

Exploring fitness and physical activity habits among civil defense personnel

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Abstract:

Problem statement: Interest in the physical fitness of civil defense personnel has increased considerably over the past two decades. **Approach:** This study employed a cross-sectional, descriptive-analytical method. We distributed a questionnaire with 12 closed statements and one open-ended question to civil defense personnel in Oman. Data from 66 participants were analyzed. The survey questions were designed according to a five-point Likert scale (ascending by frequency of physical activity): I never do this; I do this once or twice; I do this 3 to 4 times; I do this 5 to 6 times; I do this daily. **Purpose:** The study aimed to determine the Body Mass Index (BMI) physical activity levels of civil defense personnel, specifically firefighters, in the Sultanate of Oman. It also categorized physical activities into clusters and calculated a favorability score for each type. **Results:** Of the civil defense personnel, 26.15% maintained a normal weight, 15.39% were classified as obese, and the majority (56.92%) were overweight. Compared to other forms of physical activity, civil defense personnel reported participating in more walking and running activities. Activities can be categorized into three clusters: household chores, low-intensity activities (e.g., walking) and less frequent but physically demanding activities such as weightlifting and light-intensity sports, and moderate-to-high-intensity activities such as jogging or running. **Conclusions:** Civil defense personnel in Oman undergo a physical fitness assessment upon joining the service to ensure they are capable of performing their duties effectively. However, their levels of physical fitness decline over time in service. The study recommends periodic assessments and training programs.

Key Words: Physical Demands; Cardiorespiratory Endurance; Musculoskeletal Health; Lifestyle Risk Factors; Functional Movement Screening; Tactical Athlete Performance; Physical Readiness Training

Introduction

The desire to obtain a high level of physical fitness is not limited to lifestyle; possessing high physical fitness has become an essential requirement for performing professional functions and facing challenges, especially for job tasks that require significant physical effort. One profession requiring individuals to maintain a high level of physical and emotional fitness is civil defense (Farinha et al., 2024). A strong association exists between physical fitness and firefighter performance (Chizewski et al., 2021). Civil defense personnel must be constantly physically and mentally prepared to perform unexpected and unplanned tasks (Kamuk, 2020). Bos et al. (2004) note that the work of civil defense personnel is characterized by long periods of low-intensity activity interspersed with bouts of occasional activity ranging from moderate to very high intensity.

Firefighters frequently experience cardiovascular health issues (Ras et al., 2023; Soteriades et al., 2023; Panumasvivat et al., 2023). Bode et al. (2021) examined cardiovascular disease risk factors among 4,453 firefighters across four occupational health clinics in the United States (South-West, Mid-Atlantic, South-East, and Mid-West Cohorts) between 2015 and 2018. Among normal-weight firefighters, 25% had high blood pressure, 8% had low high-density lipoprotein cholesterol, and 0% had high glucose, while the prevalence rates among obese firefighters were 57%, 45%, and 11%, respectively. Storer et al. (2014) assessed whether current firefighters' fitness levels and cardiovascular disease risk factors had improved compared to those reported over the past 30 years. The study analyzed 15 firefighters from the Southern California fire department for physical fitness and cardiovascular disease risk factors, revealing that they differed from previous reports and indicating that most did not meet the recommended standards for physical fitness.

Soteriades et al. (2022) found that half of the 430 Cypriot firefighters (aged 21–60 years) self-reported either no or minimal physical activity. Walker et al. (2014) investigated the physical abilities of Australian firefighters, Perroni et al. (2014) studied the physical fitness levels of Italian civil defense personnel, and Kirlin et al. (2018) examined the physical fitness of female firefighters. Noh et al. (2020) compared the physical fitness level of Korean firefighters with that of firefighters in other countries. The study sample consisted of 102 individuals (84 males and 18 females). Maximum oxygen consumption (VO₂max), muscle strength and endurance of the knees, shoulders, and upper torso were tested using an isokinetic dynamometer, and grip strength was measured. The study showed that the level of physical fitness of Korean firefighters was relatively low compared to firefighters in other countries. Damacena et al. (2020) studied obesity in Brazilian firefighters using a cross-sectional

method. Analysis of 892 firefighters' samples, with variables including demographics, occupation, lifestyle, physical fitness, and health status, showed 48.65% of firefighters were overweight and 10.99% were obese.

Chizewski et al. (2021) investigated the relationship between physical fitness and firefighters' capabilities. The results demonstrated significant predictive variance in firefighter performance. Kamuk (2020) assessed the physical fitness and readiness levels of Turkish firefighters and explored the effect of 12 weeks of exercise training on the physical fitness levels of firefighters. The results showed that firefighters' BMI in both groups was above the critical level proposed by the World Health Organization and that VO₂max levels did not meet minimum requirements. The experimental group demonstrated improvement after 12 weeks of training, while the control group showed a decline in performance. The study concluded that firefighters' performance was poor and they were significantly prone to obesity.

Xu et al. (2020) found a relationship between various physical health indicators (weight, maximal oxygen uptake, body fat percentage, upper and lower body muscle strength) and firefighters' simulated task performance efficiency. The study included seven tasks: rope climbing, 200m run with weight carrying, 60m ladder carry, stair climb with weight, 400m equipment haul, 5km run with breathing apparatus, and 100m hose drag.

The results demonstrated that physical health indicators predict firefighting task performance, indicating that these metrics can measure the readiness of firefighters to perform their duties. Antolini et al. (2015) studied the physical fitness of Canadian wildland firefighters to determine both performance and future injury risk levels and to provide recommendations on coordinating physical fitness tests and training programs. Strength, power, and endurance tests were conducted over three sessions. Body fat percentage had the most prominent correlation with other performance tests, while push-up and vertical jump performance were strongly associated with many advanced physical fitness tests.

Calavalle et al. (2013) reported that Italian fire departments lack dedicated gym facilities for fitness training. Michaelides et al. (2011) noted that despite the demanding physical requirements for civil defense personnel, they often fail to maintain appropriate levels of physical fitness for optimal job performance. Firefighters in the United States were reported to have below-average levels of physical fitness with high rates of obesity (Poston et al., 2011). Smith (2011) and Kales et al. (2007) attributed increased rates of on-duty injuries and deaths from heart disease to the lack of a regular exercise program for these professionals.

Existing literature demonstrates that physical activity can have a positive impact on physical and mental health. Regular exercise improves cardiovascular and respiratory health, enhances muscle strength and joint flexibility, and increases the efficiency of the nervous system (Bocharin et al, 2025; Sahin and Yalcin, 2024; Lee and Joo, 2024; Al Busafi et al, 2023). It can also help reduce the risk of chronic diseases such as osteoporosis, stroke, heart disease, and type 2 diabetes, and mitigate stress, anxiety, and depression (Jee, 2025; Balogh et al., 2025; Singchainara et al., 2023; Al Busafi, 2022; Al Busafi, 2021). Additionally, physical activity improved mood and self-esteem by promoting a fit, balanced physique. We conclude that there is an ongoing and urgent need to assess the physical fitness levels of civil defense personnel, given their critical role in preserving lives and property and reducing injury among personnel. Several researchers, including Chizewski et al. (2021), have emphasized the importance of studying physical activity and fitness in this population.

Problem statement

This research was necessary because civil defense personnel, including firefighters, require high levels of physical and emotional fitness to perform demanding and unpredictable tasks. However, existing literature shows that many firefighters globally are obese, have poor cardiovascular health, and lack adequate physical fitness, all of which may hinder their ability to perform their jobs effectively and increase their risk of harm. Evaluating physical fitness levels is essential for maintaining operational preparedness and reducing workplace risks. This study's background stems from the operational needs of civil defense personnel in the Sultanate of Oman, where little research has been conducted on fitness levels, particularly BMI and frequency of physical exercise. Similar issues have been reported in previous international studies, but data on Oman's civil defense force are scarce.

For instance, studies from the USA, Cyprus, Turkey, Brazil, and South Korea reveal widespread obesity, inactivity, and declining fitness among firefighters. By assessing physical activity patterns and health markers, this study addresses a knowledge gap and helps create tailored fitness programs that improve professional preparedness and reduce health risks for civil defense personnel.

The purpose of this study is to determine the BMI and physical activity levels of civil defense personnel in the Sultanate of Oman. Favorability scores are also calculated for various physical activities. The study employed a descriptive-analytical technique and a cross-sectional approach. The analysis involved 66 participants. Results show that 56.92% of the personnel are overweight, 15.39% are obese, and 26.15% maintain a normal weight. Walking and running were their most common activities.

Previous studies have experimentally examined physical fitness tests among the target samples, while this study descriptively investigated physical activity levels among civil defense personnel. In physical fitness tests, individual differences arise due to variations in physiological age, with declining physical fitness levels as age increases.

Approach

This study evaluated the BMI and physical activity levels of Oman's civil defense personnel using a cross-sectional descriptive-analytical methodology. A standardized questionnaire assessing activity frequency on a five-point Likert scale collected the data. After data cleaning, the sample included 66 participants.

Key analysis methods were BMI calculation (using standard NIH criteria to classify participants into weight categories: underweight, normal weight, overweight, and obese) and hierarchical clustering (using Ward's linkage method and Euclidean distance to categorize physical activities by participation frequency and reveal patterns in exercise behavior. A favorability score was derived by assigning numerical weights to response categories (e.g., Daily = 5, Never = 1) and computing weighted averages, highlighting the most and least frequently practiced activities. Cronbach's alpha, which was employed to verify the survey instrument's dependability, produced a coefficient of 0.832, indicating high internal consistency.

This mixed analytical approach enabled the researchers to uncover trends in physical activity engagement, reveal disparities in fitness levels among civil defense personnel, and generate evidence-based recommendations to enhance occupational health and performance in this essential workforce.

This manuscript is organized into six sections. Section 2 outlines the research methodology. Section 3 presents the analysis of the collected data. Section 4 discusses the results and interprets the findings. Finally, Section 5 offers conclusions and recommendations.

Material & methods

This study used a cross-sectional design and descriptive-analytical approach, enabling data collection and analysis to reveal relationships between various dimensions, interpret results, and draw conclusions and recommendations.

Survey design and data collection

A questionnaire was used to collect data from the target population. The survey consisted of two parts. Part one included the definition of variables, study objectives, anonymity and confidentiality statements, and demographic information. Part two comprised 12 statements related to the study's objectives and hypotheses. Their responses were designed according to a five-point Likert scale ascending by frequency of physical activity: I never do this; I do this once or twice; I do this 3 to 4 times; I do this 5 to 6 times; I do this daily. The online survey was distributed among stakeholders, including employees in the Civil defense and Ambulance authority and civil defense and ambulance centers across various governorates in the Sultanate of Oman. A total of 74 responses were collected, and 66 were used in the analysis after data cleaning. A snapshot of the online survey is provided in **Appendix A**.

Analysis techniques and methods used

Body Mass Index measurement: Body Mass Index measures weight relative to height and indicates body fatness. According to Adolphe Quetelet's equation, BMI is computed as:

$$\text{Body Mass Index} = \text{Weight Kg} / \text{Height}^2 \text{ M}^2 \text{ ---- Equation (1)}$$

The American National Institutes of Health defines weight categories using the NIH scale. Individuals are classified as follows: Underweight ($\text{BMI} < 18.5 \text{ Kg/m}^2$), Normal weight ($18.5 \text{ Kg/m}^2 < \text{BMI} < 24.9 \text{ Kg/m}^2$), Overweight ($25.0 \text{ Kg/m}^2 < \text{BMI} < 29.9 \text{ Kg/m}^2$), and Obese ($\text{BMI} \geq 30.0 \text{ Kg/m}^2$).

Hierarchical clustering: Physical activities were grouped using hierarchical clustering. This technique was selected due to the small dataset (12 activities) and its visual interpretability via dendrograms. Additionally, it does not require a pre-specified number of clusters. Euclidean distance (standard for continuous count-like data) was used as the distance metric, while Ward's method (which minimizes variance within clusters) served as the linkage method.

Favorability score: To calculate the favorability score, we assigned weights to frequency categories (Never=1, Daily=5) and computed weighted averages.

Weights assigned: - Never: 1, 1-2 times: 2, 3-4 times: 3, 5-6 times: 4, Daily: 5

$$\text{Favorability score} = \sum (\text{Count} \times \text{Weight}) \text{ ---- Equation (2)}$$

Validity and reliability

To verify the validity of the survey, the researchers presented it to a group of specialized arbitrators from the Department of Physical Education and Sports Sciences. Modifications were made based on the arbitrators' opinions. Furthermore, to verify the reliability of the study tool, the researchers relied on Cronbach's alpha coefficient. The tool reliability coefficient reached 0.832, which is a very good reliability coefficient and a significant indicator of the validity of using the tool in this study.

Preliminary findings

Data on physical activity types show that participation and intensity vary among activities. Activities such as "Walk for exercise" and "Walk more than 10 minutes" exhibited higher levels of involvement, with mean scores of 3.22 and 2.83, respectively. These tasks also exhibited quite significant variability, with standard deviations of 1.52 and 1.25, indicating that participants perform them with moderate consistency. In contrast, activities such as "Weightlifting" and "Bicycling" had lower mean values (0.92 each) and are less commonly practiced, implying that they are more intensive or specialized activities that attract fewer participants. "Household activities" (mean

= 2.92) and “Jogging/running” (mean = 2.83) fell into a mid-range category, indicating moderate to frequent participation and moderate variability.

The distribution of involvement frequency reflects variations in the intensity and character of the activities. “Light-intensity sports” and “High-intensity sports” had lower means (1.74 and 2.00, respectively), showing that most individuals only participate in these activities occasionally. Percentile distribution (25th, 50th, and 75th) further confirms that while a significant portion of participants engage in these activities occasionally, the frequency of engagement drops sharply for more intense activities such as “Exercise during work hours for more than 40 minutes” and “Visit to gyms,” with means of 1.92 and 1.13, respectively. Overall, these findings indicate that lower-intensity and more accessible activities are more regularly pursued, whereas higher-intensity activities are less common and linked with more occasional participation. With a standard deviation of 13.56, the “Never” category exhibits the greatest variety, with participation counts varying from 1 for “Walk for exercise” to 39 for “Bicycling.” With a standard deviation of 5.39, the “1–2 times” category demonstrates the most consistent participation, with activity counts ranging from 13 (“Walk for exercise”) to 27 (“Exercise >20 minutes”). The lowest mean (8.25) for the “Daily” category suggests that regular daily participation is uncommon for all activities. Table 1 shows the mean and standard deviation of physical activities.

Table 1. Mean and standard deviation of physical activities

Physical activities	Mean	Standard deviation	25%	50%	75%
Household activities (trimming trees, etc.)	2.92	1.37	1	3	4
Walk for exercise	3.22	1.52	2	3	5
Jogging/running	2.83	1.43	1	3	4
Light-intensity sports (volleyball, swimming, etc.)	1.74	1.08	1	2	3
High-intensity sports (basketball, soccer, etc.)	2.00	1.23	1	2	3
Weightlifting	0.92	1.02	0	1	1
Bicycling	0.92	1.08	0	1	1
Walk more than 10 minutes	2.83	1.25	1	3	4
Exercise during work hours	2.28	1.12	1	2	3
Exercise during work hours for more than 20 minutes	2.35	1.12	1	2	3
Exercise during work hours for more than 40 minutes	1.92	1.05	1	2	3
Visit to the gym	1.13	1.09	0	1	2

Results

Body Mass Index of civil defense personnel

We used the NIH BMI scale to investigate the body mass index of civil defense personnel in Oman. Findings indicate a high rate of overweight cases, comprising 56.92% of the sample, along with an obesity prevalence of 15.39%. These figures suggest low levels of physical activity accompanied by a decrease in physical fitness levels, which may negatively affect the efficiency of civil defense personnel’s performance while carrying out the tasks assigned to them in emergency situations. Figure 1 presents the BMI distribution of civil defense personnel according to the NIH scale.

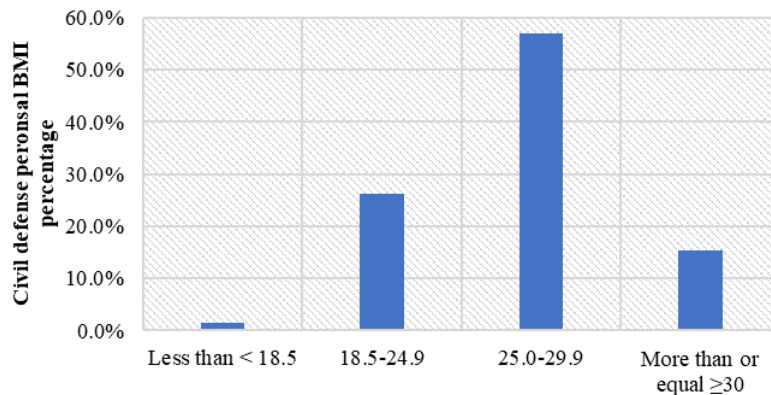


Fig1. BMI of civil defense personnel (NIH BMI scale)

Different types of physical activities among civil defense personnel

Most common daily activities: The highest reported daily activity is walking for exercise, at 26.8%. Walking is the most common form of exercise, as evidenced by the fact that almost all responders walk occasionally (only 1.5% never walk for exercise). The “Never” rate (6.1%) is low for walking for more than 10 minutes a day (25.8%), implying that walking is a common activity, whether for leisure or commuting. Approximately one out of five daily runs or jogs (19.7% per day) exhibit moderate regularity. Additionally,

16.7% of people conduct household chores such as car washing or tree trimming each day, and only 6.1% of people report never doing these tasks. Although not as common as walking, this shows that most people frequently complete at least some household tasks. Short activity breaks are encouraged in many workplaces. Here, 16.7% of employees work out daily for any length of time. The majority engage in some everyday work-time activities, and only 21.2% report never doing so. In contrast, gym visits and high-intensity activities are significantly less frequent, with daily participation rates below 10%. Weightlifting, cycling, and light sports show the lowest levels of daily participation, at just 3.0%, suggesting these are the least likely to be part of daily routines.

Least common daily activities: The lowest daily rates are found in weightlifting, cycling, and light-intensity sports (each at 3.0% daily). Bicycling and weightlifting are considered niche activities, as more than half of the respondents (59.1% and 54.5%, respectively) never engage in these sports. Only 6.1% visit the gym daily, and the vast majority (53%) never do so. The gym is one of the least often used facilities. Just over 9% engage in daily sports such as soccer or basketball. Compared to walking, these activities have a higher “Never” rate (24.2%). Peaks in lower-frequency categories are common for these less frequent activities (e.g., many people practice weightlifting or attend the gym sessions only 1–2 times a week or not at all).

Activities rarely done (highest “Never” rates): Certain activities have very high rates of non-participation. For example, bicycling (59.1% never), followed by weightlifting (54.5% never), gym visits (53.0% never), light-intensity sports (47.0% never), and exercise lasting over 40 minutes at work (47.0% never). Figure 2 (a–j) presents the weekly physical activity patterns among civil defense personnel in Oman.

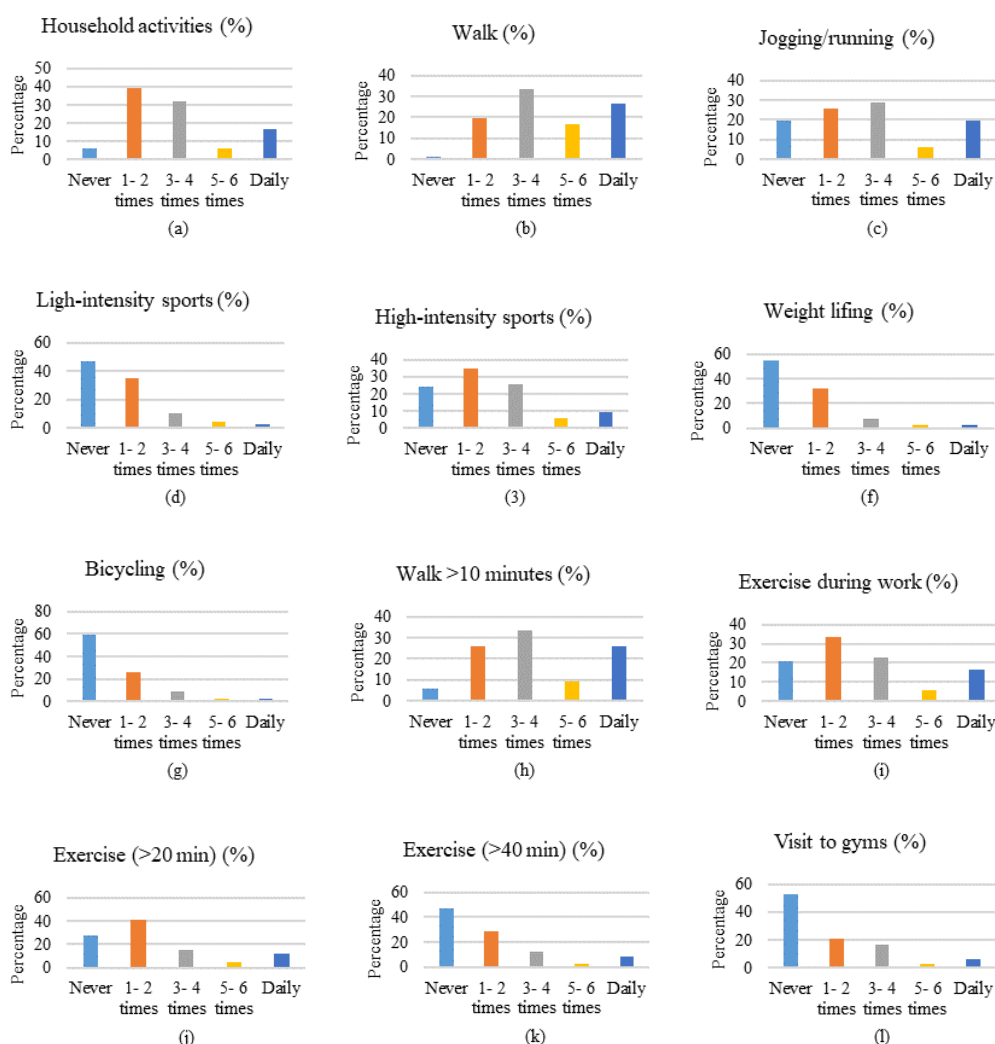


Fig 2 (a–j). Different types of physical activities/week among civil defense personnel in Oman

Hierarchical clustering and correlation of physical activities

The activities were grouped into distinct clusters based on their frequency and intensity. Household chores, walking for exercise, and walking for more than ten minutes formed one cluster, representing common and relatively low-intensity activities. A second cluster included less frequent but more physically demanding

activities, such as weightlifting, bicycling, and gym visits. Light-intensity sports and exercise lasting more than forty minutes during work hours were more isolated, differing from most other activities in participation patterns. Finally, high-intensity sports and jogging or running are clustered together, reflecting activities of moderate-to-high intensity. Figure 3 presents the hierarchical clustering of weekly physical activities via a dendrogram.

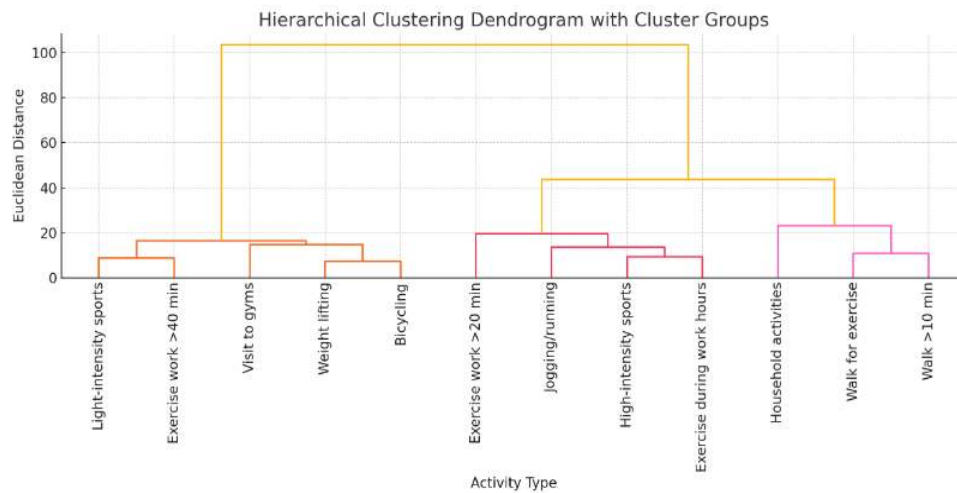


Fig 3. Hierarchical clustering of weekly physical activities via a dendrogram

The correlation matrix shows clear trends in physical activity preferences that are influenced by lifestyle limitations, intensity, and accessibility. Activities that are incorporated into daily life—such as housework (1.00), walking for exercise (0.92–0.97 with other walks), and brief walks during work hours (0.79–0.88)—dominate as barriers to adoption are low, and little preparation or resources are required. In contrast, structured activities that require more time, effort, or resources, such as high-intensity sports (0.92 correlation with light sports) or gym visits (0.84 with light sports), are less common.

This behavior also reflects intensity preferences: light-intensity options remain underutilized despite their accessibility, perhaps because of perceived inefficacy or lack of engagement, while high-intensity sports attract a devoted minority, as evidenced by their moderate correlations with gym use (0.73–0.84) and weaker ties to workplace exercise (–0.4 to –0.75). These patterns are exacerbated by workplace constraints: lengthier workouts (>20 or >40 minutes) exhibit negative correlations (–0.55 to –0.9) with routine tasks, underscoring the impracticality of prolonged workouts during strict work hours. These findings highlight a critical need for flexible workplace wellness programs that accommodate shorter, more frequent activity bursts. Together, these insights suggest that promoting health requires strategies tailored to reduce friction for structured activities while leveraging the natural integration of movement into daily routines. Table 2 presents the correlation of physical activities.

Table 2. Correlation of physical activities

Correlation Matrix												
Activity	Household	WalkEx	Jogging	Light Sport	High Sport	Weight	Bicycling	Walk10min	WorkEx	WorkEx20	WorkEx40	Gyms
Household activities	1	0.92	0.85	-0.76	-0.63	-0.88	-0.91	0.94	0.79	-0.45	-0.82	-0.72
Walk for exercise	0.92	1	0.78	-0.81	-0.7	-0.93	-0.95	0.97	0.85	-0.52	-0.88	-0.8
Jogging/running	0.85	0.78	1	-0.65	-0.55	-0.75	-0.78	0.82	0.72	-0.38	-0.7	-0.65
Light-intensity sports	-0.76	-0.81	-0.65	1	0.92	0.83	0.87	-0.79	-0.68	0.61	0.75	0.84
High-intensity sports	-0.63	-0.7	-0.55	0.92	1	0.72	0.75	-0.68	-0.6	0.54	0.65	0.73
Weightlifting	-0.88	-0.93	-0.75	0.83	0.72	1	0.95	-0.89	-0.8	0.58	0.85	0.78
Bicycling	-0.91	-0.95	-0.78	0.87	0.75	0.95	1	-0.92	-0.83	0.62	0.88	0.81
Walk (>10 minutes)	0.94	0.97	0.82	-0.79	-0.68	-0.89	-0.92	1	0.88	-0.55	-0.9	-0.82
Exercise work hours	0.79	0.85	0.72	-0.68	-0.6	-0.8	-0.83	0.88	1	-0.4	-0.75	-0.7
Exercise (>20 minutes)	-0.45	-0.52	-0.38	0.61	0.54	0.58	0.62	-0.55	-0.4	1	0.52	0.6
Exercise (>40 minutes)	-0.82	-0.88	-0.7	0.75	0.65	0.85	0.88	-0.9	-0.75	0.52	1	0.77
Visit to the gym	-0.72	-0.8	-0.65	0.84	0.73	0.78	0.81	-0.82	-0.7	0.6	0.77	1

Favorability score of physical activities

Walking for exercise (3.52) and walking for more than 10 minutes (3.23) received the highest average scores, indicating they are the most popular activities. In contrast, weightlifting (1.68), bicycling (1.65), and light-intensity sports (1.82) had the lowest scores, suggesting lower popularity. Other activities, such as jogging/running (2.80) and workplace exercise (2.64), had intermediate scores, reflecting moderate participation. These patterns reflect a preference for lower-intensity and more accessible activities over higher-intensity or specialist exercises. Figure 4 presents the favorability scores (averaged) for various physical activities.

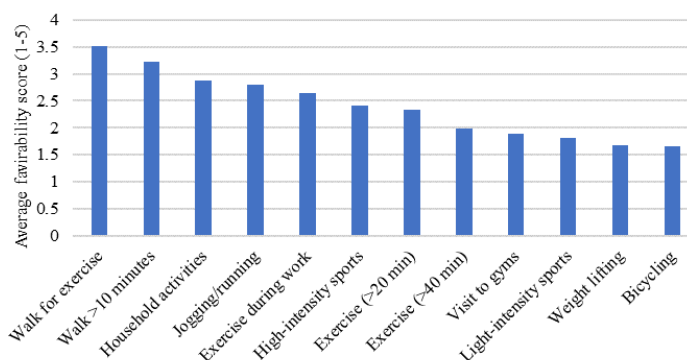


Fig 4. Favorability scores (averaged) for various physical activities

Discussion

Overweight and obese individuals are highly prevalent among civil defense personnel in the Sultanate of Oman. These results align with the findings of Bode et al. (2021), who reported that 49% of firefighters in the United States were overweight, 37% were obese, and 14% were of normal weight. The results also correspond with Damacena et al. (2020), who found that 48.65% of Brazilian firefighters were overweight, and 10.99% were obese. The global prevalence of overweight and obesity cases among civil defense personnel likely stems from a lack of attention to physical fitness.

According to the findings, 26.8% of participants walked daily for exercise, making it the most common type of physical activity, while 19.7% of people engaged in jogging or running every day, reflecting a modest level of regularity. Additionally, 16.7% of people engaged in daily household chores, and the same percentage worked out during work hours. In contrast, high-intensity sports and gym visits were significantly less common, with participation rates below 10%. Only 3.0% of respondents reported participating in weightlifting, cycling, or light-intensity sports on a regular basis, making them the least popular daily activities. A substantial portion of respondents said they had never participated in these sports (59.1% for weightlifting and 54.5% for cycling). Only 6.1% reported going to the gym daily, making it one of the least common physical activities, and just over 9% of participants played high-intensity sports like basketball and soccer each day.

Activities with low barriers to participation that are easily incorporated into everyday life—such as walking and housework—dominate. In contrast, scheduled activities such as sports and gym visits are less prevalent because they demand more resources or effort. In terms of intensity preferences, light-intensity activities are neglected, possibly because they are perceived as offering little value or engagement, whereas high-intensity sports tend to draw a devoted minority of participants. Additionally, many participants found longer workouts more difficult to schedule during workdays, suggesting that workplace wellness programs need to be more adaptable to encourage physical activity throughout the workday.

Compared to high-intensity or gym-based activities, which often have higher “never” rates and lower daily frequencies, light activities—including walking and housework—show high daily participation and lower “never” rates. With exceptionally low “never” rates (ranging from 1.5% to 6.1%) and high daily participation rates (around 26%), “walking for exercise” and “walking for more than 10 minutes” exhibit strikingly comparable patterns. This suggests that, within this group, walking is the most frequently performed form of physical activity. Walking is almost as common as household tasks, with 16.7% of respondents reporting daily participation and only 6.1% admitting never doing so. This suggests that routine tasks, such as household chores, contribute significantly to weekly physical activity for many individuals, even surpassing formal sports in frequency for some.

Rather than being performed daily, several activities reach their maximum percentage in the “1–2 times/week” category. For instance, 40.9% engage in brief work-break workouts 1–2 times, 39.4% perform home chores at that frequency, and 34.8% participate in high-intensity sports similarly. This suggests that, for most activities, casual engagement is more prevalent than consistent daily commitment. Just 21.2% of employees report never exercising at work, making short workday workouts somewhat prevalent. However, involvement drastically declines with increasing duration. Only 12.1% of people take breaks longer than 20 minutes every day, and 27.3% never do. Just 9.1% take breaks longer than 40 minutes daily, while 47% never do, highlighting how rare extended active breaks are at work. The combination of high “never” rates for cycling, gym attendance,

and weightlifting suggests a portion of the population largely avoids formal or intensive exercise, possibly favoring lighter or incidental activity instead.

Favorability scores show that walking for exercise (3.52) and walking for more than 10 minutes (3.23) received the highest average ratings, indicating that they are among the most popular physical activities. In contrast, weightlifting (1.68) and cycling (1.65) had the lowest average scores, reflecting that individuals did not participate in these sports very often. While negative correlations imply an unfavourable relationship, positive correlations show that when one activity rises, the other tends to rise as well. People who participate in one activity may be less likely to participate in the other, as evidenced by the significant correlation between “Household activities” and “Walk for exercise” (0.92), and the negative correlation between “Household activities” and “Weightlifting” (-0.88). People who engage in household activities are more likely to walk for exercise but less likely to do weight training or cycling. Gym-goers tend to participate in light or high-intensity sports while avoiding long walks.

Based on their participation patterns, physical activities can be grouped into distinct clusters. The first cluster, “Everyday light activities,” is defined as frequent, daily, and often incidental engagement and includes walking, exercising, and home chores during working hours. Longer workouts during work hours (lasting more than 20 to 40 minutes) are included in the second cluster, “Intense sports,” which represents more moderate and structured patterns of physical activity. Jogging and high-intensity sports are included in the third cluster, “Heavy training and gym exercises,” which varies in terms of participation but typically requires high-intensity effort. The fourth cluster, “Special isolated cases,” includes less common and seemingly more specialized hobbies like weightlifting, cycling, and gym attendance. As they are rarely engaged in and usually practiced relatively infrequently, light-intensity sports stand out as an anomaly.

Conclusions

A considerable percentage of civil defense workers in the Sultanate of Oman are overweight or obese, according to BMI data, highlighting a broader issue with physical preparedness within this vital workforce. The results also indicate that employees’ overall levels of physical activity range from low to moderate, with a clear preference for accessible, low-intensity activities like walking and routine housework. Physical activities were categorized into four distinct clusters: (1) Everyday light activities (e.g., walking, household tasks), (2) Intense sports (e.g., running, high-intensity workouts), (3) Heavy training and gym exercises (e.g., weightlifting), and (4) Special isolated cases (e.g., cycling, niche hobbies). Notably, walking and running emerged as the most common forms of exercise, while high-intensity and structured training (gym workouts, weightlifting) were significantly less frequent.

The findings carry both theoretical and practical significance. By demonstrating that low levels of physical activity continue even in physically demanding occupations, the study theoretically supports current models that link occupational performance and physical health. From a practical standpoint, it emphasizes the pressing need for organized, work-related fitness programs and legislative changes that support physical preparedness as a necessity rather than a preference. The favorability analysis also highlights exercise-related behavioral patterns, with some activities correlating positively. This suggests that increasing participation in one type of physical activity, such as walking, may promote participation in other forms of physical activity, such as light sports or household chores. Conversely, intense or specialized exercises (e.g., weightlifting, cycling, or extended gym sessions) remain neglected and appear disconnected from regular fitness routines.

These results highlight the significance of targeted fitness interventions that account for employee preferences, current activity patterns, and occupational limitations for civil defense groups. Programs that encourage gradual increases in physical activity, beginning with preferred routines such as walking, might turn out to be more scalable and long-lasting. Future studies should examine how physical activity varies over time following policy changes and evaluate how customized fitness strategies affect work performance indicators and health consequences. Enhancing the physical fitness of civil defense personnel is ultimately a strategic necessity that directly affects public safety and operational performance in addition to being a health priority.

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Conflict of interest

There are no potential conflicts of interest. All the contributors to the manuscript have been acknowledged and listed as authors.

The authors’ contributions to the manuscript

Conceptualization, Majid Al Busafi and Abdullah Al Qaidi; Methodology, Majid Al Busafi; Software, Asharul Khan; Validation, Majid Al Busafi, Abdullah Al Qaidi, Kashef Zayed, Nabil Gmada; Formal Analysis, Asharul Khan, Nabil Gmada; Investigation, Majid Al Busafi; Resources, Majid Al Busafi; Data Curation, Asharul Khan, Kashef Zayed; Writing – Original Draft Preparation, Majid Al Busafi, Abdullah Al Qaidi, Kashef Zayed, Nabil Gmada; Writing – Review & Editing, Asharul Khan, Majid Al Busafi; Visualization, Asharul Khan.

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Appendix A: Snapshot of Survey Questions

Sn	Types of Physical Activities/Week	Likert Scale				
		Never	1-2 times	3-4 times	5-6 times	Daily
		Frequency	Frequency	Frequency	Frequency	Frequency
1	How many times a week do you engage in physical household activities (such as trimming trees, arranging them, plowing the land, watering plants, washing the car, etc.)?	4	26	21	4	11
2	How many times a week do you walk for exercise?	1	13	22	11	19
3	How many times a week do you practice jogging, running, or both?	13	17	19	4	13
4	How many times a week do you engage in moderate, non-strenuous physical activities such as volleyball, swimming, table tennis, bowling, or similar activities?	31	23	7	3	2
5	How many times a week do you engage in high-intensity and strenuous physical activities such as (basketball, handball, soccer, tennis, sprinting, fast swimming, badminton, squash, and similar activities)?	18	25	9	6	8
6	How many times a week do you train with weights?	36	21	5	2	2
7	How many times a week do you use a bicycle or a stationary exercise bike?	39	17	6	2	2
8	How often do you walk outside for more than 10 minutes without stopping?	4	17	22	6	17
9	How often do you exercise during work hours in a week?	14	22	15	4	11
10	How often do you exercise during work hours for more than 20 minutes in a week?	18	27	10	3	8
11	How often do you exercise during work hours for more than 40 minutes in a week?	31	19	8	2	6
12	How often do you visit gyms (fitness centres) in a week?	35	14	11	2	4