness. As part of this research, I am conducting a short survey of all sworn LAFD personnel to find their opinions on playing ball sports while on duty and their physical fitness. For the purposes of this survey, a ball sport is defined as any sport that is played with a ball such as: basketball, football, baseball, tennis, kickball, etc. Though the overall results of this survey will be incorporated into my ARP, your individual responses will be kept confidential. I hope this will encourage you to participate in this survey and answer honestly. Participation in this survey however is completely optional, but is highly encouraged. Please complete this survey by October 27th if you choose to participate. Your feedback is very important for my ARP.

To take this survey, please click on the link below. It should only take 5-10 minutes to complete.

<https://www.surveymonkey.com/r/RD5RSZ6>

Thank you in advance for helping me out with my ARP.

Paul Grano
Division Chief-LANL Training Coordinator
Los Alamos Fire Department
Office (505) 662-8313
Cell (505) 500-7325
email: paul.grano@lacnm.us

 Unable to log in to: SharePoint.



Appendix C

Ball Sports Survey Email Sent to New Mexico Fire Chiefs



Thu 10/12/2017 1:58 PM

Grano, Paul

Survey Request for EFO Project for On Duty Ball Sports

To: Grano, Paul

Bcc: 'Brian Kadle'; 'Davis Sperling'; 'Eric Enriquez'; 'Erik Lutzenberg'; 'J. Maxon'; 'Jason Gonzales'; 'Johnny Greene'; 'Mike Meek'; 'Terry Page'; 'gsaint@cabq.gov'; 'jmathews@cityofraton.com'; 'rdlopez@cityofcarlsbadnm.com'; 'estafoya@coepd-nm.us'

New Mexico Chiefs,

I am working on an Applied Research Project (ARP) for the Executive Fire Officer Program. The purpose of my research is to find out if allowing firefighters to play ball sports while on duty enhanced their physical fitness. The Los Alamos Fire Department had up until this year prohibited ball sports of any kind to be played by its on duty firefighters. The purpose of my research is to determine if on duty ball sports enhances firefighter physical fitness. As part of this research, I am conducting a short survey of various fire departments to gather information on firefighters playing ball sports while on duty. For the purposes of this survey, a ball sport is defined as any sport that is played with a ball such as: basketball, football, baseball, tennis, kickball, etc. Though the overall results of this survey will be incorporated into my ARP, your individual responses will be kept confidential. I hope this will encourage you to participate in this survey and answer honestly. Please complete this survey by October 29th if you choose to participate. Your feedback is very important for my ARP. Please click on the link below to take this survey.

<https://www.surveymonkey.com/r/6M3XPQW>

Thank you in advance for helping me with my research by taking this survey.

Paul Grano
Division Chief-LANL Training Coordinator
Los Alamos Fire Department
Office (505) 662-8313
Cell (505) 500-7325
email: paul.grano@lanl.nm.us

Unable to log in to: SharePoint.



Appendix D

Ball Sports Survey Email Sent to EFO Class



Thu 10/12/2017 2:36 PM

Grano, Paul

EFO Survey Request

To: 'justin.beal@fresno.gov'; 'vconley@cityofirving.org'; 'deweycoy@gmail.com'; 'christopher.divver@verizon.net'; 'firechief@rockland-ma.gov'; 'mark.dupuis@rochesternh.net'; 'Grano, Paul'; 'gush@gjcity.org'; 'jppolito@pbgfl.com'; 'david.jensen@state.or.us'; 'dean@kalapaki.com'; 'wilppman@auroragov.org'; 'jmartin432@verizon.net'; 'brian.miller@westerville.org'; 'alrufer@charter.net'; 'tshaumeyer@gmail.com'; 'trevelm@burlingtoniowa.org'; 'Ken.Uzeloc@calgary.ca'; 'joe.s.zaludek@d.eugene.or.us'; 'roderick.jolivet'; 'Scott Duffey'; 'CHRISTOPHER.DIVVER@VERIZON.NET'; 'DREWDEVRIES@GMAIL.COM'; 'Arnold, Thomas'; 'arnoldj@portsmouthva.gov'; 'JOE.S.ZALUDEK@CI.EUGENE.OR.US'; 'mrettmer@gmail.com'; 'JORDAN.D.REESE@GMAIL.COM'; 'TONY.R.PRATA@GMAIL.COM'; 'JMETZ@WESTMETROFIRE.ORG'; 'JACOBMCAPFEE@YAHOO.COM'; 'JIMARTIN432@VERIZON.NET'; 'CAKNEECE@COMCAST.NET'; 'hankskj@durangofirerescue.org';

Hello EFO Peers,

Hope all is well with everyone. I also hope everything is going well on your final ARP's (for those of you who are like me and still working on this).

My final ARP's topic is on duty ball sports for firefighters. The purpose of my research is to find out if allowing firefighters to play ball sports while on duty enhanced their physical fitness. Up until earlier this year, my department had prohibited all ball sports while on duty. The purpose of my research is to determine if on duty ball sports enhances firefighter physical fitness. I've created a short survey on this topic and am hoping each of you will be willing to help me out on my ARP by taking this survey. Please complete this survey by October 29th if you choose to participate. Your feedback is very important for my ARP. Please click on the link below to take this survey.

<https://www.surveymonkey.com/r/6M3XPQW>

Thank you in advance for helping me with my research by taking this survey. As always, I'll be happy to help out any way I can for your ARP's as well (or anything else beyond ARP's).

Paul Grano
Division Chief-LANL Training Coordinator
Los Alamos Fire Department
Office (505) 662-8313
Cell (505) 500-7325
email: paul.grano@lacnm.us

Unable to log in to: SharePoint.



Appendix E

Internal Survey Questions and Results

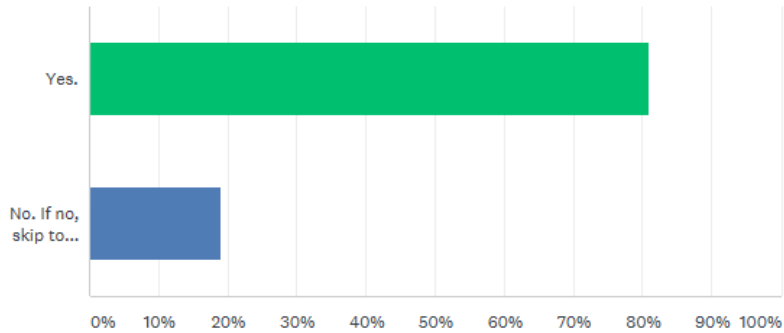
Q1.

Customize

Export ▼

Do you currently participate in or have you participated within the last year in any ball sports while on duty?

Answered: 58 Skipped: 0



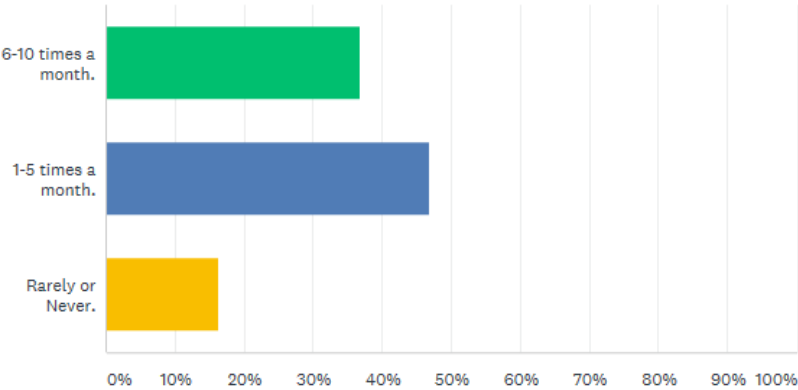
ANSWER CHOICES	RESPONSES	
▼ Yes.	81.03%	47
▼ No. If no, skip to question 10.	18.97%	11
TOTAL		58

Q2.

Customize Export

How often do you play ball sports on duty?

Answered: 49 Skipped: 9



ANSWER CHOICES	RESPONSES	
6-10 times a month.	36.73%	18
1-5 times a month.	46.94%	23
Rarely or Never.	16.33%	8
TOTAL	49	

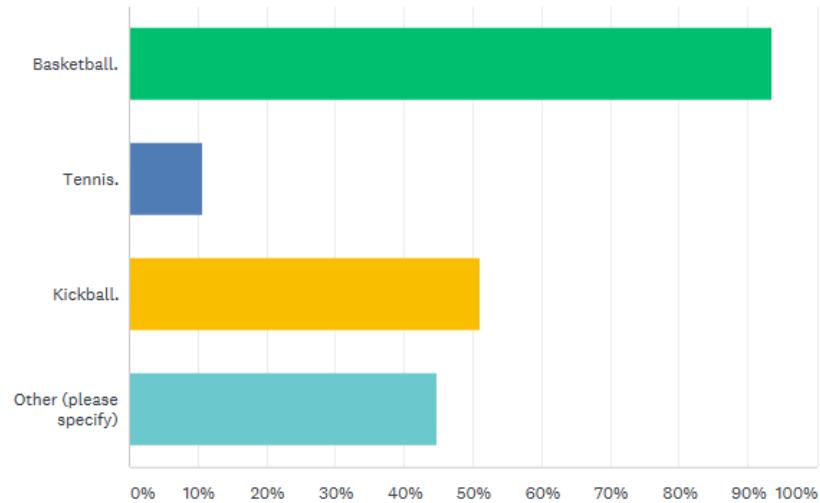
Q3.

Customize

Export ▼

Which ball sports do you play on duty? Check all that apply.

Answered: 47 Skipped: 11



ANSWER CHOICES	RESPONSES	
▼ Basketball.	93.62%	44
▼ Tennis.	10.64%	5
▼ Kickball.	51.06%	24
▼ Other (please specify) Responses	44.68%	21

[RESPONSES \(21\)](#)[TEXT ANALYSIS](#)[MY CATEGORIES](#)

Categorize as... ▼

Filter by Category ▼

Search responses

Showing **21** responses

football

10/31/2017 2:39 PM

[View respondent's answers](#)

Football

Football, volleyball		
10/27/2017 9:21 AM	View respondent's answers	^
Soccer		
10/23/2017 11:41 PM	View respondent's answers	
Frisbee Football		
10/23/2017 8:16 PM	View respondent's answers	
touch football		
10/23/2017 5:05 PM	View respondent's answers	
Soccer		
10/23/2017 4:05 PM	View respondent's answers	
Ultimate frisbee		v
flag football		
10/14/2017 10:11 PM	View respondent's answers	^
Volleyball, football		
10/14/2017 5:30 PM	View respondent's answers	
touch football		
10/13/2017 6:54 PM	View respondent's answers	
Volleyball, 2 hand touch Football		
10/13/2017 2:37 PM	View respondent's answers	
Hockey, Ultimate Frisbee,		
10/13/2017 11:26 AM	View respondent's answers	
Soccer		v

Volleyball	10/13/2017 7:33 AM	View respondent's answers
Volleyball, two-hand touch football	10/13/2017 7:28 AM	View respondent's answers
two hand touch football	10/13/2017 6:48 AM	View respondent's answers
Football,	10/12/2017 11:24 AM	View respondent's answers
Street/Floor Hockey	10/12/2017 6:32 AM	View respondent's answers
throwing a baseball		

Frisbee, Volleyball	10/11/2017 4:10 PM	View respondent's answers
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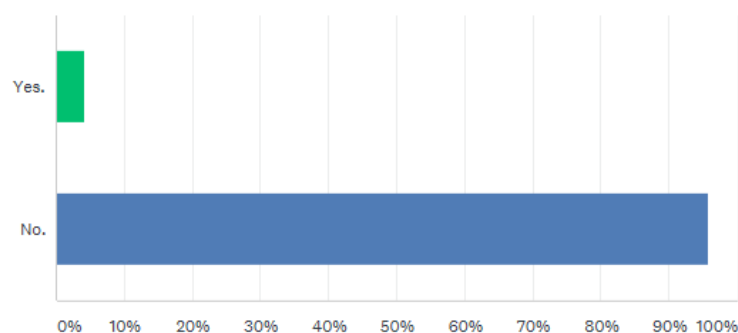
Total Respondents: 47	
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Q4.

[Customize](#)[Export](#)

Are ball sports the only form of exercise you participate in while on duty?

Answered: 47 Skipped: 11



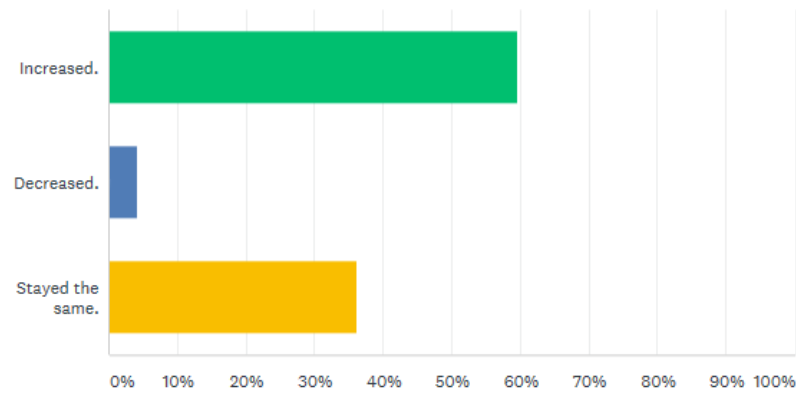
ANSWER CHOICES	RESPONSES	
Yes.	4.26%	2
No.	95.74%	45
TOTAL		47

Q5 .

Customize Export

Which best describes the amount of time you spend on physical fitness training since ball sports were allowed to be played while on duty?

Answered: 47 Skipped: 11



ANSWER CHOICES	RESPONSES	
Increased.	59.57%	28
Decreased.	4.26%	2
Stayed the same.	36.17%	17
TOTAL		47

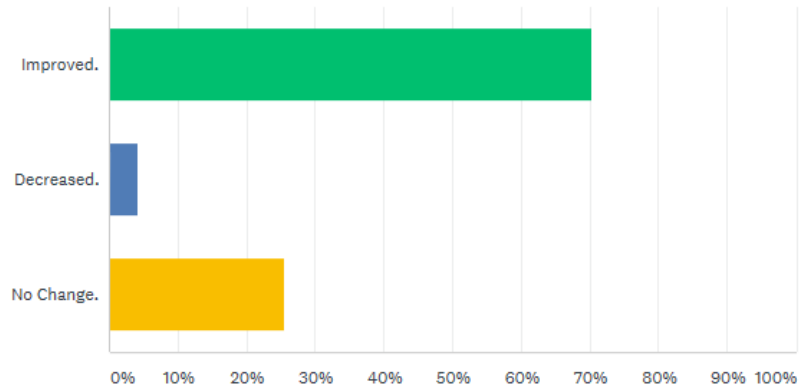
Q6 .

Customize

Export ▼

In regards to your fitness level needed as a firefighter, how has playing ball sports while on duty impacted your level of fitness?

Answered: 47 Skipped: 11



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Improved.	70.21%	33
▼ Decreased.	4.26%	2
▼ No Change.	25.53%	12
TOTAL		47

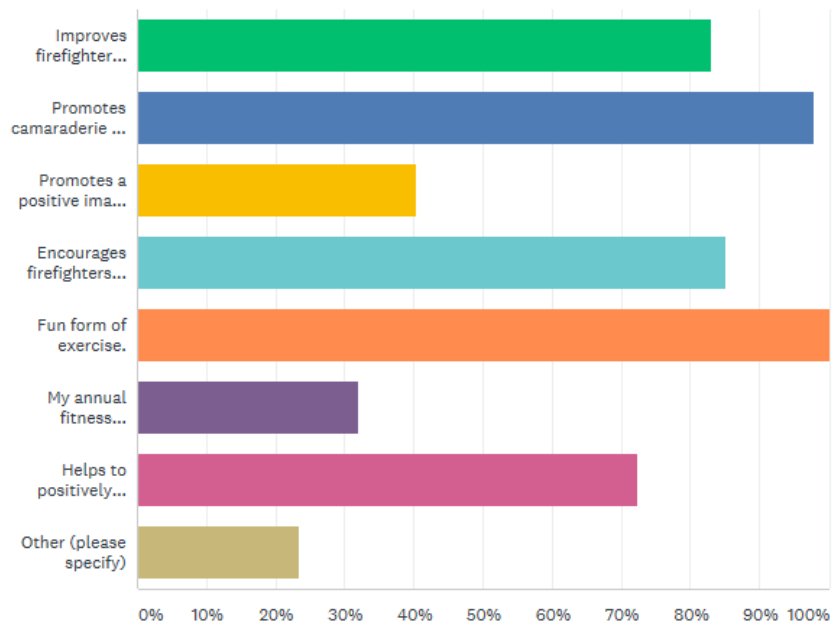
Q7.

Customize

Export ▼

What do you feel are the benefits for the firefighters in being allowed to play ball sports while on duty? Check all that apply.

Answered: 47 Skipped: 11



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Improves firefighter physical fitness.	82.98%	39
▼ Promotes camaraderie and team-building among firefighters.	97.87%	46
▼ Promotes a positive image of firefighters.	40.43%	19
▼ Encourages firefighters to become more active in physical fitness training.	85.11%	40
▼ Fun form of exercise.	100.00%	47
▼ My annual fitness evaluation (Microfit) has improved since playing ball sports while on duty.	31.91%	15
▼ Helps to positively reduce stress.	72.34%	34
▼ Other (please specify) Responses	23.40%	11

Showing 11 responses

allows us to interact with public and other crews we might not normally get to

10/31/2017 2:43 PM

[View respondent's answers](#)

Encourages longer PT sessions, often 2 hours

10/27/2017 9:21 AM

[View respondent's answers](#)

The biggest thing it does for anyone is engage the stabilizer muscles. The very muscles around knees, hips, shoulders, ankles, core, and back. The very muscles and joints we need to be dialed in for real world movements in the even of a fire. Wellness center, CTT, the gym etc... do nothing to little, to truly engage these fine twitch stabilizers. The introduction of ball sports and the Peloton bike has increased the amount of exercise guys get significantly. Individuals whom often never work out will join us in basketball or soccer.

10/23/2017 11:41 PM

[View respondent's answers](#)

contributes to building strength in stabilizing muscles and muscle recruitment not regularly exercised. Especially in lateral movements and use of fast twitch muscles

10/23/2017 8:38 PM

[View respondent's answers](#)

I've rarely seen so many members working out together. I think it's getting more members actively involved with PT

10/23/2017 6:09 PM

[View respondent's answers](#)

Keeps me motivated to stay physically fit

10/23/2017 5:32 PM

[View respondent's answers](#)

The community sees us out in the public

10/13/2017 2:37 PM

[View respondent's answers](#)

Gets you outside. Positive interactions with some citizens.

10/13/2017 11:26 AM

[View respondent's answers](#)

Increases hand-eye coordination and agility, which should reduce injury and increase performance on structure fire calls.

10/13/2017 10:25 AM

[View respondent's answers](#)

Makes me do cardio where otherwise I would just weight train.

Improves stability muscle strength

10/11/2017 5:48 PM

[View respondent's answers](#)

Total Respondents: 47

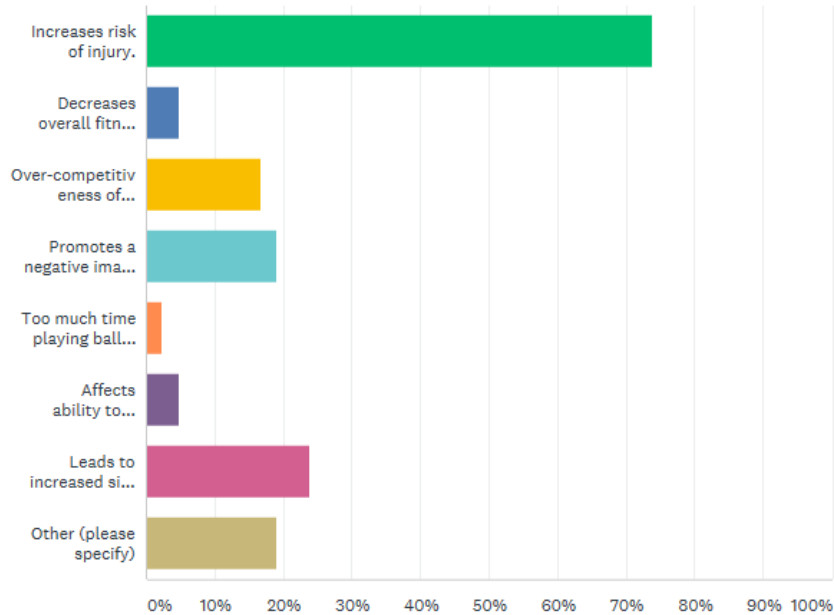
Q8.

Customize

Export ▼

What do you feel are the drawbacks (potential or real) of allowing firefighters to play ball sports while on duty? Check all that apply.

Answered: 42 Skipped: 16



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Increases risk of injury.	73.81%	31
▼ Decreases overall fitness (i.e.: too much time spent on ball sports at the expense of other fitness activities such as strength training).	4.76%	2
▼ Over-competitiveness of firefighters which may lead to hurt feelings or negative tension among crews.	16.67%	7
▼ Promotes a negative image of firefighters.	19.05%	8
▼ Too much time playing ball sports while on duty at the expense of time devoted to other important tasks (i.e.: non-physical fitness training, pre-incident planning, public education, etc.).	2.38%	1
▼ Affects ability to respond to emergencies (i.e.: firefighters may play to the point of physical exhaustion, play area is located far from the apparatus, personnel/apparatus out of their response district, etc.).	4.76%	2
▼ Leads to increased sick leave usage or increased injuries.	23.81%	10
▼ Other (please specify) Responses	19.05%	8

Possibly angers some community members, however, we have multiple citizens laughing at us and taking pictures of us for sons, nephews, etc...

10/27/2017 9:21 AM

[View respondent's answers](#)

I have seen a few whiny individuals during basketball but this is very seldom and was nipped in the bud fairly quickly. With every change comes the potential for injury, but I would much rather see a person injured during a ball sport then on the fire ground. Thats a no brainer that the so called "paramilitary" organizations can't and haven't grasped. I'm 40 years old. My body has been through a hell I wouldn't wish on too many people. I feel it everyday, in everystep I take HOWEVER I can still out maneuver in sports or on the fireground 98% of even our youngest guys. I owe that to never stopping. Never giving in and quitting those fast twitch, reactive, hand eye coordination activities. Soccer, ultimate frisbee, B-ball etc all keep us young. Yes stuff can happen but better to slowly introduce the body back into it here than completely tearing the body apart on the fireground. On the other hand I can completely see why this is frowned upon from a managerial and financial standpoint. The numbers don't lie for our department in regards to recent ball sports injuries. We don't run enough fire calls to support the validity in my earlier comment, but guys have toned the games down, learned quickly about the limitations of our bodies. I think ball sports would have never been allowed had Chief himself not tore his knee playing....basketball that was affiliated with LAFD. It happens unfortunately but the key is to keep yourself healthy come back stronger and more motivated and think ball sports encourage that more than just mundain, routine muscular movements in a gym

10/23/2017 11:41 PM

[View respondent's answers](#)

I think the increased injury rate is directly related to the prior LACK of conditioning

• none

10/23/2017 5:32 PM

[View respondent's answers](#)

I think initially injuries have gone up, but only because many of us haven't played sports in a while. As we regain our feel for the sports, injuries should return to normal levels, with less occurring on the fire scene.

10/13/2017 10:25 AM

[View respondent's answers](#)

none

10/13/2017 6:48 AM

[View respondent's answers](#)

Injuries are always a concern however I feel injuries that may have happened were'nt directly cuased by sports, rather underlying injuries that may have been exposed.

10/12/2017 9:37 AM

[View respondent's answers](#)

no drawbacks

10/11/2017 5:40 PM

[View respondent's answers](#)

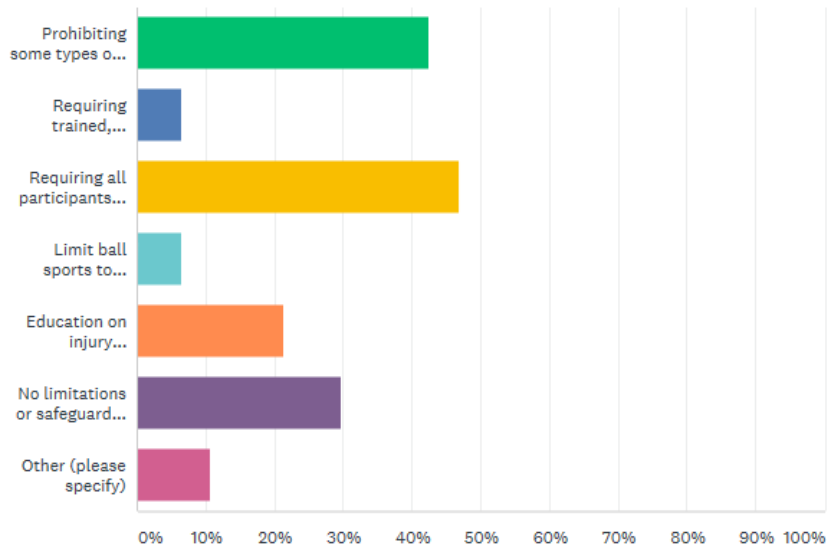
Q9.

Customize

Export ▼

What limitations or safeguards do you believe should be implemented when playing ball sports while on duty?

Answered: 47 Skipped: 11



ANSWER CHOICES ▼

RESPONSES ▼

▼ Prohibiting some types of ball sports while on duty (i.e.: tackle football).	42.55%	20
▼ Requiring trained, certified, and/or knowledgeable coaches to be present to enforce rules and safety practices (may include an LAFD firefighter performing this function).	6.38%	3
▼ Requiring all participants to warm up/cool down (stretching) after ball sport activity.	46.81%	22
▼ Limit ball sports to non-contact only (i.e.: tennis).	6.38%	3
▼ Education on injury prevention specific for the ball sport being played prior to participation.	21.28%	10
▼ No limitations or safeguards needed.	29.79%	14
▼ Other (please specify)	10.64%	5

[Responses](#)

Showing 5 responses

I agree with the "non-contact" aspect. We have been very good at adhering to this policy.

10/27/2017 9:21 AM

[View respondent's answers](#)

Captains should intervene when tension arise among players and/or becomes too competitive.

10/23/2017 8:16 PM

[View respondent's answers](#)

Requiring only very limited contact in sports like basketball and soccer would help, but honestly the crews that are playing are already doing that.

10/13/2017 10:25 AM

[View respondent's answers](#)

Allow punching bags. It is one of the best workouts for cardio, muscular indurance, and core stability.

10/12/2017 9:37 AM

[View respondent's answers](#)

Making sure proper equipment, protection equipment is used

10/12/2017 6:32 AM

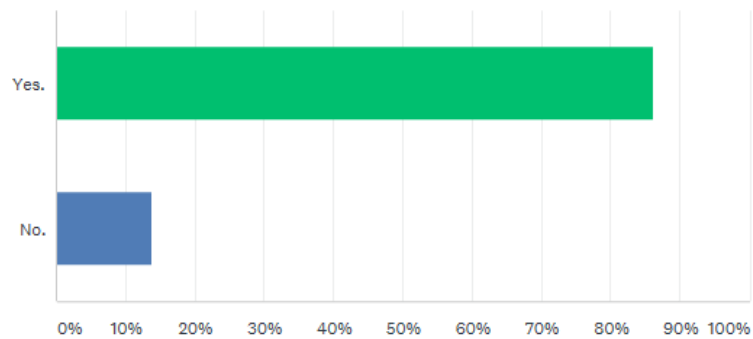
[View respondent's answers](#)

Q10.

[Customize](#)[Export](#) ▼

Do you believe that LAFD should continue to allow its firefighters to play ball sports while on duty?

Answered: 58 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Yes.	86.21%	50
▼ No.	13.79%	8
TOTAL		58

Appendix F

External Survey Questions and Results

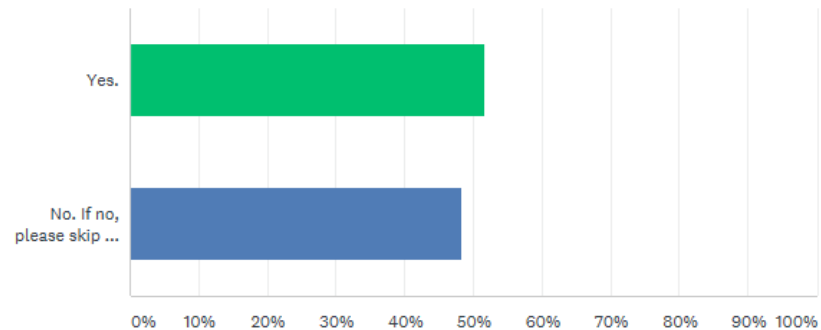
Q1.

Customize

Export ▼

Does your fire department allow its firefighters to play ball sports while on duty?

Answered: 29 Skipped: 0



ANSWER CHOICES ▼

RESPONSES ▼

▼ Yes.

51.72%

15

▼ No. If no, please skip to Question 6.

48.28%

14

TOTAL

29

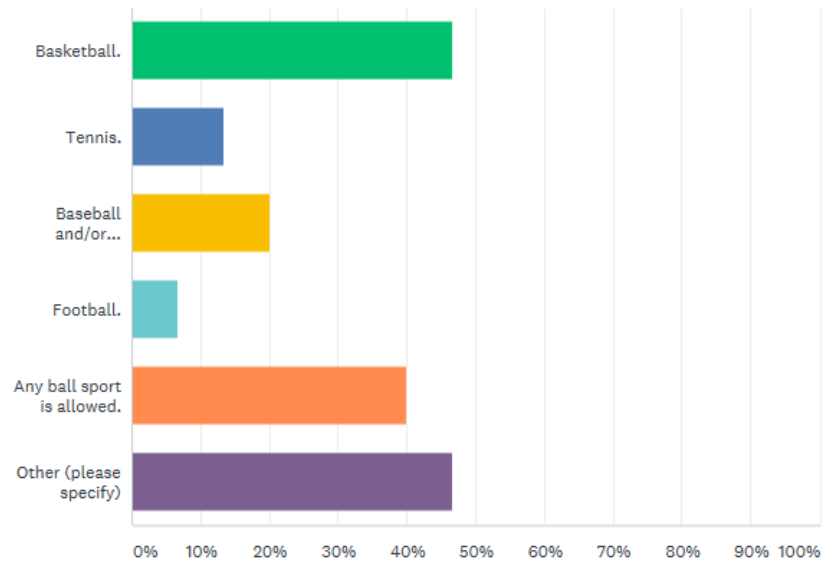
Q2.

Customize

Export ▼

Which ball sports are firefighters allowed to play while on duty? Check all that apply.

Answered: 15 Skipped: 14



ANSWER CHOICES	RESPONSES	
▼ Basketball.	46.67%	7
▼ Tennis.	13.33%	2
▼ Baseball and/or Kickball.	20.00%	3
▼ Football.	6.67%	1
▼ Any ball sport is allowed.	40.00%	6
▼ Other (please specify)	46.67%	7

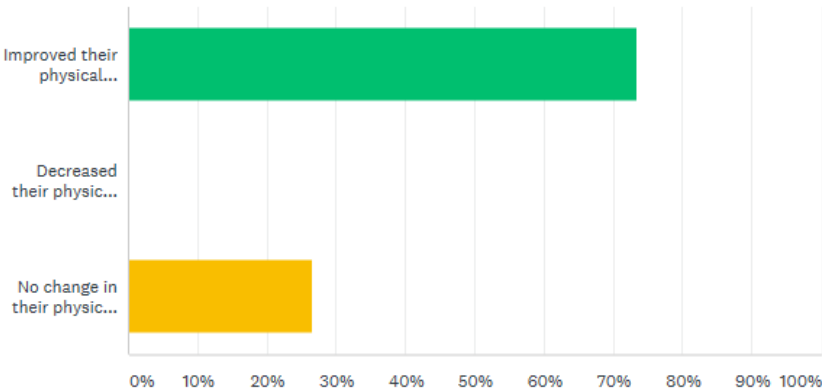
Showing 7 responses		
No restrictions by policy. Whatever you can do on station property.	10/24/2017 11:23 AM	View respondent's answers
Swimming	10/18/2017 7:55 AM	View respondent's answers
Handball is the only approved ball sport, but other sports, i.e. basketball, volleyball and paddle tennis are played, as well.	10/18/2017 7:41 AM	View respondent's answers
They play a basketball shooting game like horse where they do push ups, sit-ups, air squats, and laps if they miss. We have also allowed Ultimate "Cardio" Frisbee, and Racquetball	10/13/2017 5:01 AM	View respondent's answers
Soccer	10/12/2017 7:49 PM	View respondent's answers
racketball and wallyball	10/12/2017 5:07 PM	View respondent's answers
Non contact/competitive sports	10/12/2017 3:34 PM	View respondent's answers
Total Respondents: 15		

Q3.

Customize Export

What impact does allowing ball sports to be played by on duty firefighters have on your firefighters' physical fitness levels overall?

Answered: 15 Skipped: 14



ANSWER CHOICES	RESPONSES	
Improved their physical fitness.	73.33%	11
Decreased their physical fitness.	0.00%	0
No change in their physical fitness levels.	26.67%	4
TOTAL	15	

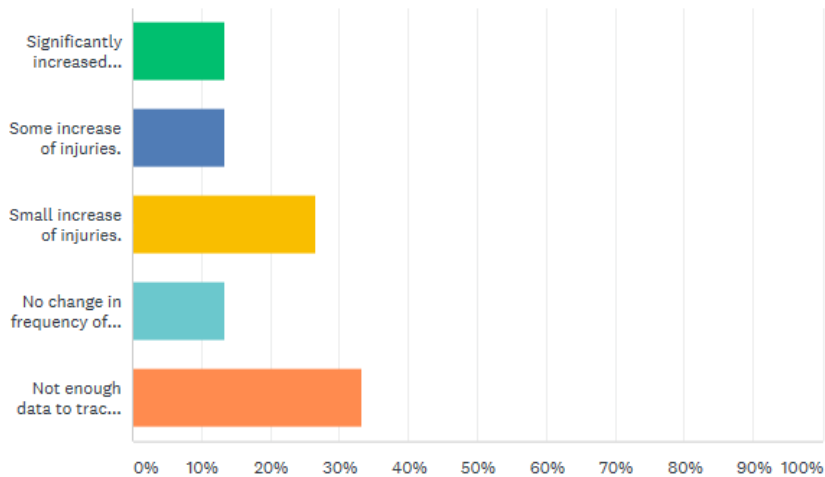
Q4.

Customize

Export ▼

What impact to firefighter injuries have ball sports had on your firefighters as a result of them playing ball sports while on duty (injuries directly associated with them playing on duty ball sports)?

Answered: 15 Skipped: 14



ANSWER CHOICES	RESPONSES	
Significantly increased injuries.	13.33%	2
Some increase of injuries.	13.33%	2
Small increase of injuries.	26.67%	4
No change in frequency of injuries.	13.33%	2
Not enough data to track this.	33.33%	5
TOTAL		15

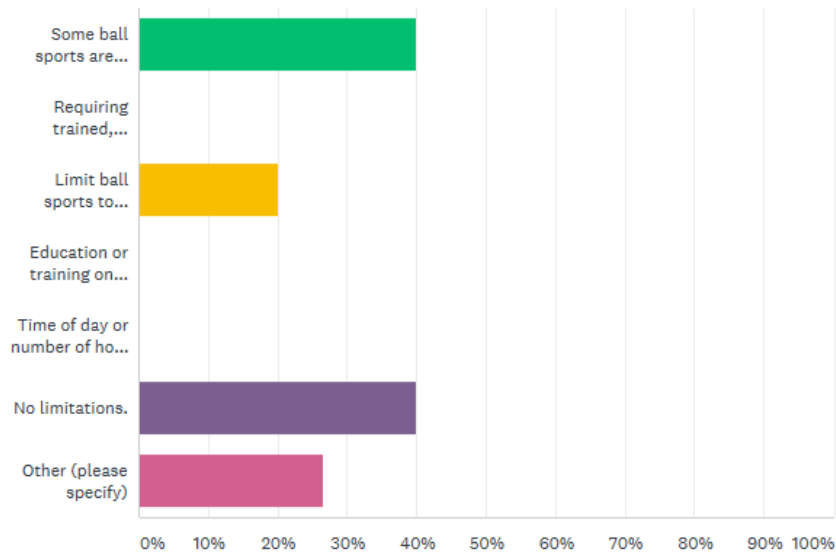
Q5.

Customize

Export ▼

What limitations or safeguards does your department have for firefighters when they play ball sports while on duty? Check all that apply.

Answered: 15 Skipped: 14



ANSWER CHOICES ▼	RESPONSES ▼
▼ Some ball sports are prohibited while on duty (i.e.: tackle football).	40.00% 6
▼ Requiring trained, certified, and/or knowledgeable coaches or firefighting personnel to be present to enforce rules and safety practices.	0.00% 0
▼ Limit ball sports to non-contact only (i.e.: tennis; basketball is considered a contact sport).	20.00% 3
▼ Education or training on injury prevention specific to the ball sport being played prior to participation.	0.00% 0
▼ Time of day or number of hours allowed to play ball sports.	0.00% 0
▼ No limitations.	40.00% 6
▼ Other (please specify) Responses	26.67% 4

Showing 4 responses

Topic is not addressed in policy in anyway.

10/24/2017 11:23 AM

[View respondent's answers](#)

Must remain in service and take calls

10/12/2017 7:49 PM

[View respondent's answers](#)

all appropriate PPE must be used, ie)eye protection

10/12/2017 3:34 PM

[View respondent's answers](#)

If an injury occurs it is considered a personal injury and not a duty injury

10/12/2017 3:02 PM

[View respondent's answers](#)

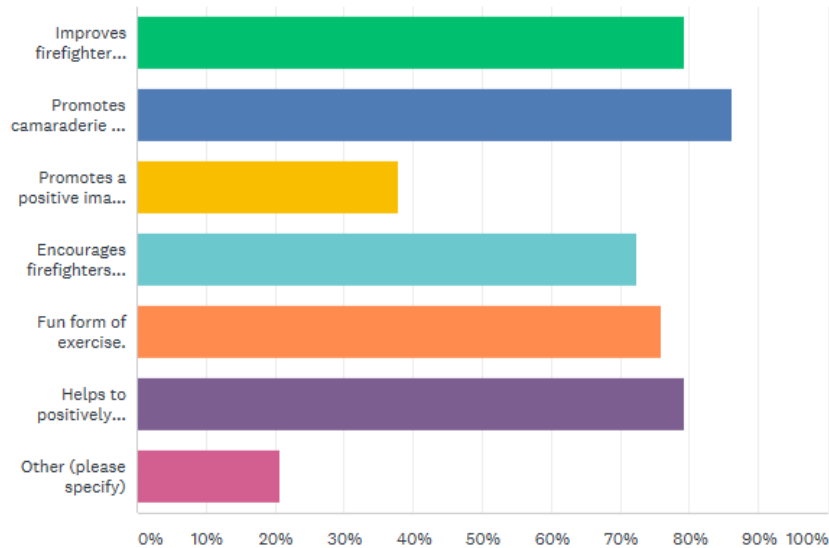
Q6.

Customize

Export ▼

What are the benefits of allowing firefighters to play ball sports while on duty? Check all that apply.

Answered: 29 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Improves firefighter fitness.	79.31%	23
▼ Promotes camaraderie and team-building among firefighters.	86.21%	25
▼ Promotes a positive image of firefighters.	37.93%	11
▼ Encourages firefighters to become more active in physical fitness training.	72.41%	21
▼ Fun form of exercise.	75.86%	22
▼ Helps to positively reduce stress.	79.31%	23
▼ Other (please specify) Responses	20.69%	6

Showing 6 responses

Answers are speculative. No study to support any specific response.

10/24/2017 11:23 AM

[View respondent's answers](#)

Increases injury potential

10/18/2017 7:46 AM

[View respondent's answers](#)

We don't do ball sports as we have suffered too many injuries that caused workers compensation claims to go up as well as the District/Town to question what we were doing in our spare time. We have access to a full gym, cardio/weights at every fire station so playing sports isn't really a easy sell. Doing crew workouts are equally beneficial and develops all of the listed items in Question 6.

10/13/2017 1:55 PM

[View respondent's answers](#)

We do not allow sports in diry

10/13/2017 9:59 AM

[View respondent's answers](#)

increase work out by pushing limitations

10/12/2017 5:07 PM

[View respondent's answers](#)

Good community involvement

10/12/2017 4:03 PM

[View respondent's answers](#)

Total Respondents: 29

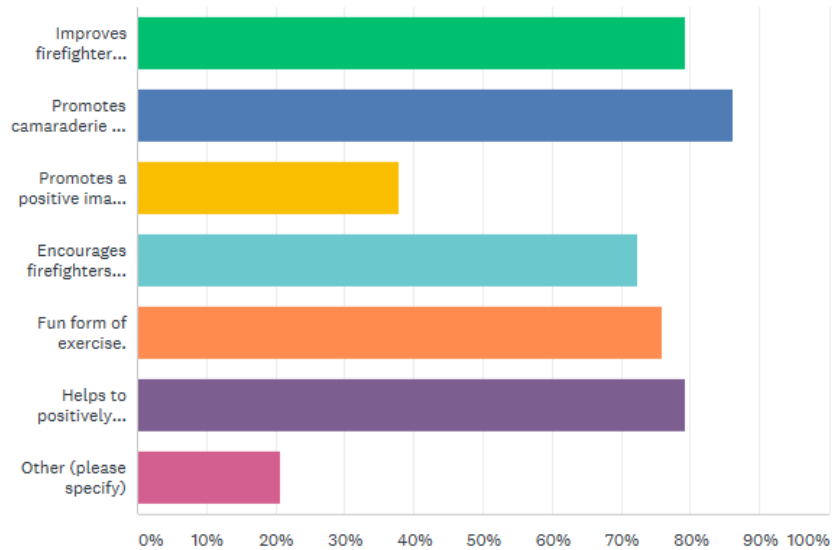
Q6.

Customize

Export ▼

What are the benefits of allowing firefighters to play ball sports while on duty? Check all that apply.

Answered: 29 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Improves firefighter fitness.	79.31%	23
▼ Promotes camaraderie and team-building among firefighters.	86.21%	25
▼ Promotes a positive image of firefighters.	37.93%	11
▼ Encourages firefighters to become more active in physical fitness training.	72.41%	21
▼ Fun form of exercise.	75.86%	22
▼ Helps to positively reduce stress.	79.31%	23
▼ Other (please specify) Responses	20.69%	6

Showing 6 responses		
Answers are speculative. No study to support any specific response.		View respondent's answers
10/24/2017 11:23 AM		
Increases injury potential		View respondent's answers
10/18/2017 7:46 AM		
We don't do ball sports as we have suffered too many injuries that caused workers compenstation claims to go up as well as the District/Town to question what we were doing in our spare time. We have access to a full gym, cardio/weights at every fire station so playing sports isn't really a easy sell. Doing crew workouts are equally beneficial and develops all of the listed items in Question 6.		View respondent's answers
10/13/2017 1:55 PM		
We do not allow sports in diry		View respondent's answers
10/13/2017 9:59 AM		
Increase work out by pushing limitations		View respondent's answers
10/12/2017 5:07 PM		
Good community involvement		View respondent's answers
10/12/2017 4:03 PM		
Total Respondents: 29		

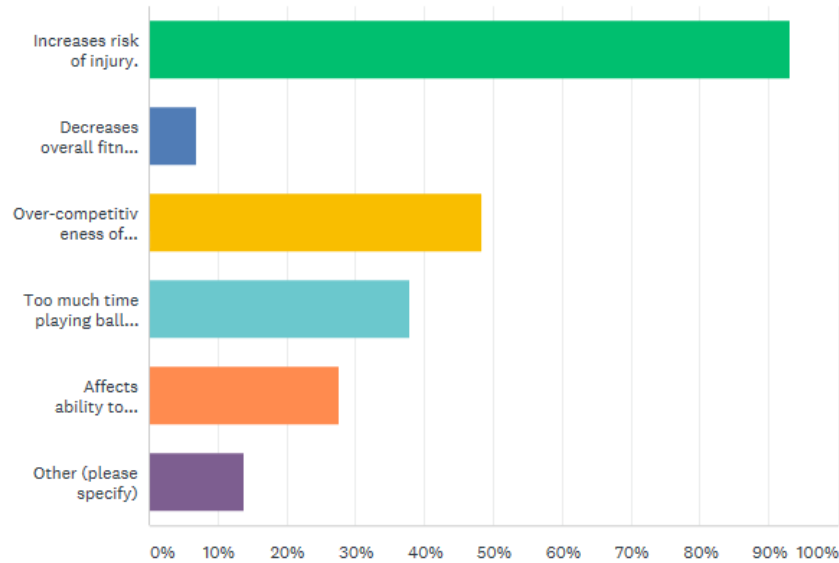
Q7.

Customize

Export ▼

What are the drawbacks (potential or real) of allowing firefighters to play ball sports while on duty? Check all that apply.

Answered: 29 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Increases risk of injury.	93.10%	27
▼ Decreases overall fitness (i.e.: too much time spent on ball sports at the expense of other fitness activities such as strength training).	6.90%	2
▼ Over-competitiveness of firefighters which may lead to hurt feelings or negative tension among crews.	48.28%	14
▼ Too much time playing ball sports while on duty at the expense of time devoted to other important tasks (i.e.: non-physical fitness training, pre-incident planning, public education, etc.).	37.93%	11
▼ Affects ability to respond to emergencies (i.e.: firefighters may play to the point of physical exhaustion, play area is located far from the apparatus, personnel/apparatus out of their response district, etc.).	27.59%	8
▼ Other (please specify) Responses	13.79%	4

Showing 4 responses

When it was allowed we had more PT related injuries and received regular complaints from the public.

10/16/2017 11:55 AM

[View respondent's answers](#)

Workers Compensation issues and long term absence due to injuries from more intense activities.

10/13/2017 7:08 AM

[View respondent's answers](#)

depending on location may take personnel out of response area exceptable limits.

10/12/2017 5:23 PM

[View respondent's answers](#)

negative perception from citizens of what FF are paid for

10/12/2017 3:34 PM

[View respondent's answers](#)

Total Respondents: 29

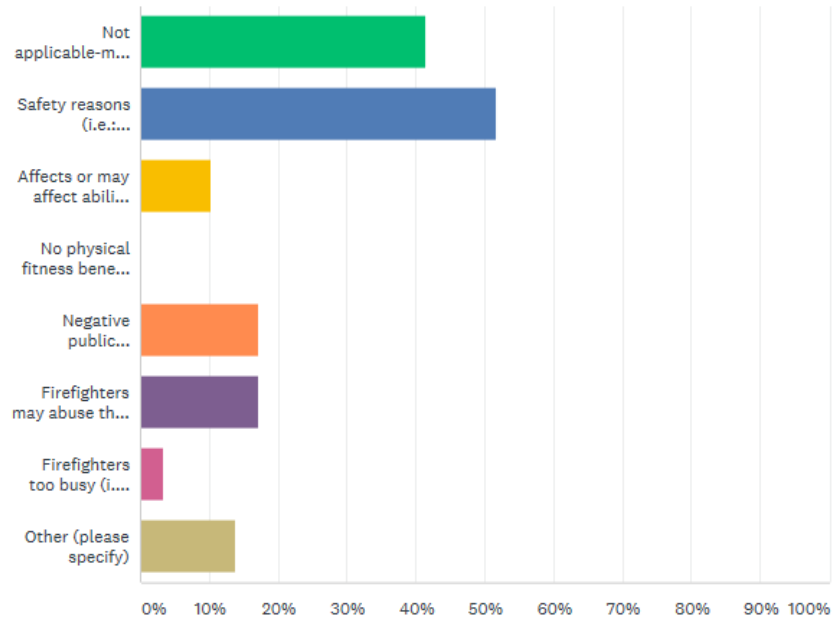
Q8.

Customize

Export ▼

Why does your fire department not allow its firefighters to play ball sports while on duty (regardless of who has prohibited this activity such as the Fire Chief, Risk Manager, Mayor, etc.)? Check all that apply.

Answered: 29 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼	
▼ Not applicable-my fire department allows on duty ball sports.	41.38%	12
▼ Safety reasons (i.e.: increased injuries).	51.72%	15
▼ Affects or may affect ability to respond.	10.34%	3
▼ No physical fitness benefit for the firefighters.	0.00%	0
▼ Negative public perception.	17.24%	5
▼ Firefighters may abuse this privilege (i.e.: spend too much time on ball sports neglecting time for other tasks).	17.24%	5
▼ Firefighters too busy (i.e.: high call volume, other non-emergency tasks).	3.45%	1
▼ Other (please specify) Responses	13.79%	4

Showing 4 responses

We have no specific policy either way

10/18/2017 10:10 AM

[View respondent's answers](#)

High Injury costs and time off duty based on our past experiences.

10/13/2017 7:08 AM

[View respondent's answers](#)

We allow

10/13/2017 5:01 AM

[View respondent's answers](#)

confrontations, bullying

10/12/2017 5:23 PM

[View respondent's answers](#)

Total Respondents: 29

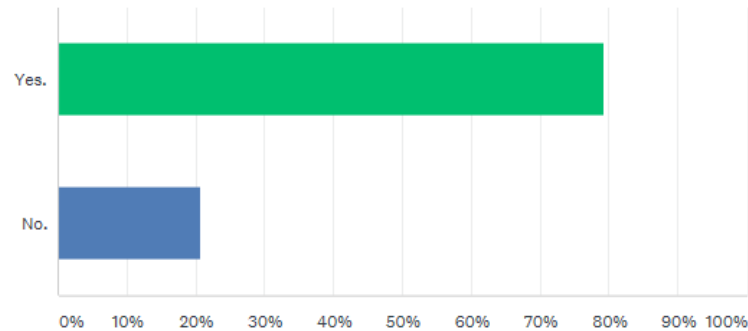
Q9.

Customize

Export ▼

Do you personally feel that firefighters should be allowed to play ball sports while on duty, especially if limitations or safeguards are implemented?

Answered: 29 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼
▼ Yes.	79.31% 23
▼ No.	20.69% 6
TOTAL	29

[Comments \(15\)](#)

RESPONSES (15)

TEXT ANALYSIS

MY CATEGORIES

Categorize as... ▼

Filter by Category ▼

Search responses



Showing 15 responses

Within reason. On property, not overly aggressive between participants. No reduction in ability to respond.

10/24/2017 11:23 AM

[View respondent's answers](#)

I believe the creating an athletic and fitness oriented culture is necessary and active sports facilitate that.

10/18/2017 10:10 AM

[View respondent's answers](#)

Some ball sports can be approved, question limits response. Needs to be non-contact, or low speed type in order to reduce/limit injuries.

10/18/2017 7:46 AM

[View respondent's answers](#)

Certain sports should not be allowed due to injuries on duty, this causes increase in overall workerscomp payouts. Tradition within our Fire Department still allows handball.

10/18/2017 7:41 AM

[View respondent's answers](#)

When previously allowed we had more PT related injuries, we received negative comments from the public, and we saw the allowed PT time allotment abused regularly.

10/16/2017 11:55 AM

[View respondent's answers](#)

Functional training is more beneficial as it puts FF's in real workload type environments and prepares them for the duties they will be conducting while engaged in their work.

10/13/2017 1:55 PM

[View respondent's answers](#)

Volleyball or other non contact sports

10/13/2017 7:08 AM

[View respondent's answers](#)

In the past there has been injuries from playing ball. Standard basketball, usually becomes "full contact" at some point due to the competitiveness of the firefighters. We have the same issues with CrossFit type workouts.

10/13/2017 6:16 AM

[View respondent's answers](#)

It is a form of fitness, but they are not the ultimate fitness activity so it must be moderated by the company officers.

10/13/2017 5:01 AM

[View respondent's answers](#)

Higher risk of injury

10/12/2017 7:49 PM

[View respondent's answers](#)

all the reasons listed above

10/12/2017 5:23 PM

[View respondent's answers](#)

Too many injuries and negative perception about firefighters not being busy

10/12/2017 3:02 PM

[View respondent's answers](#)

As long as they are getting other duties done and not substituting shooting hoops for actual physical fitness I feel it's no different than watching TV, surfing the web, or any other non-work activity.

10/12/2017 2:47 PM

[View respondent's answers](#)

team building, fun exercise, good for mental health

10/12/2017 2:47 PM

[View respondent's answers](#)

Anything is better than sitting in the recliner all day

10/12/2017 2:40 PM

[View respondent's answers](#)

Q10 .

Export ▼

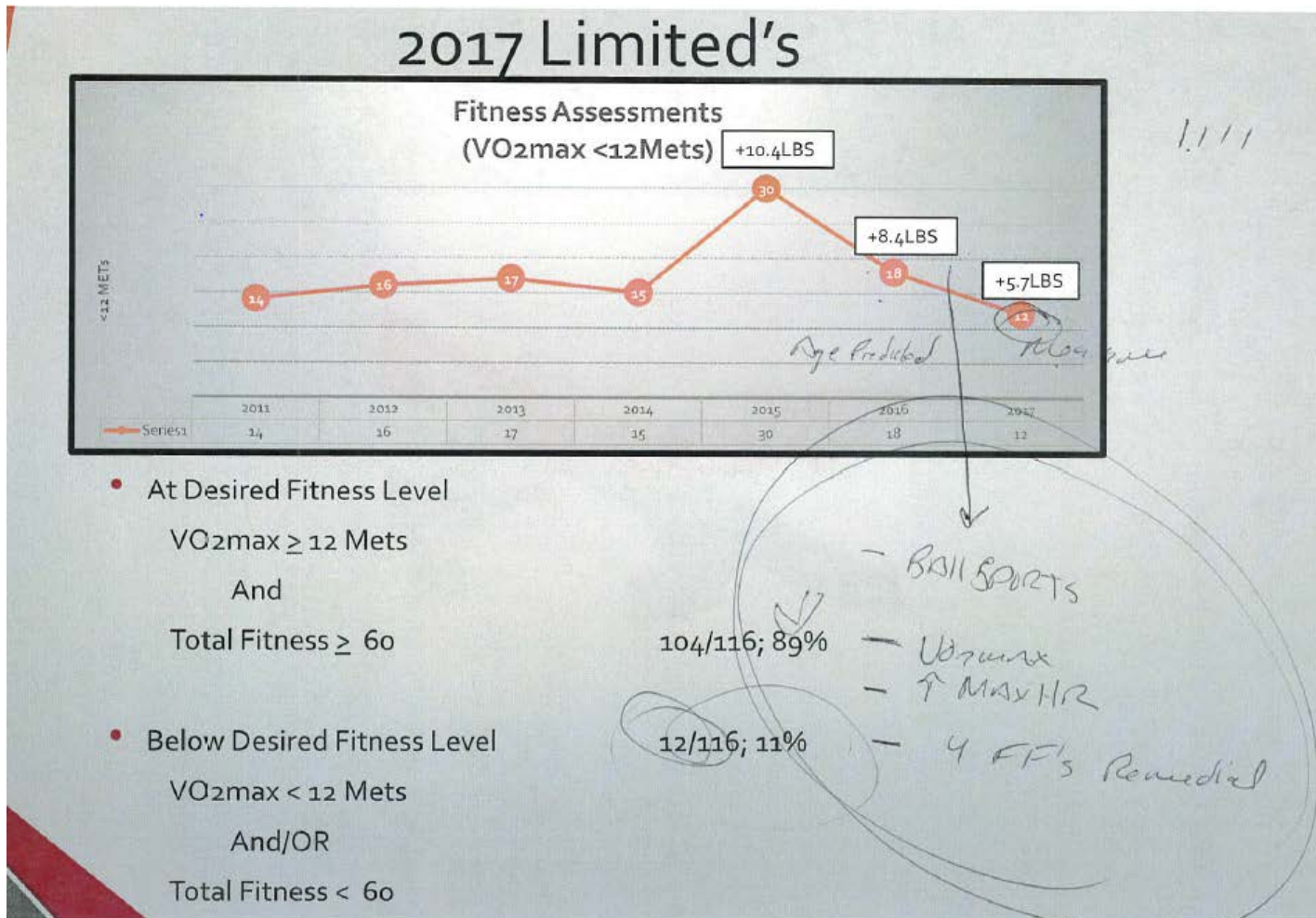
Address

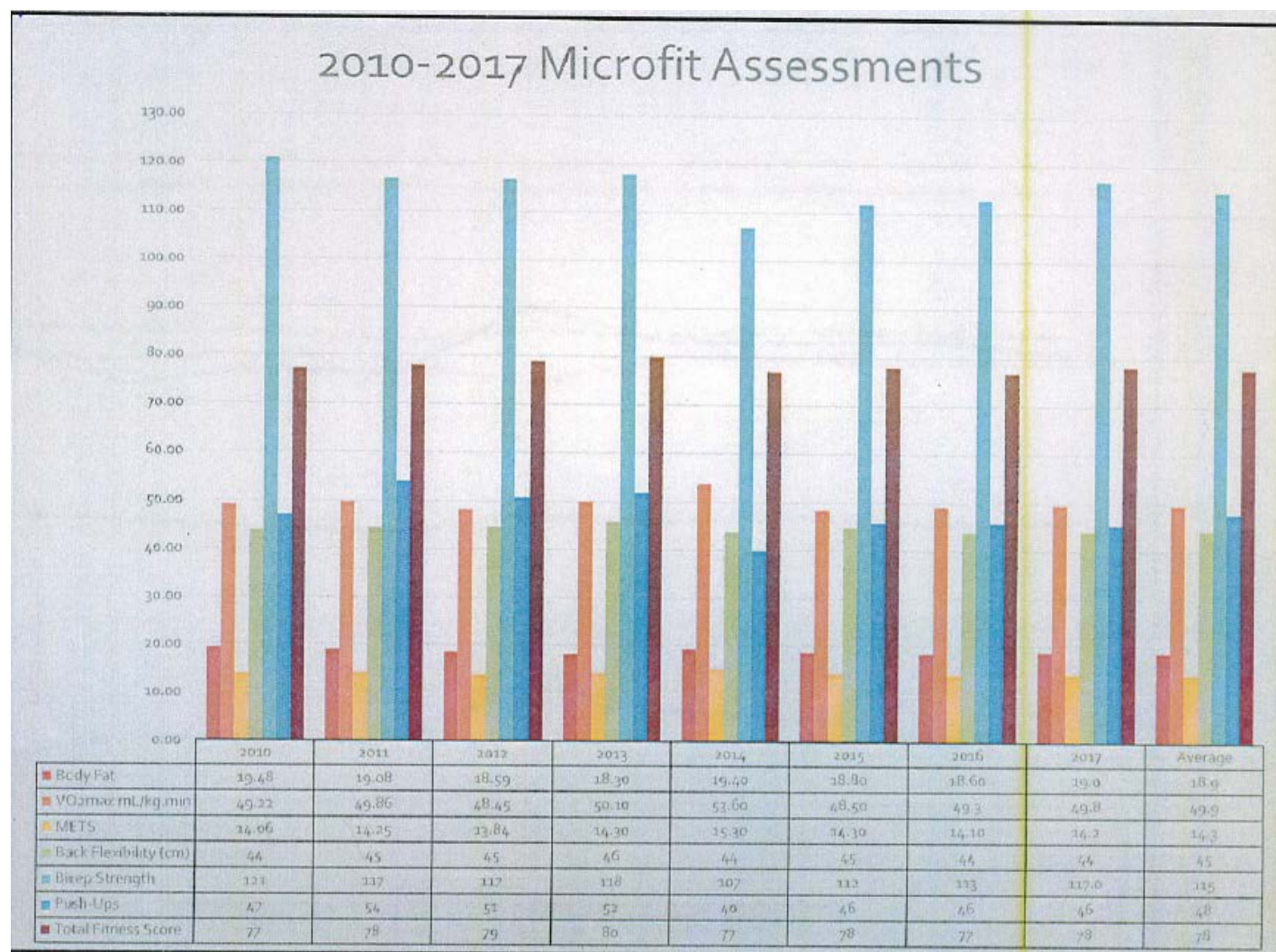
Answered: 24 Skipped: 5

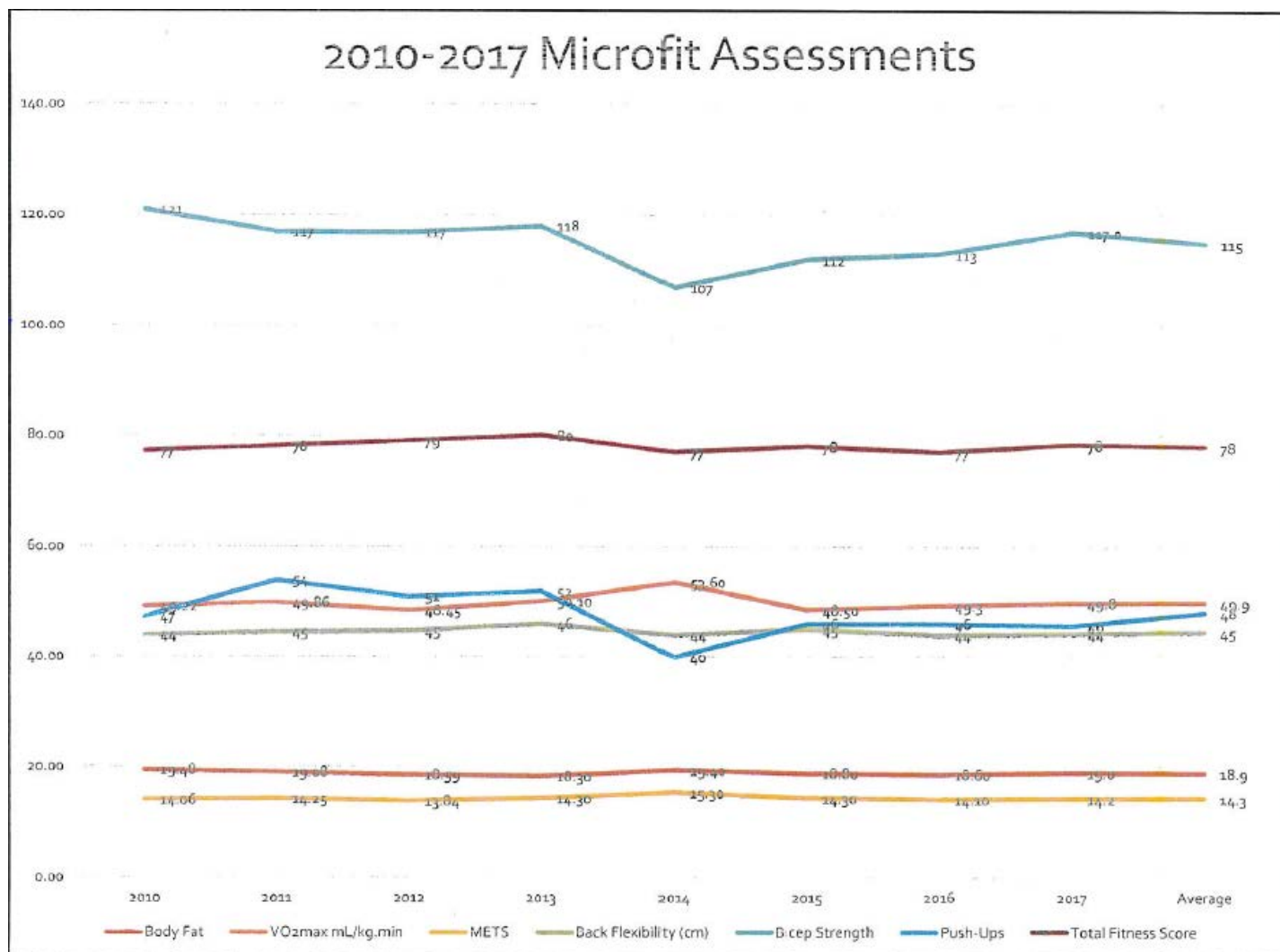
ANSWER CHOICES ▼		RESPONSES ▼	
Name	Responses	91.67%	22
Company	Responses	91.67%	22
Address	Responses	0.00%	0
Address 2	Responses	0.00%	0
City/Town	Responses	95.83%	23
State/Province	Responses	95.83%	23
ZIP/Postal Code	Responses	0.00%	0
Country	Responses	0.00%	0
Email Address	Responses	95.83%	23
Phone Number	Responses	91.67%	22

Appendix G

LAFD Fitness Data







Appendix H

Interview with Adam Martinez Conducted on Oct. 26 at 1:30 PM

1. What are your current job title and job duties? Specifically, what is your role with the Los Alamos Fire Department (LAFD)?

My title is Wellness Center Program Lead. My general job duties are overseeing and facilitating the LANL Wellness Center Facility and Group Exercise Class programs, Surveillance Fitness programs, and Satellite Exercise Sites. Specifically for LAFD, I manage its Surveillance Fitness Program. This program's purpose is to develop health, fitness, nutrition, and injury prevention programs. This includes annual fitness testing and functional movement screenings of all the firefighters. Also, I develop and present health education classes to firefighters and attend Fitness Committee Meetings each quarter. I also serve as a personal fitness trainer for the firefighters while on duty who need or request additional fitness training. Finally, I facilitate fitness equipment purchases for the LANL owned stations.

2. What is your job, educational, and training background (i.e., education, training, experience, etc.) in regards to physical fitness and in particular firefighter fitness?

I have a Bachelor of Science Degree in Exercise Science and a Master of Science Degree in Exercise Science/Sports Administration. My certifications include American College of Sports Medicine Certification as an Exercise Physiologist, National Strength and Conditioning Association certification as a Certified Strength and Conditioning Specialist, and am certified from the American Council of Exercise as a Peer Fitness Trainer through the IAFF. In regards to my NSCA Certification, this is the only nationally accredited organization that certifies trainers to work on physical fitness

training specifically geared towards occupational and tactical athletes. What this means is that firefighters are considered occupational athletes with specific fitness needs and requirements for their job and my certification through them demonstrates that I know and understand the needs of firefighters in regards to physical fitness and fitness programs for them.

3. What are the minimum fitness requirements for LAFD firefighters?

LAFD follows NFPA 1582 and NFPA 1583 - as it quantifies the minimum physical fitness requirements for firefighters and its physical fitness program. For example, LAFD follows NFPA 1582, Section 5.1 which says that a fire department shall evaluate 13 essential job tasks as outlined in this section against the types and levels of emergency services it provides the local community. In other words, LAFD looks at all 13 of these essential job tasks and evaluates its firefighters' ability to carry out these tasks. Also, LAFD follows the Wellness Fitness Initiative 4th Edition. This initiative outlines an overall wellness/fitness system for firefighters.

4. How are LAFD firefighter fitness levels measured?

The Wellness Center conducts an annual fitness assessment of all LAFD firefighters. Microfit is the software program we use to conduct these fitness assessments. We used an objective and validated fitness assessment tool that has been validated by the American College of Sports Medicine. The assessment measures body composition, VO2 max, flexibility, muscular strength, and muscular endurance. Also, we utilize a VO2 Max Assessment using indirect calorimetry if we have trouble getting a true assessment of METS and aerobic fitness levels for the firefighters. Although LAFD requires all of its firefighters to pass the CTT annually, it is more of assessment to ensure that the

firefighters can perform various firefighting duties. There is no research that says if a firefighter can pass the CTT within 6 minutes and 59 seconds that they also are meeting the minimum of 12 METS required by NFPA.

5. Since LAFD has allowed its firefighters to play ball sports while on duty, have you seen any changes in the firefighters' fitness levels? Also, please explain how this is measured.

Looking at the annual fitness assessment results, I have not seen any data that supports any noticeable changes in the firefighters' fitness levels as measured by an objective fitness assessment. So the answer is no. We have not done any formal baseline measurements to see whether or not ball sports have or have not specifically improved firefighter fitness. For example, we can look at the number of firefighters who have not passed their annual fitness assessments on their first attempts over the last three years. These failures were because either they did not meet the minimum overall fitness score of at least 60 or the 12 MET minimum requirement or both. In 2015, 30 firefighters did not pass, in 2016, 18 firefighters did not pass, and in 2017 12 did not pass. There is some data that we need to look at to try to explain the decrease in the numbers of firefighters not passing their assessments. In 2015, the average weight gain of all firefighters was 10.4 pounds, in 2016 the average weight gain was 8.4 pounds, and in 2017 the average weight gain was only 5.7 pounds. When it comes to assessing MET scores, weight and in particular weight gain, has a profound effect on MET levels. When people gain weight from one year to the next, this can affect their ability to meet the minimum 12 MET requirement. Besides weight, there are a couple of other factors that may explain fewer fitness assessment failures this year. First, we now have the ability to utilize a VO2 Max Assessment to help determine an individual's true MET value if a submaximal

assessment is suspect of an invalid assessment, whereas we did not have that tool until this past year. This helps us to determine true and accurate MET levels of individuals that we hadn't had in prior years. Second, we are having more firefighters coming to me asking to be put onto a prescribed fitness program a couple of months before their annual fitness assessments. In other words, some of the firefighters are being more proactive in their physical fitness before doing their assessments rather than waiting until after their assessments to get on a prescribed workout program. As I said, I don't see any data that shows that ball sports are improving firefighter fitness when I look at the fitness assessment data. I have brought some documentation to support my answer.

Researcher Note: This documentation is shown in Appendix G.

6. Since LAFD has allowed its firefighters to play ball sports while on duty, have you seen any injuries that were specifically related to ball sports? If so, please explain the frequency, types, and severity of injuries.

From what I know, the most severe injuries in 2017 have directly been the result of playing ball sports. There have been three severe injuries due to ball sports which included one broken ankle and two anterior cruciate ligament or ACL injuries. Also, a few firefighters have reported to me off the record that they have sustained injuries as a result of playing ball sports. This hasn't been officially reported for hesitation that the department will stop allowing firefighters to play on duty ball sports.

7. How can ball sports be utilized by on-duty firefighters to increase physical fitness? Are there any criteria that should be followed (i.e., only allowing ball sports that provide an aerobic workout)?

Ball sports that have a huge aerobic component are the only ones that would provide enough PT to help with improving the main standard for identifying physical readiness (>12METs) as it relates to NFPA 1582. For example, basketball and soccer would probably be the best ball sports to play for firefighter fitness. However, this may not necessarily be the case because they would have to be played with a high enough intensity level to provide that aerobic fitness level to kick in. Most sports are anaerobic, requiring short bouts of effort, followed by long recovery periods. Keep in mind though, that if a firefighter is now playing ball sports versus not doing any PT at all, then playing ball sports would be better than doing no PT at all of course if the main purpose of implementing ball sports was to improve fitness levels. Some PT is better than no PT. Another thing is that ball sports don't provide a training stimulus for different components of fitness. Ball sports does not help with the development of strength (i.e., Strength Training) nor does it improve or provide benefits in mobility/flexibility (Static and Dynamic Stretching). Finally, there is a risk that LAFD's overall physical fitness will decline if its firefighters choose to just play ball sports as their PT instead of participating in a proper physical fitness training program that addresses the needs specific to firefighting. We know that the body adapts to training stresses and the way we improve physical fitness is through progressive overload and periodization. From one week to the next what variable (volume, intensity) is being changed or challenged? Playing ball sports will not provide regular periodization and progressive overload, therefore there will be no training stimulus to adapt and improve fitness.

8. How can the risk of injuries associated with the playing of ball sports by on-duty firefighters be minimized (i.e., limit certain ball sports, requiring coaches to be present, education on injury prevention, etc.)?

The best way to minimize the risk of injuries to firefighters whenever they play ball sports while on duty is to have referees or safety officers present whenever they are being played. These referees or safety officers should have some training so that they understand and enforce the rules. Referees are part of sports to control the nature of the game and keep the sports safe. Also, the appropriate equipment should be used for whichever ball sport is being played. For example, appropriate footwear should be worn. If playing basketball, shoes made for this sport should be worn that provides ankle support to minimize ankle sprains. If playing soccer, cleats should be worn to provide foot traction on the grassy field. Appropriate equipment is probably the most realistic safety measure that can be taken to minimize injuries. Finally, types of ball sports that are allowed to be played should be limited. This should be based on the potential fitness benefit the sport provides while looking at the risk of the sport if the sole purpose of playing ball sports is to improve fitness. In contrast, while football may provide some aerobic fitness benefit, this sport should be prohibited because it poses a higher risk of injury because it is a high contact sport. Sports should be looked at as whether the benefit of playing sports while on duty outweighs the risk and non-contact sports usually have a lower risk of injury.

9. Do you believe that the playing of ball sports by on-duty LAFD firefighters should be allowed to continue (or possibly encouraged)? Why or why not.

If only looking at objective data from LAFD's fitness scores before ball sports being allowed to the time that ball sports have been allowed, no evidence shows enough fitness benefits to justify the injury risks. For LAFD, the risk outweighs the benefits, and my opinion is based on the injury data due to ball sports this year when looking at them about LAFD fitness scores. So based on the injuries that have been sustained due to ball sports and the fitness data, my overall opinion is no, ball sports should not be allowed by on-duty firefighters. My recommendation of "no" is based solely on whether or not ball sports should be used as a method to improve firefighter physical fitness. If a firefighter wants to improve physical fitness as it relates to improving the ability to improve firefighting, then they need to perform physical training that focuses on aspects of firefighting (cardiorespiratory fitness, muscular strength, muscular endurance, flexibility, mobility, core strength, injury prevention, power, etc.) However, there are some intangible benefits of on-duty ball sports for firefighters. For example, ball sports can be very good at team building amongst the crews. If I were only to look at the intangible benefits of ball sports, then I would say yes on-duty ball sports should be allowed. I want to conclude that the LAFD firefighters' fitness based on years of data as measured by an objective and validated assessment are well above average overall when compared to other fire departments across the country and ball sports are not needed if the sole purpose is to improve the fitness of our firefighters.

Appendix I

Interview with Joseph Baca Conducted on 11/1/17 at 9:30 AM

1. What is your current job title and responsibilities as related to LAFD's Physical Fitness Program?

I am the Acting Safety Division Chief for the Los Alamos Fire Department. As such, I manage LAFD's Peer Fitness Trainer program, the overall Safety and Wellness Program at LAFD, the department's Injury and Accident Program, and the Alternative Work Assignment Program. Part of my responsibilities includes working directly with Occupational Medicine and the Wellness Center to ensure that all firefighters are fit for duty. This includes managing the annual fitness assessments or Microfits for all firefighters, ensuring that all firefighters complete the CTT physical agility every year, and ensuring that all firefighters go through a complete and thorough medical examination annually. Finally, I ensure that LAFD adheres to all OSHA safety regulations.

2. Since LAFD has allowed its firefighters to play ball sports while on duty, have there been any documented injuries that were specifically related to ball sports? If so, please explain the frequency, types, and severity of injuries.

Yes, LAFD does have some documented firefighter injuries due to on-duty ball sports. There has been five injuries total as a result of firefighters playing ball sports. Three of these have been severe with the other two being minor. The severe injuries included two knee injuries which were torn ACL's and one ankle injury which involved torn ligaments.

One of the minor injuries was due to a firefighter getting hit in the eye with the ball and the other involved a strained calf muscle.

3. Has sick leave usage increased due to injuries directly related to firefighters playing ball sports while on duty (i.e., number of firefighters using sick leave, number of cumulative hours used, etc.)?

I do not have that information. You will have to get that information from LAFD payroll.

Researcher Note: This information was obtained from LAFD payroll and is shown in Appendix K.

4. Have any firefighters been assigned to Alternative Work Assignments (AWA or light duty) as a result of injuries sustained due to playing ball sports while on duty? If so, how many firefighters?

The three firefighters who sustained the severe injuries were assigned to AWA. The timeframes of these AWA assignments ranged from two months to nine months. The individual who was on AWA for nine months is still assigned to AWA so that this timeframe will go longer, but it is not known exactly how much longer. Probably at least a couple more months.

5. What have been the financial costs due to injuries as a direct result of firefighters playing ball sports while on duty (i.e., sick leave costs, worker compensation, medical, overtime)?

I do not have that information also. I will try to find it, but it may be best if you try to get this information from Steven Klepeis at Los Alamos County Risk. He would either have it already or know how to get it for you.

Researcher Note: This information was obtained via email from Steven Klepeis and is shown in Appendix J.

6. Do you believe there should be any limitations when allowing ball sports to be played by on-duty firefighters?

Yes. Someone, preferably the Captain or another individual who has some training and is knowledgeable about the rules of the ball sport being played, should be assigned to referee or officiate play. This person would be similar to a safety officer who is not playing in the game and makes sure all the players are following the rules and playing safely. Next, we probably should limit ball sports to certain types. For example, tackle football should probably be prohibited.

7. Do you believe that the playing of ball sports by on-duty LAFD firefighters should be allowed to continue (or possibly encouraged)? Why or why not.

Yes, though not necessarily encouraged. We should definitely encourage everyone to participate in physical fitness training when they are on duty. The younger generation of firefighters that we have now is much more into technology than the older generations. I think that ball sports encourage them especially, along with our older members to be more active in PT. Ball sports help to make exercise fun as well.

Appendix J

Email from Steven Klepeis

Paul,

██████ did not pursue Workers' Comp.

The total cost for the other two is \$35,820.56, one claim being a much greater cost than the other.

There are many other costly LAFD claims from injuries while exercising. The ones you cite just show how costly these claims can be. Let me know if you need anything else.

Steven P. Klepeis, ARM
Risk Manager
101 Camino Entrada, Bld. 5
Los Alamos, NM 87544
505-662-8192

From: Grano, Paul
Sent: Thursday, November 30, 2017 9:38 AM
To: Klepeis, Steven <steven.klepeis@lacnm.us>
Subject: Information Request

Hello Steve,

Would you please send me information on what the costs were for the following 3 LAFD firefighters who sustained injuries as a result of playing ball sports while on duty. The firefighters and the approximate time period of their injuries are as follows:

████████████████████
████████████████████
████████████████████

I'm working on getting exact dates, but I'm hoping that a general time period would work for you. If not, please let me know and I can get that to you. HR is running a report and may take a couple of days for me to get this.

I would just need cost information to the county/insurer for any medical exams, treatment, etc. and workers compensation costs to the county/insurer as well.

Thank you for helping me with this!

Appendix K

Sick Leave Use

	A	B	C	D	E	F	G	H
1								
2								
3	Leave Taken		Sick Lve					
4			0					
5								
6								
7								
8	Leave Taken		Sick Lve					
9			0					
10			0					
11			0					
12			40					
13			0					
14			0					
15			0					
16			0					
17			0					
18			0					
19			0					
20			0					
21								
22								
23								
24	Leave Taken		Sick Lve					
25			0					
26			40					
27			80					
28			0					
29			0					
30			0					
31			0					
32			0					
33			0					
34			0					
35			0					
36			0					