

# An Examination of the Prevalence of Injury and the Pain and Disability in Specialized Positions of the Elite Players of Iran's Youth Premier League Volleyball

MOJTABA BABAEI KHORZOGHI<sup>1</sup>, FOROUZAN ZAREZADEH<sup>2</sup>, MOHAMMAD REZA MOHAMMADI POUR<sup>3\*</sup>

<sup>1</sup>Assistant professor, Group of health in Teaching and work environment, Center of physical Education, Isfahan University of Technology, Isfahan, Iran. [babaei@iut.ac.ir](mailto:babaei@iut.ac.ir)

<sup>2</sup>Sports Pathology and Corrective Exercise, Instructor, Center of physical Education, Isfahan University of Technology, Isfahan, Iran. [Forouzan\\_Zarezadeh@yahoo.com](mailto:Forouzan_Zarezadeh@yahoo.com)

<sup>3</sup>Instructor, Center of physical Education, Isfahan University of Technology, Isfahan, Iran. [mohamadrezamohamadipur@gmail.com](mailto:mohamadrezamohamadipur@gmail.com)

## ABSTRACT

**Introduction:** Volleyball is considered one of the most exciting and popular sports throughout the world and as this has rapid and explosive movements in various directions, the size of the forces involved in such movements can result in injuries. Regarding this, the study tried to examine the injuries and the degree of disability pain, particularly in specialized volleyball positions in the eighth most harmful sport in the world of sports.

**Materials and Methods:** The study was retrospective descriptive examining the acute injury, chronic injury, and the pain and disability among the players. The population was all the elite players of the Premier League of Iranian boys' youth volleyball. The number of players willing to cooperate in this study was 81. Data was collected by the interviewer using Cornell and Nordic questionnaires and then the collected data was analyzed using descriptive statistical tests in SPSS 24 and Excel software.

**Results:** The highest rates of acute and chronic injuries regarding the specialized position of the players were in the position (opposite) in the shoulders at 23.61 and 33.33% of the total, respectively, in the position of libero in the back area, respectively, as 15.87 and 8.33% of the total. Moreover, the rates of these injuries - acute and chronic - in outside hitter position were in the arm and elbow at 71.11 and 80% of the total, respectively, in the setter position in the back area at 16.67 and 25% of the total, and finally in the middle blocker position, the highest rate of acute injury was in the neck area with 47.78% and chronic injury in the ankle and thigh as 66.67% of the total. However, overall, the most injury belongs to the positions of outside hitter and middle blocker. However, the highest percentage of pain and disability were related to musculoskeletal problems in the lower limbs was 40.45% of the total pain and disability and in the lower limbs the highest pain and disability was observed in the knees with 20.58%. The second rate of pain and disability was in the upper limbs of athletes as 35.08%. The highest pain and disability was observed with a large difference of 18.43% in the shoulders, then 18.22% in the trunk and 13.53% in the waist.

**Conclusion:** By studying the prevalence of injuries to athletes in specialized positions of each sport, one can plan athletes' training programs to prevent injuries and even enhance them creating better efficiency for them.

**Keywords:** Volleyball, musculoskeletal injury, pain and disability

## INTRODUCTION

William J. Morgan invented volleyball sport was in 1895 in Massachusetts that is currently one of the most popular sports in the world. This sport has more than 800 million athletes throughout the world (19). As in volleyball the players of the two teams are separated by a net and have no physical contact, one expects that the injuries to be low in this sport. However, as volleyball has fast and explosive movements in various directions, the magnitude of the forces involved in such movements could result in injury. Regarding this, the studies show a 3% incidence of injury per 100 hours of training and competition in the age group of 14 to 20 years making it as the eighth most harmful sport (1).

Various parts of the body are inevitably exposed to injury in sports. The injuries happen as a result of athletes colliding with each other, the ground, sports equipment and even a temporary loss of control of the body. The severity and mechanism of the incident vary, and the incidence of injury negatively affects the face of professional sports. In the statistics available, 80 out of every 100 athletes have been injured in competitions and training (2,3).

The nature of some sports determines specific injuries to parts of the limbs; for instance, common injuries to the upper and lower limbs are caused in volleyball because of the constant contact of the lower part of the body with the ground and upper with the ball (2).

Among the common acute injuries in volleyball are ankle sprains and patellar tendon injuries, and recurrent sprains can result in osteoarthritis and injury and rupture of the shoulder tendon are common in high-head activities in spike and defense in volleyball too (4). Regarding this, one can refer to a study on the prevalence of injuries of local and elite Greek volleyball players, where most of the injuries were related to ankle sprains in players of both groups (6). In a study on the common injuries of male and female university volleyball players, Umbagh et al. (2017) concluded that the rate of ankle injury is about 24 to 25% and the knee injury about 16.3 to 25% (7).

In a study to examine the upper limb injuries of volleyball and handball players in Iran, overall 269 muscle strain (42.01% related to volleyball players), 67 cases of ligament tendon rupture injuries (61.12% related to volleyball players), 143 cases of bruises and injuries (37.77% related to volleyball players), 47 cases of

dislocations (36.18% related to volleyball players), and 38 cases of fractures (68.42% related to volleyball players) were reported in the upper limbs (2). In a similar 10-year study of epidemic and knee injuries recorded among 17397 volleyball and handball players, ACL damage was reported as 20.3% (5). Verhagen et al. (2003) conducted a group study of 486 Dutch second- and third-tier volleyball players over a period of one year reporting that 41 out of 100 injuries were ankle sprains that had the highest incidence of acute injuries (9).

A study on the relationship between functional injuries and upper limb structure in Iranian Super League volleyball players with an emphasis on classifying the type and degree and potential of functional injuries in the upper limb on 107 athletes showed that 47.7% of athletes have limited mobility and restrictions in the upper limbs in daily life and 36.6% have the potential for these injuries. In a study on elite female volleyball players to determine the prevalence of sports injuries, Salimi (2010) reported 48% of upper limb, 14.2% of lower limbs and 38% of the head and neck injuries (3).

Regarding this, Souli et al. (2017) examined 133 female university volleyball players during 4 years where the knee injuries were the highest with 12%, of which 75.2% occurred during training, 20.3% during competition, and 4.5% during bodybuilding and strength training. However, it has to be noted that in the second degree, shoulder injuries with 8.3%, ankle injuries with 7.5% and fingers with 6.8% and finally minor percentages of injuries from the whole body have been reported (8).

Direct (medical examinations) and indirect (questionnaires) methods are used to identify the type of injuries and their degrees in sports, and many injuries can be prevented by special attention to specialized technical skills and simple considerations (3,4).

The purpose of identifying sports injuries is to provide players and coaches with information about injuries that usually happen with serious consequences, and to provide basic measures to prevent them (9). As few studies has been carried out on the introduction of sports injuries and the pain and disability of athletes, especially in specialized volleyball positions, the study tries to examine the prevalence of injury and the pain and disability in specialized positions of Iran elite youth volleyball players at the Premier League of Iranian youth volleyball.

## MATERIALS AND METHODS

The study was retrospective descriptive examining the acute injury, chronic injury, and the pain and disability among the players. The population was all young male professional volleyball players in the Iranian Premier League. The number of players in the tournament was 112, but the number of people volunteered to participate was 81. Data was collected by the interviewer using Cornell and Nordic questionnaires. The extended version of the Nordic Musculoskeletal Questionnaire (NMQ-E) has 11 variables from 9 human body areas (3 areas for the upper limbs, 3

areas for the torso and 3 areas for the upper limbs) about the severity and duration of pain, being acute and chronic where the answers are as "yes and no." If the answer is complete (yes) to the questions, 99 data is obtained, but if the answer is negative, the person will deal with other parts of the body. The questionnaire translated by the researcher had appropriate validity and reliability with ICC index higher than 0.7 and the standard error of SEM measurement 0.56-1.76 as well as the range of Kappa agreement coefficient 0.78-1 (20).

Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) is designed in three stages - Frequency of discomfort, severity of discomfort, and the effect of discomfort with the body map and overall examines 20 body parts. This questionnaire is currently used in America and other countries and is known as a valuable tool. The questionnaire has been translated by a researcher in Iran. The validity of the questionnaire for the severity of discomfort with Kappa correlation coefficient in various organs has been reported as 0.828 - 0.960 and for the frequency of pain and discomfort of Spearman correlation coefficient in various organs 0.836 - 0.941. The reliability analysis of the questionnaire on the frequency of discomfort, severity of discomfort and the effect of discomfort on the work ability with Cronbach's alpha coefficient showed values of 0.955, 0.961 and 0.969, respectively. (21).

The information of all people were studied in three sections as individual information (age, weight, height, sports history of the player and the player's parents), information on pain and disability, as well as pathological information (location of all injuries, severity, duration of injury).

It has to be noted that the pain and disability is based on the degree of discomfort in the position, but does not necessarily result in acute or chronic injury and only affects their performance; however, acute injury includes injuries that the athlete is injured at the moment but in chronic injuries, the person has been injured for a long time.

The collected data was analyzed using descriptive statistical tests in SPSS 24 and Excel.

## RESULTS:

### Samples features

In terms of demographic information, the mean age, weight, height, sports history of the player and parents were  $18.40 \pm 0.77$  years,  $73.85 \pm 9.55$  kg,  $185.15 \pm 9.10$  cm,  $6.55 \pm 2.17$ , and  $7.94 \pm 11.04$  years, respectively.

As is seen in Table 1, the highest percentage of pain and disability for musculoskeletal problems in the lower limbs is 40.45% of the total pain and disability and in the lower limbs the highest pain and disability is 20.58% in the knees. The second rate of pain and disability in the upper limbs of athletes is 35.08% where the highest pain and disability with a large difference of 18.43% was in the shoulders, then 18.22% in the trunk and 13.53% in the lumbar and finally 6.25% neck injury.

Table 1. Score and percentage of pain and disability related to musculoskeletal problems of volleyball players in young boys age group

The location of pain and disability	The type of pain and disability	Pain and disability scores	Total percentage (Pain score to total pain score)		Percentage of total / location	
			Separated	Non- separated		
Head	Neck	157	6.25	6.25	6.25	
Body	Back	118	4.69	4.69	18.22	
	Waist	340	13.53	13.53		
Upper limb	Shoulder	348	348	13.85	18.43	
		115	115	4.57		
	Arm	137	137	5.45	7.44	
		50	50	1.99		
	Forearm	62	62	2.47	4.18	
		43	43	1.71		
	Wrist	74	74	2.94	5.01	
52		52	2.07			
Lower limbs	Pelvis	39	1.55	1.55	40.45	
	Thigh	73	73	1.91		6.14
		81	81	3.22		
	Knee	301	301	11.98		20.58
		216	216	8.59		
	Leg	41	41	1.63		4.45
		71	71	2.82		
Ankle	103	103	4.11	7.73		
Total		441	100	100	100	

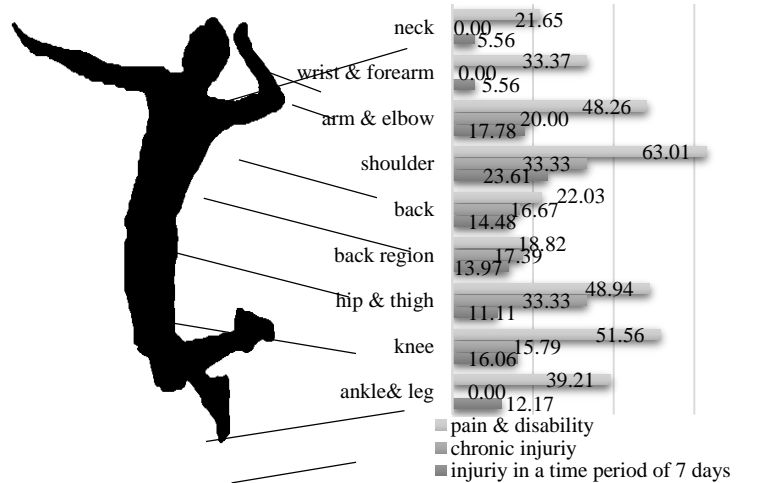


Figure 1) Percentage of injuries in the last 7 days, chronic and pain and disability in the last 12 months Opposite

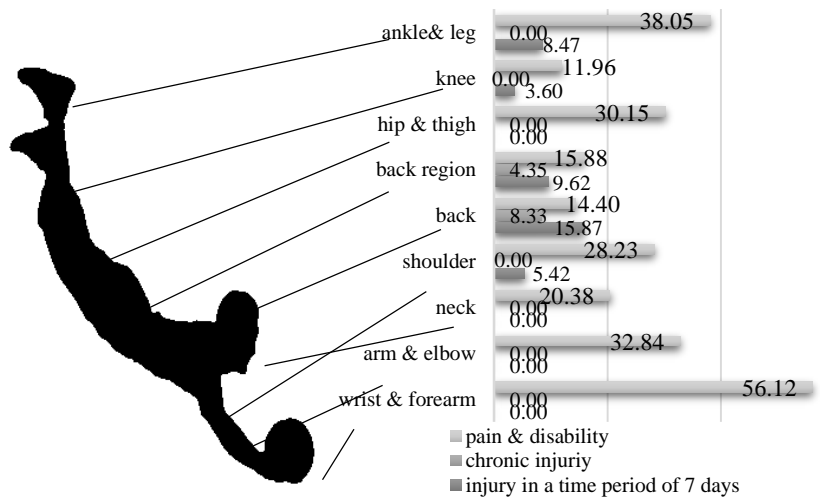


Figure 2) Percentage of injuries in the last 7 days, chronic and pain and disability in the last 12 months Libero

As is seen in Figure 1 for opposite players, the highest rate of acute injury in the last 7 days belonged to the shoulders (23.61%), arm and elbow (17.78%), respectively, and the highest rate of chronic injury was in the hips, thighs and shoulders (33.33%) and arms and elbows (20%), respectively. The highest rates of pain and disability were in the shoulders (63.01%), knees (51.56%) and arms and elbows (48.26%), respectively. The lowest rate of acute injury in the last 7 days was in the neck, wrist and forearm (5.56%) and the lowest chronic injury was in the neck, ankle and leg, wrist and forearm without injury and the lowest rate of pain and disability in the wrist and forearm (16.68%).

As is seen in Figure 2 for libero players, the highest rate of acute injury in the last 7 days was in the back (15.87%) and back (9.62%), respectively, and only 2 chronic injuries in the libero position were in the back (8.33%) and the waist (4.35%), respectively. The highest rates of pain and disability were in the wrist and forearm (56.12%), and ankle and leg (38.05%), respectively. The lowest rate of acute injury in the last 7 days as well as chronic injury was reported in the wrists and forearms, arms and elbows, neck, buttocks and thighs without injury and the lowest rate of pain and disability in the knee (11.96%).

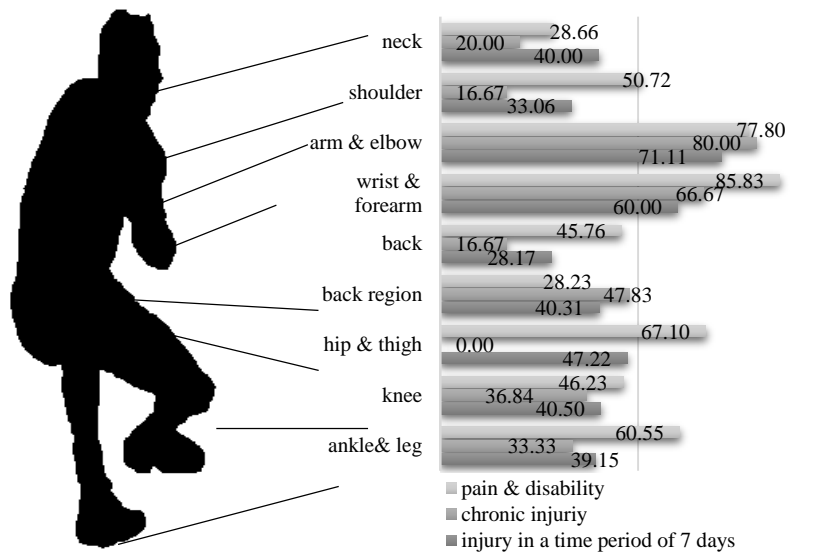


Figure 3) Percentage of injuries of the last 7 days, chronic and pain and disability in the last 12 months, Outside Hitter

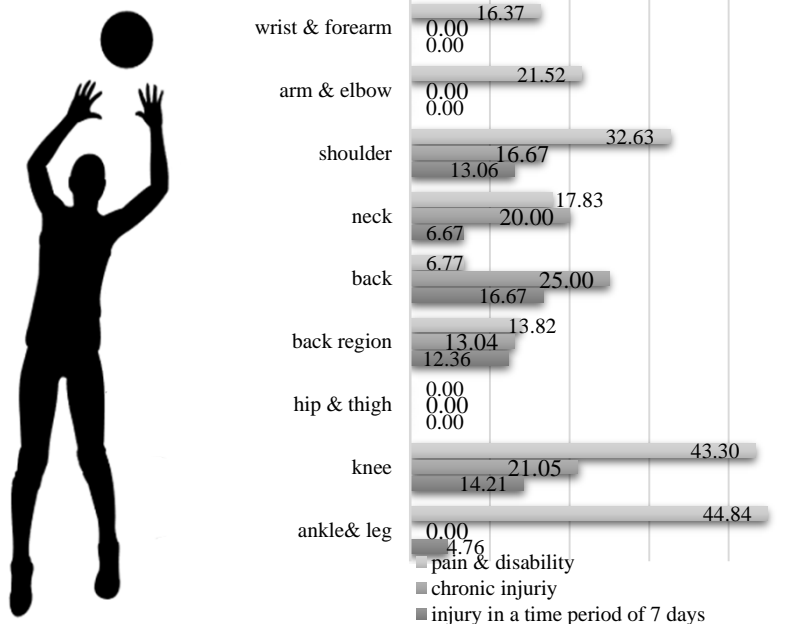


Figure 4) Percentage of injuries of the last 7 days, chronic and pain and disability in the last 12 months Setter

As Figure 3 shows, in the outside hitter position, the highest rate of acute injury in the last 7 days belongs to the arms and elbows (71.11%), wrist and forearms (60%) and buttocks and thighs (47.22%), respectively. The highest rate of chronic injury belongs to the arm and elbow (80%), wrist and forearm (66.67%) and then in the back (47.83%), respectively, and the highest rate of pain and disability was for the wrist and forearm (85.83%), arm and elbow (77.80%), buttocks and thigh (67.10%) and ankle and leg (60.55%), respectively. The lowest rate of acute injury in the last 7 days was reported in the back (28.17%) and the lowest chronic injury in the hip without injury, and the lowest rate of pain and disability in the waist (28.23%) and neck (28.66%).

As Figure 4 shows, in the setter position, the highest rate of acute injury in the last 7 days belongs to the back (16.67%) and knee (14.21%), respectively, and the highest rate of chronic injury to the back (25%), and knee (21.05%), respectively. The highest pain and disability were reported in ankle and shank (44.84%), knee (43.30%) and shoulder (32.63%), respectively. The lowest rate of acute and chronic injury reported in the last 7 days was in the wrist and forearm, arm, elbow, buttocks and thigh without any injury and the lowest rate of pain and disability in the hip and thigh without pain.

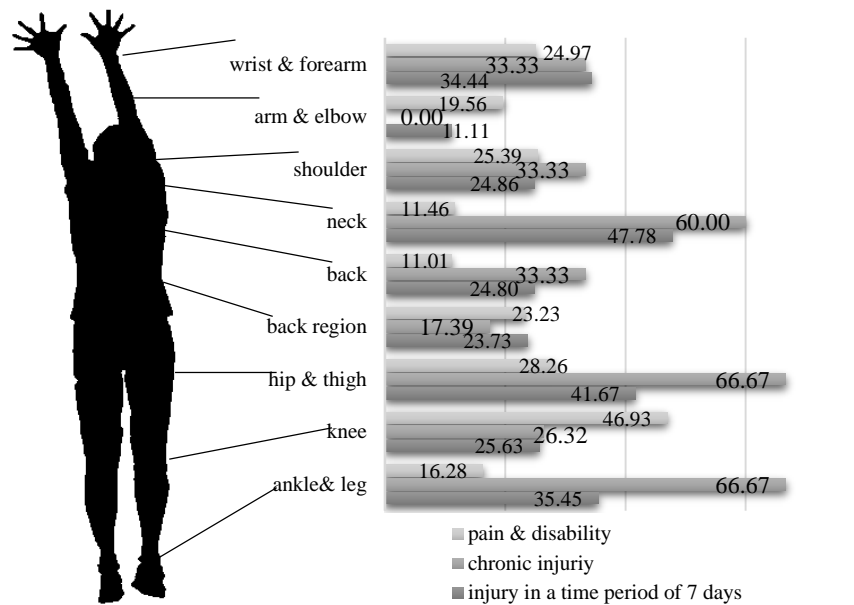


Figure 5) The percentage of injuries in the last 7 days, chronic and pain and disability in the last 12 months of the Middle Blocker

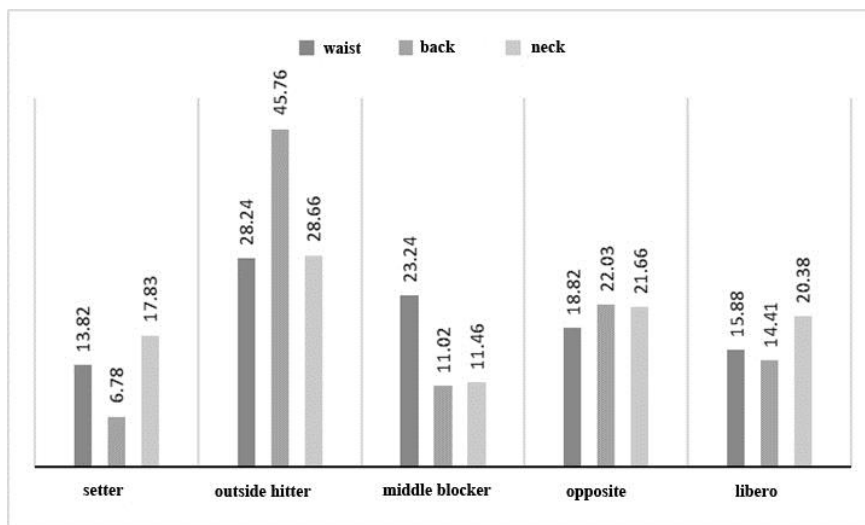
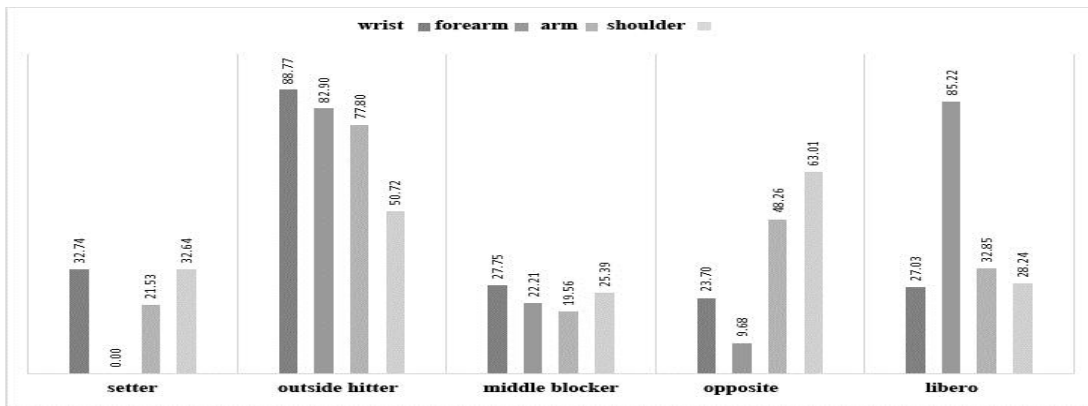


Figure 1. The percentage of pain and disability related to head (neck) and trunk (back and waist) based on the specialized position of volleyball players in the young boys age group

As Figure 5 shows for the middle blocker position, the highest rates of acute injury in the last 7 days belong to the neck (47.78%), buttocks and thighs (41.67%) and ankles and shanks (35.45%), respectively, and the highest rate of chronic injury belongs to the buttocks, ankles and shanks (66.67%) and neck (60%), respectively. Moreover, the highest rates of pain and disability were in the knee (46.93%), and buttocks and thighs (28.26%). The lowest rate of acute injury in the last 7 days was reported in the arm and elbow (11.11%) and the lowest chronic injury was in the arm and elbow without injury, and the lowest rate of pain and disability was in the back (11.01%) and neck (11.46%), respectively.

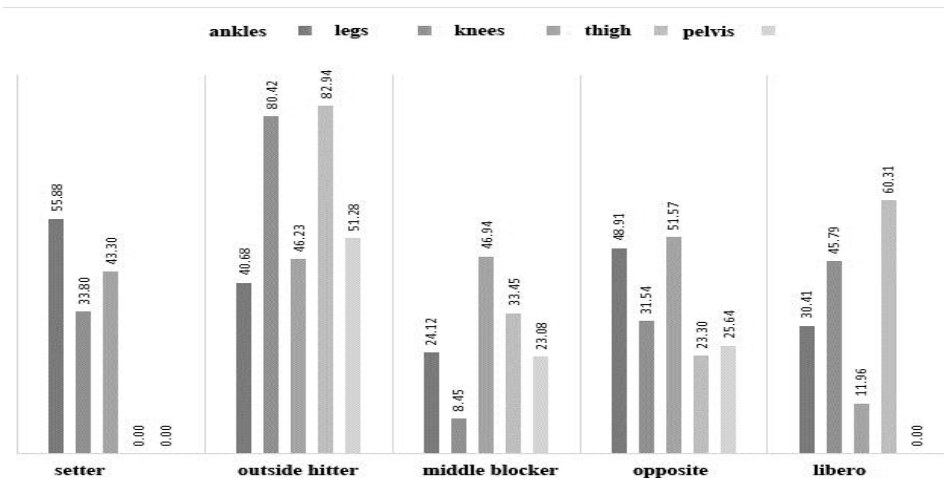
As Figure 1 shows, the highest pain and disability rate was reported in the trunk (45.76% back and 28.24% of the back) and head and neck (28.66%), which belonged to the outside hitters and the lowest pain and disability in the trunk (6.78% in the back, 13.82% in the waist) belonged to the setter and in the head and neck (11.46%) belonged to the position of middle blocker. According to Figure 1, overall, in the total percentages of pain and disability related to the head and torso, the highest belongs to the position of outside hitter and opposite, and the lowest belongs to the setter and middle defender, respectively.



**Figure 2.** The percentage of pain and disability related to the upper limbs (shoulder, arm, forearm and wrist) based on the specialized position of volleyball players in the young boys age group

As Figure 2 shows, the highest rate of pain and disability related to the upper limb was reported in the wrist (88.77%), belonging to the outside hitter, the highest rate in the forearm of the libero (85.22%) and outside hitter (82.90%). The highest pain in the arm (77.80%) belongs to the outside hitter and the highest pain in the shoulder (63.01%) belongs to the opposite. The least pain and disability of the forearm, without pain belongs to setter and also the least pain in the arm (19.56%) belongs to the

middle blocker, the least pain in the wrist (23.70%) belongs to the opposite and the least pain in the shoulder (25.39%) belongs to the middle blocker. According to the reports observed in this chart and overall the percentages of pain and disability related to the upper limbs, the highest belongs to the outside hitter and libero positions, respectively, the lowest belongs to the setter and middle blocker, respectively.



**Figure 3.** The percentage of pain and disability related to the lower limbs (pelvis, thighs, knees, shank and ankles) based on the professional position of volleyball players in the young boys age group

As Figure 3 shows, the highest pain and disability related to the lower limb in the thigh (82.94%) and the highest pain in the leg (80.42%) belongs to the outside hitter and the highest pain in ankle (55.88%) belongs to the setter, the highest pain in the knee (51.57%) belongs to opposite and the highest pain in the pelvis (51.28%) belongs to the outside hitter. The least pain and disability of the pelvis with no pain belongs to the setter and the libero and the painless thigh belongs to the passer and then the least pain in the shank (8.45%) belongs to the middle blocker, the least pain in the knee (11.96%) belongs to the libero and the least ankle pain (24.12%) belongs to the middle blocker. According to the reports in this chart and the overall percentages of pain and disability related to the lower limbs, the highest belongs to the position of outside hitter and opposite, and the lowest belongs to the setter and the middle defender, respectively.

## DISCUSSION:

The purpose of the study is to examine the prevalence of acute and chronic injuries in specialized positions of elite players in Iranian youth Premier League of volleyball. As Figure 1 shows, the opposite position has the highest rate of acute injury in the last 7 days, chronic injury and pain and disability in the shoulders of these athletes were reported. The results are in line with those of Agard and Georgenson (1996), Jung et al. (2006), Verhagen et al. (2004), and Bahr & Racer (2003). Regarding this, J. Kane et al. (2010) have stated acute and chronic injury with shoulder pain and disability as the common injuries of volleyball. It seems that the opposite players are among the most effective players in determining the outcome of volleyball competitions. Among the main causes of this injury, one can state several spikes that end up in this specialized position by setters. It has to be stated that the high percentage of pain and disability in the knee because of the pressure of jumping and repeated landings and the high percentage of pain and disability in the shoulders can be the result of the number of consecutive spikes to change the direction of the ball in front of the defenders.

As Figure 2 reported about the libero position, the highest incidence of acute injury of 7 days and chronic back and lumbar injury that is in line with Bahr and Racer (2003), Shuffle et al. (1990), and Verhagen et al. (2004). Injury in this area seems to happen in libero position for two main reasons. One is repeated repetition of the forearm followed by placing both hands in front of the body with multiple pressures when the ball hits both hands along the help of the muscles of the chest and back, and the other is flexion and extension of the spine in multiple repetitions of forearm movements, of knocking, rolling as well as spine hyper extension in diving movements that belongs mainly to this specialized position. The high percentage of pain and disability in the forearm area of these players can be associated with the intensity of the shots received by the ball in that area that leads to superficial bruising and not to acute or chronic injuries.

As Figure 3 shows about the outside hitter position, the highest rate of acute injury in the last 7 days has been reported as chronic injury and pain and disability in the arms and elbows, wrists, hips, thighs and back that is in

line with Shuffle and Partners (1990) and Bahr and Racer (2003). The main reason for the high rate of sports injuries in this specialized position can be attributed to the full presence of these players in all activities, movements and techniques performed in a volleyball competition. Regarding this, injuries to the arm, elbow and wrist can be related to overuse in the spike stages of these players. Moreover, buttock and thigh injuries can be attributed to repeated use of muscles involved in ready-to-receive positions, three steps, jumps, and frequent landings in defense and spike. Moreover, back injuries, like libero position, are related to spine flexion and extension in the receiving stages and hyper-extension in the spike and dive stages.

As Figure 4 shows for setter position, the highest rate of acute injury in the last 7 days has been reported in the back, knees and shoulders, respectively, and over time has led to the same chronic injury. Moreover, the highest pain and disability have been reported in the knee, ankle, shank, and shoulder, respectively, which is in line with the studies of August Sean et al. (2006), Watkins & Greene (1992), Agard and Johansson 1996, Shuffle et al. (1990), Verhagen et al. (2004), and Bahr and Racer (2003). It seems that the injuries stated, especially in the shoulder and back, are the result of the high activity of the hand above the head when sending the pass back and forth. One of the reasons for knee injuries in setters can be the rapid and sudden movement of the passer to reach the ball and send the pass and participate in the defense on the net.

As Figure 5 reported, middle blocker has the most acute injuries in the last 7 days that are in line with chronic injuries and pain and disability in the buttocks and thighs, followed by the ankles and shanks, respectively. The stated reports are in line with many studies like Verhagen et al. (2004), August Sean et al. (2006), Watkins and Green (1992), Agard and Georgenson (1996), and all three studies by Ajel et al. (2007). Based on *Identification of Injury in Olympic Sports*, the cause of ankle injury can be the frequent participation of the middle blocker in the net defense, as well as being too involved with side blockers and opposing speakers near the net, as well as the cause of hip and knee injuries with repeated jumps and landings for the defense, as well as the middle blocker's turns and returns after the defense to participate in spiking, usually associated with the internal and external rotations of the thighs and knees.

## CONCLUSION

The study examined the prevalence of injuries (like acute and chronic) and the extent of disability and its effect on the performance of athletes in specialized volleyball positions in all human limbs. Given the statistics extracted from volleyball players, one can design specialized training exercises for players so that besides preventing common injuries and treatment in volleyball even better performance away from injury is provided for them. It is hoped that the study will be of some help in the development of sports teams, coaches and athletes.

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