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# Physical activity and sport participation in veterans with extremity musculoskeletal disorders

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**Abstract:** Increasing the physical activity and sport participation rates of people with disabilities has been one of the most important targets of sport policy both at national and international levels. The purpose of the current investigation was to assess participation in sports or physical activities among Iranian veterans with extremity musculoskeletal disorders. Data were obtained from health needs assessment studies conducted among Iranian veterans with musculoskeletal disorders in a 12-year period between 2005 and 2017. The collected Information on sport or physical activity participation was analyzed using $\chi^2$ test, independent t-test, partial correlation coefficient and binary logistic regression ($p < 0.05$). Studies on 2644 veterans with extremity musculoskeletal disorders indicated that 37.6% (n = 994) of them participated in at least one type of sport or physical activity. The highest percentage of sport participation was 65% in bilateral upper limb amputees. Results from logistic regression analysis indicated that the chance of sport participation decreased with ageing while it increased with "Disability Percentage" assigned by the medical commission of the Veterans and Martyrs Affairs Foundation which is responsible for determining the disability rate of the veterans in Iran. It was observed that veterans with a higher "Disability Percentage" had a higher duration and frequency of sport or physical activity participation. The most popular sports among the subjects were track and field (20.1%, n = 192) and swimming (15.6%, n = 149). Generally, more than a third of the subjects participated in sports or physical activities in total and sport or physical activity participation was greater in the high-level lower extremity amputation group.

**Keywords:** disability; amputee; health needs assessment

## Introduction

The concepts of physical activity and sport are so complex and multi-faceted that they present an expansive scope and involve activities and events in very different levels, ranging from leisure and recreational activities by children to mega sport events such as World Cups. Since these concepts have been of interest to researchers in different fields of knowledge such as health, humanities, sociology, psychology, laboratory sciences, and business, they have been defined in various ways (Träff et al., 2017).

Everyone may temporarily or permanently experience impairment as an inevitable fact of human life and there is no doubt that disability is a part of the human condition. Disability can be conceived as a deficiency in terms of function(s) and/or capability(s) among persons with health problems and results from the interaction between resources, personal and

structural factors, and health deprivations which include impairments and health conditions defined by World Health Organization.

Armed conflict causes an enormous number of disabilities worldwide and it is one of the main risk factors contributing to disability-adjusted life-years (DALYs) and years lost because of disability (YLDs) in war (Gore et al., 2011). Musculoskeletal extremity injuries have been reported as approximately fifty percent of all combat wounds (Belmont et al., 2010). According to officials from Iran's Veterans and Martyrs Affairs Foundation (VMAF), VMAF covered thousands of combat-related lower and upper limb amputees in Iran (Allami et al., 2017). Based on the VMAF database, there are 548,499 veterans who suffer from war-related injuries. Musculoskeletal injuries comprise nearly seventy percent of all war-related injuries. 153 veterans have bilateral upper limb amputation, 2723 have unilateral upper limb amputation and 800 have bilateral lower limb amputation, and 11,776 have unilateral lower limb amputation (Ghoseiri et al.,2018).

Without rehabilitative services, these conditions can have cultural, social, economic and environmental consequences for people with disability (Bornman, 2004). Participation restrictions are one of the problems that people with disabilities may experience while trying to involve in life situations including physical activities and sports (Kazou, 2017). Despite the physical, social, and mental health benefits of engaging in physical activities, few individuals with acquired physical disabilities participate in adapted sports (Perrier et al., 2015).

Veterans suffering from physical or psychological injuries have always been advised to participate in physical activities or sports as they are considered as simple, reasonable and efficient methods of intervention (Serfioti & Hunt, 2021). However, since older veterans who have functional disabilities are usually encountered with unique challenges, unique strategies are needed to be able to increase their participation in physical activities (Bailey & Griffiths, 2018). In addition to using treatments offered by psychological or pharmacological methods, it is necessary to provide the veterans with more various options including new alternatives (Serfioti & Hunt, 2021). This allows them to choose a method or a combination of methods that are more suitable for their needs (Bailey & Griffiths, 2018). Programs focusing on veterans or clinicians involved with them need to first take into consideration the veterans' specific characteristics including the limitations they have in terms of physical activities or the degree of their mental health severity (Serfioti & Hunt, 2021). Then, these programs or clinicians can promote veterans' participation in affordable and safe physical activities which can be effective in promoting physical health and well-being of military veterans (Serfioti & Hunt, 2021). Several psychological and physical advantages including promoted motivation for living, acceptance of body image and leading a healthier lifestyle have been identified as the benefits of participation in physical activities and sports (Serfioti & Hunt, 2021). Sports deserve to be incorporated into treatment and rehabilitation programs as they can physically and mentally improve veterans' health and help them with transition into civilian life (Serfioti & Hunt, 2021). Since quality of life has been proved to function as a mediator in enhancing the eudemonic well-being of veterans, it is essential to promote their quality of life and social support (Abtahinia & Rastgoo, 2020).

Therefore, organizations involved with the welfare of veterans and disabled athletes play a crucial role in enhancing the social interactions of the veterans as this can improve their eudemonic well-being in the long run (Abtahinia & Rastgoo, 2020). Based on the critical importance of involvement in sports and physical activities, the purpose of the current investigation was to assess participation in sports and physical activities among Iranian veterans with upper and lower extremity musculoskeletal disorders.

## Materials and Methods

The Janbazan Medical and Engineering Research Center (JMERC), with the support of Veterans and Martyr Affair Foundation (VMAF), has conducted several distinct surveys in veterans with extremity musculoskeletal disorders. During a 12-year period between 2005 and 2017, cross-sectional, health needs assessment studies were performed among thousands of Iranian veterans with musculoskeletal disorders across the country for clinical understanding of their health status and health care demands. The health needs assessment studies were undertaken with a scientific team including trained experts for collecting demographic data (gender, age, level of amputation or disorder, disability percentage), prosthetic and orthotic specialists, physical therapists, psychologists, general practitioners, internists and orthopedists. After obtaining the confirmation from the Ethics Committee of the Veterans and Martyrs Affairs Foundation (VMAF), health needs assessment studies were conducted by Janbazan Medical and Engineering Research Center (JMERC). The informed consent forms were also filled and signed by all the subjects participating in the health needs assessment studies.

Participants were interviewed by face-to-face with trained assessors and then completed a questionnaire. The questionnaire was designed by experts based on their experiences with veterans' musculoskeletal examinations during the first two decades after Iran- Iraq war. In this study, as a part of a larger health needs assessment study, physical activity and sport participation were assessed in veterans with extremity musculoskeletal disorders. In this study, JMERC's database was used to create a new data file (containing demographics, "Disability Percentage", participation in sport or physical activity, and the types of sports or physical activities) for veterans with upper and lower extremity musculoskeletal disorders.

There were 6000 veterans with musculoskeletal disorders who were invited to participate in the study. Of which, 47% (n = 2808) veterans enrolled in the study. The incomplete questionnaires were excluded from the subsequent analyses. Therefore, the results of this study are reported based on the data obtained from veterans with:

- High level lower extremity amputations (short trans-femoral, hip disarticulation and hemi-pelvectomy)
- Knee disarticulation or above knee amputation
- Below knee amputation
- Ankle-foot disorders (Foot and ankle disorders consisted of all unilateral or bilateral lower limbs musculoskeletal injuries (including levels above the ankle) causing dysfunction in foot and ankle (lower length discrepancy, drop foot, etc.)
- Bilateral upper extremity amputation
- Bilateral lower limb amputation

The term "veterans" was defined as the participants who received a "Disability Percentage" or "Disability Rate" allocated by the medical commission of the VMAF. According to the legislation passed by the Iranian parliament on June 21st, 1995 and approved by the cabinet on December 13th, 2009, the medical commission of the VMAF and the armed forces medical council are responsible for determining the disability rate of the veterans. The overall disability rate is represented by a percentage and is based on the level of physical or mental impairment (Allami et al., 2017).

All participating veterans were asked to respond to the closed question "Do you participate in any sports or physical activities?" using one of two options of "No" or "Yes". Around 95% (n = 2644) veterans answered this question. If they responded, "Yes", then they were asked to respond to three questions regarding the amount of time spent, the frequency, and the type of sport or physical activity. The amount of time spent on sports or physical activities was determined based on the participants' responses to the question "How many

hours do you exercise per week?". They had five options for the question: "less than 5 hours per week", "6–10 hours per week", "11–15 hours per week", "16–20 hours per week" and "more than 21 hours per week". Less than one in six (14%, n = 368) veterans had answered this question. To determine the frequency of taking part in sports and physical activities the subjects were asked to choose one of the options "Everyday", "Several days a week", "Once a week" and "Less than once a week" as an answer to the question "How often do you take part in a sport or physical activity?" The question was answered by 19% (n = 510) veterans. In the end, 36% (n = 951) of veterans responded to an open question about their sport type.

In addition to descriptive statistics (mean, standard deviation, frequency and percentage of the collected data), group differences regarding the investigated factors were analyzed using the chi-square test of independence and Fisher's exact test. Independent t-test was applied to reveal the differences between the mean ages of participating and non-participating veterans in sports or physical activities. To demonstrate the relationship between means of years passed since the injuries and sport or physical activities participation, a partial correlation coefficient analysis was conducted. Binary logistic regressions were used in order to study the associations between "Disability Percentage" and age and sport or physical activity participation (Reference category 'Non-participating'). The significance level was set at $p < 0.05$. All analyses were performed using the SPSS software for Windows, version 16.

## Results

The veteran population studied in this paper consisted of 2644 veterans with the musculoskeletal disorders. 98.1% (n = 2594) of them were male and 1.9% (n = 50) were female. They had musculoskeletal disorders as follows: 16.9% (n = 446, $age_{mean}$ = 43.53 and SD = 6.6) with above knee amputation, 9.6% (n = 255, $age_{mean}$ = 52.36 and SD= 7.3 ) with below knee amputation, 3.8% (n = 100, $age_{mean}$ = 51.51 and SD = 5.5) with high level lower extremity amputations, 12% (n = 316, $age_{mean}$ = 41.97 and SD = 6.3 ) with bilateral lower limb amputation, 3.9% ( n = 103, $age_{mean}$= 37.48 and SD = 10.0 ) with bilateral upper limb amputation and 53.9 % (n = 1424, $age_{mean}$= 51.22 and SD = 7.9) with ankle and foot disorders. In general, 37.6% (n = 994) of the veterans had participated in at least one type of sport or physical activity.

The rate of participation in sports or physical activities was shown for different variables (Table 1). The highest percentage of sport participation was 65% in bilateral upper limb amputees. The mean ages of the veterans who had or had not participated in sport or physical activities were 46.74 (SD = 8.38) and 49.37 (SD = 8.83) years and the mean of years passed since the injuries were 25.28 (SD = 6.23) and 26.56 (SD = 5.92), respectively. The difference between mean ages of the two groups was statistically significant ($p < 0.001$, $t = 7.50$) and the highest participation rates were in the prime age group (30y or younger) and decreased significantly with age ($p<0.001$). However, in partial correlation coefficients analysis, there was no significant positive correlation between the mean of years passed since the injuries and sport or physical activities participation ($r = -0.008$, $p = 0.68$) after controlling age as a confounding variable. Veterans with 70 percent disability had a higher participation rate in sport or physical activities.

**Table 1.** Demographic and clinical characteristics of the participants.

| | Non-participating | | Participating | | $\chi^2$ | p |
|---|---|---|---|---|---|---|
| | % | N | % | N | | |
| Sex | | | | | 4.01 | 0.04 |
| Male | 62.1 | 1612 | 37.9 | 982 | | |
| Female | 76 | 38 | 24 | 12 | | |
| Age group (n=2602) | | | | | 55.63 | <0.001 |
| 30y or younger | 46 | 23 | 54 | 27 | | |
| 31-40y | 50 | 187 | 50 | 187 | | |
| 41-50y | 64.5 | 735 | 38.5 | 461 | | |
| 51-60y | 67.3 | 523 | 32.7 | 255 | | |
| 61y or older | 76.5 | 156 | 23.5 | 48 | | |
| Level of amputation/disorder | | | | | 97.41 | <0.001 |
| Foot and ankle disorders | 71.2 | 1014 | 28.8 | 410 | | |
| Below knee amputees | 62.4 | 159 | 37.6 | 96 | | |
| Knee disarticulation /above knee amputees | 55.4 | 247 | 44.6 | 199 | | |
| High level lower extremity amputations | 47 | 47 | 53 | 53 | | |
| Bilateral lower limb amputees | 46.5 | 147 | 53.5 | 169 | | |
| Bilateral upper limb amputees | 35 | 36 | 65 | 67 | | |
| "Disability Percentage" (n=2616) | | | | | 140.13 | <0.001 |
| 25 or less | 73 | 523 | 27 | 193 | | |
| 26-49 | 71.4 | 415 | 28.6 | 166 | | |
| 50-69 | 60.2 | 402 | 39.8 | 266 | | |
| 70 or more | 45 | 293 | 55 | 358 | | |

In an analysis of factors influencing the physical activity and sport participation in our study, binary logistic regression showed an increased participation with decreasing age. Reference category was 'Age group 30y or younger'. Veterans who perceived themselves as high "Disability Percentage" were almost 3.08 times more likely to participate in physical activity or sports. Reference category was "Disability Percentage" 25 or less (Table 2). Veterans in category 70 or over "Disability Percentage" (OR = 3.08, 95% CI = 2.33–4.08, $p < 0.001$) and in category 50-60 "Disability Percentage (OR = 1.67, 95% CI = 1.32–2.10, $p < 0.001$) are more likely to take part in physical activity or sports when compared with veterans in category 25 or less "Disability Percentage". There is no difference when comparing category 26-49 "Disability Percentage" with the reference group (25 or less "Disability Percentage"). On the other hand, as age increases, the likelihood of physical activity and sport participation decreases. Veterans in category 30y or younger age group (OR = 3.22, 95% CI = 1.52 – 6.81, $p < 0.001$) are more likely to participate in physical activity or sports when compared with veterans in reference category 30y or younger (Table 2).

Then $\chi^2$ test revealed that "Disability Percentage" had relationship to duration and frequency of sport or physical activity participation ($p < 0.05$) (Table 3). Considering that the observed frequency of some cells was less than 5 or even zero, Fisher's exact test was used and revealed significant results ($p < 0.05$) (Mehta & Patel, 1983). The most popular sports among the participants were track and field (20.1%, n = 192) and swimming (15.6%, n = 149). Details of participation in different types of sports were shown in Table 4.

**Table 2.** Binary logistic regression analysis of sport participation and disability percentage and age.

| | Odds ratio | 95% Confidence Interval | | p |
|---|---|---|---|---|
| | | Upper (UCI) | Lower (LCI) | |
| Disability Percentage | | | | |
| 25 or less | Reference | | | |
| 26-49 | 1.08 | 1.38 | 0.84 | 0.54 |
| 50-69 | 1.67 | 2.1 | 1.32 | <0.001 |
| 70 or more | 3.08 | 4.08 | 2.33 | <0.001 |
| Age group | | | | |
| 30y or less | 3.22 | 6.81 | 1.52 | <0.001 |
| 31-40y | 2.41 | 3.68 | 1.58 | <0.001 |
| 41-50y | 1.82 | 2.61 | 1.27 | <0.001 |
| 51-60y | 1.62 | 2.35 | 1.12 | 0.01 |
| 61y or older | Reference | | | |

**Table 3.** Duration and frequency of participation in sports and physical activity according to Disability Percentage" and result of Fisher's exact test.

| | Disability Percentage | | | | |
|---|---|---|---|---|---|
| | 25% or less | 26-49 % | 50-69 % | 70% and over | p |
| Duration (hours per week) | (n = 39) | (n = 58) | (n = 70) | (n = 201) | 0.01 |
| 5 h or less | 74.4 | 75.9 | 62.9 | 55.7 | |
| 6 - 10 h | 25.6 | 20.7 | 30 | 32.3 | |
| 11 - 15 h | 0.0 | 1.7 | 1.4 | 9.5 | |
| 16 - 20 h | 0.0 | 0.0 | 1.4 | 0.5 | |
| 21 h or more | 0.0 | 1.7 | 4.3 | 2.0 | |
| Frequency (day per week) | (n = 66) | (n = 73) | (n = 190) | (n = 181) | <0.001 |
| Every day | 42.4 | 52.1 | 38.4 | 29.3 | |
| Several times a week | 30.3 | 31.5 | 41.6 | 43.1 | |
| One day a week | 21.2 | 11.0 | 10.0 | 24.3 | |
| Less than one day a week | 6.1 | 5.5 | 10.0 | 3.3 | |

**Table 4.** Types of sports participated by veterans* ( N=951).

| | AFD n= 148 | BKA n= 130 | KD/AKA n= 252 | HLLEA n= 82 | BLLA n= 242 | BUEA n= 97 |
|---|---|---|---|---|---|---|
| Archery and shooting | 1.3 | 3.0 | 5.5 | 3.6 | 7.8 | 3.0 |
| Wheelchair Basketball | 0.0 | 0.0 | 2.3 | 0.0 | 11.5 | 0.0 |
| Gym | 1.3 | 8.4 | 8.3 | 6.0 | 7.4 | 3.0 |
| Football | 2.0 | 1.5 | 2.7 | 1.2 | 0.0 | 12.3 |
| General exercise | 6.7 | 22.3 | 23.8 | 7.3 | 10.7 | 17.5 |
| Mountaineering | 6.7 | 7.6 | 9.9 | 6.0 | 4.5 | 14.4 |
| Others | 4.0 | 8.4 | 3.1 | 3.6 | 6.1 | 9.2 |
| Table Tennis | 2.0 | 0.7 | 3.9 | 3.6 | 6.1 | 3.0 |
| Swimming | 6.0 | 24.6 | 12.3 | 29.6 | 15.7 | 15.4 |
| Track and field | 61.4 | 15.3 | 11.5 | 8.5 | 8.2 | 25.7 |
| Sitting Volleyball | 7.4 | 3.8 | 12.6 | 25.6 | 13.6 | 1.0 |
| Weightlifting | 0.6 | 3.8 | 3.5 | 4.8 | 7.8 | 1.0 |

*Some veterans participated in more than one sport or physical activity. Veterans with: High level lower extremity amputations (HLLEA), Knee disarticulation /above knee amputation (KD/AKA), Below knee amputation (BKA), Ankle-foot disorders (AFD), Bilateral upper extremity amputation (BUEA), Bilateral lower limb amputation (BLLA)

## Discussion

Of the 2644 participating veterans with upper and lower extremity musculoskeletal disorders, 37.6% participated in sport or physical activities in total. The rate of sport or physical activity participation in this group was higher than the general population (31.2%)(Alikhani, 2005). Similarly, Littman and colleagues (2009) have shown that the prevalence of inactivity was significantly lower in veterans compared with nonveterans, although people with disabilities are less active than their non-disabled peers. Female veterans in this study had participated in sport or physical activities at a lower rate than men. This finding is in line with the existing literature (Slater & Tiggemann, 2011), although considering the low number of female veterans in the present study, it is very difficult to compare gender differences in sport or physical activity participation.

The difference between the mean age values of non-participating and participating veterans in sport or physical activities was found to be significant in this study. Inactivity prevalence significantly increased with age in a normal population (Watson, 2016). There was an inverse relationship between physical activity and age following amputation (Kars et al., 2009). In the studies of Kegel and colleagues, age differences were not statistically tested but a lower mean age was reported for the recreationally active participants with lower limb amputation (Kegel et al., 1980). In another study, Kars and colleagues, reported there was a significant difference between the mean age of the sport-participating respondents and the non-sport-participating respondents (Kars et al., 2009). Sports participation was reported to change with age, depending on characteristics and types of sports behavior (Van Mechelen et al., 2000). In the present study, we did not find any relationships between the time passed since injury in war and sports participation after age-control. In line with this study, according to the study of Kars and colleagues , there was no relationship between age at the time of amputation and sports participation (Kars et al., 2009). Kegel and colleagues, reported a lower mean age at time of amputation in recreationally active participants as compared to the inactive respondents (Kegel et al., 1980). Our results showed that age had a greater effect on the sports participation than the time passed since injures.

The results showed that sport or physical activity participation declined with decreased “Disability Percentage” in this study. The percentage of participation increased from about a third in veterans with ankle-foot disorders to more than half in bilateral lower limb amputees and persons with short trans-femoral, hip disarticulation and hemi-pelvectomy. Among those who participated in sport or physical activities, the frequency and duration of participation in sport or physical activities was higher among those who had a higher “Disability Percentage” compared with the other participants. Along with this study, a cross-sectional study revealed veterans with ankle-foot disorders suffered from poor health-related quality of life (Allami et al., 2017). In a study on mine victims, more than 70% of children had below 50% disability and compared with the other services they received, their satisfaction with sport services was the lowest (Abbaspour et al., 2015). Veterans who had reported no sport activities had a significantly lower quality of life in comparison with other veterans. Several studies support the impact of sport activities on enhancing the quality of life among veterans (Lee & Uihlein, 2019). Another study shows that participation in sports or physical activities can improve socio-medical approach among the disabled and can enhance the community’s attitude toward their abilities (Mitchell et al., 2019).

For people with war related injuries, the only channels through which they can enter the Veterans’ Affairs Organization is the Commission of Disability Percentage Determination and even after entrance all the services rendered to them depend on the percentage of disability assigned and confirmed by this commission. The higher the veterans’ assigned percentage of disability, the bigger chances they will have to receive

various services (Modirian & Eskandari, 2010).Whereas veterans' affairs organizations refer to themselves as pioneers in rendering sport services to veterans and claim that they play a leading role in providing the veterans with a variety of sport services, they confess that when they are confronted with budget deficit, sports activities are the first items to be omitted (Lee & Uihlein, 2019). It is shown that the policy of providing more services to veterans with higher disability rates has led into different challenges such as tendency to increase the "Disability Percentage" and more concentration of veterans' affairs organizations on those with higher priorities, i.e. veterans with greater "Disability Percentage" (Duhaney, 2020). Kars and colleagues (2009) assessed participation in sports in 105 individuals with lower limb amputations and reported 32% of them had participated in sports. Yari and colleagues described activity level and mobility limitations of 46 subjects with hemi-pelvitomy and hip disarticulation and stated that 39% of them had participated in sports (Yari et al., 2008). However, in our investigation the percentage of sports participation was greater in high level lower extremity amputations group. This is not in accordance with the results of Kegel and colleagues (1980) who observed nearly similar recreational activity levels in subjects with different levels of amputation. However, in another study, Kegel and colleagues (1978) stated the level of amputation played an important role in determining whether amputees were recreationally active or not. In line with those results, Karmarkar and colleagues (2009) reported a more proximal amputation which led to decreased sport participation. In contrast, Kars and colleagues (2009) stated the level of amputation was not a predetermining factor for participation in sports after a lower limb amputation. Nevertheless, Couture and colleagues (2010) concluded sport and (or) physical activity participation is directly related to physical limitations and lack of accessibility. Overall, based on our results, veterans in the high-level extremity musculoskeletal disorders had a greater likelihood of participation in sport or physical activity.

In this study, compared to individuals with lower limb musculoskeletal disorders, more people with bilateral upper limb amputation participated in sport or physical activity. The reason is that at the time of the health need assessment study they were younger than veterans with lower extremity musculoskeletal disorders on average. Bragaru and colleagues (2013) studied sports participation in individuals with major upper limb deficiency and concluded that a majority of individuals with upper limb deficiency participated in sports. Bragaru and colleagues (2011) stated, in another study, the high rate of sport participation in individuals with bilateral upper limb amputation could be more similar to the patterns of people without impairments compared with the subjects with lower limb deficiency. Further studies are needed to increase the generalizability of this finding.

In the present study, swimming was the most practiced sport among individuals suffering from bilateral lower limb amputation, short trans-femoral, hip disarticulation and hemi-pelvectomy and below knee amputation. However, participants with bilateral upper extremity amputation and ankle-foot disorders practiced track and field more than the other sports and those suffering from knee disarticulation or above knee amputation did general exercise more than the other physical activities. Two studies also showed that swimming, and fitness were the most popular sports in individuals with lower extremity amputees (Kars et al., 2009; Yari et al., 2008). We acknowledge that our results do not speak to causality of select sport type due to the absence of this question. In the recent years, increasing the rates of physical activity and sport participation has been one of the most important targets of sport policy both at national and at international levels because, through community-based sport activities, physical activity and sport participation can provide social and health-related benefits contributing to nation-building. This enables policy makers to compare and contrast the development, implementation and impact of physical activity and sport

participation policies. International research clearly indicates that in developed and developing countries physical activity and sport participation rates decrease due to factors such as gender and disability (Kiuppis, 2018).While participation in physical activities and sports can cause economic, cultural and social impacts and provide health benefits for the individuals and the community (Saunders et al., 2018), it can have some disadvantages such as sports related injuries.

## Conclusions

The study population of the present research could be a good representative of veterans with different kinds of upper and lower extremity injuries because the sample size is fairly large. Of the 2644 participating veterans with upper and lower extremity musculoskeletal disorders, more than a third participated in sport or physical activities in total. In our investigation, the sports or physical activity participation was greater in high level lower extremity amputations group.

## Perspectives

To conclude, higher levels of disability and the percentage of disability did not show a negative impact on participation in sport or physical activity. It seems that VAMF and similar organizations in other countries have paid more attention to veterans with a higher percentage of disability in sports or physical activity participation while veterans with lower rates of disability have received less attention from these organizations. It could be suggested that, the hypothesis is worth further investigation.

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