

Examining Location of Injuries of Upper and Lower Body Extremities in Volleyball Players within the Zambezi Volleyball Association

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Abstract

Injuries of upper and lower body extremities are very common among volleyball players and their impact on sports has numerous effects in training sessions and competitive games. The purpose of this study was to examine the location of injuries of upper and lower body extremities in volleyball players within the Zambezi Volleyball Association. The study employed quantitative research methods to explore more on injuries of upper and lower body among participants. The study population consisted of (n = 141) participants (n = 37 female, n = 104 male) with 10 teams (n = 3 female, n = 7 male). The participants were purposively selected based on their experience and involvement in volleyball training sessions and games. The data was analyzed using SPSS software programme. The result percentages and frequencies were presented in tables. A total number of 293 injuries (73 female, 220 male) were sustained during the 2021-2022 season from these body locations: shoulder injuries 63 (44.6%), Hand/wrist injuries 51 (36.0%), Ankle injuries 47 (33.0%), Head/face injuries 29 (20.5%), knee 26 (18.4%), trunk injuries 20 (14.1%), arm/elbow injuries 15 (10.6%), foot injuries 14 (9.9%), lower leg injuries 11 (7.8%), hip/thigh/upper leg injuries 9 (6.3%) and 8 neck injuries (5.6%). This study concludes that there are more injury occurrences sustained among male compared to female participants within the same injury locations. Moreover, common locations of injuries were sustained in shoulders, wrists and ankles in most volleyball players (20% - 63%) in one season.

Keywords

Volleyball, Location, Injuries, Upper Body Extremities, Lower Body Extremities

1. Introduction

Researches have shown that injuries in volleyball occur very often, and it is extensively assumed that an increase in occurrence, intensity and length of training might lead to high rates of injury (Augustsson et al., 2006). Despite volleyball's lack of physical contact with the opponents and teams been divided by a net, injuries of lower and upper body extremities were found to take place during blocking, spiking, illegal intrusion on the other side and unintentional fouls of players (Reitmayer, 2017). Continued jumping and uneven landings was found to put more pressure on the knees and led to severe overused injuries (Erkes, 2012). Moreover, volleyball is an above-head sport in which passing, touching the ball takes place above the player's head. This recurring routine exposes the shoulder and the neck muscle groups to an excessive mechanical trauma leading to injuries such as rotator cuff tendinitis, even rotator cuff tear and impingement (Timpka et al., 2014).

Injuries in volleyball are common due to ground contact, players contact, objects contact, diving, stretching, falls, twisting, turning movements, injury over-use and pressure (Chowdbury, 2020). Research has found that sports injuries causes increase players' suffering in aspects such as: emotional, social, psychological, physical and economical burden; moreover, these injuries were found to be the main fear and threat to all athletes globally (Hamid et al., 2014). Research further found that most injuries sustained in volleyball are due to lack of warm-up, the intensity of exercises that do not match the body's capabilities, or the use of inadequate techniques and poorly selected sports equipment (Minko et al., 2021).

2. Problem Statement

Research have shown that there are over 800 million players worldwide who at least participate in volleyball on weekly basis, with an approximately figure of 46 million in USA alone (WHO, 2019). Volleyball injuries have been recorded and reported by numerous sports researchers globally, with injuries such as ankles, hands, knees, shoulders and back pain topping the list (Briner & Gallo, 2015). Therefore, the main purpose of the current study is to explore location injuries of upper and lower body extremities among volleyball players.

3. Research Question

- What are the common locations of injuries of upper and lower body extremities among volleyball players in the Zambezi Volleyball Association?

4. Literature Review

The federation Internationale de Volleyball approximates that over 800 million

people play volleyball globally (Reeser, 2008). The utmost area of development has been in beach volleyball, which involves two people playing on sand unlike indoor volleyball which requires six on each side. Both beach and indoor volleyball are Olympic sports and watched by many internationally (WHO, 2019).

Shoulder injuries have been projected to be responsible for 8% to 20% of all volleyball-associated injuries (American Association of Neurological Surgeons, 2023). Research shows that through the period of 16 years shoulder complications are rated as the leading causes of time lost from competition and training between male and female volleyball players a severe time-loss frequency of 0.65 injuries per 1000 athletic coverages, ranking shoulders third behind the ankles and the knees as the most often injured body parts (Reeser et al., 2010). Repetitive high demand in throwing activities such as spiking and services put extra pressure on the shoulder joint of the volleyball players. Moreover, it's unfortunate that the ability to do these movements effortlessly requires high synchronization in muscle nearby the shoulder (Zarei et al., 2021). Research further shows that volleyball-precise abilities such as serving and spiking and place put great load on the shoulder girdle. These overhead abilities subject the main shoulder girdle to repetitive pressure, which may cause failure and injury to the easy tissues (Cools & Reese, 2017). To well comprehend the mechanism of chronic shoulder injuries in volleyball players, the volleyball health expert should have a fundamental familiarity with the required knowledge of the volleyball serve and spike. Comparable throwing motion, the technicalities of spiking can be separated into three stages: raising, speeding up, and slowing down/follow-through (Cools & Reese, 2017).

Research shows that approximately 25% of all sports-associated injuries include the wrist or hand and its frequency is growing not only because of the competitive level of sports in school and university athletes but because of the activity level of the overall population (Avery et al., 2016). Studies have shown that most common of hand and wrist injuries were treated without surgical procedures; moreover, of all National Collegiate Athletic Association (NCAA) students players that sustained hand and wrist injuries in the middle of 2014 and 2015, 3.78% were treated through a surgical procedure. A report by Holoyda et al. (2021) shows that a figure of 4422 hand and wrist injuries documented by the Incident Statistics Program (ISP) in the middle of 2014 to 2015, male players sustained 72,423 injuries (6.01/10,000 players experience) and female athletes sustained 30,675 injuries (4.13/10,000 player experience). Total of 3.78 of hand and wrist injuries needed surgical procedure intrusion (Holoyda et al., 2021). A study by Opanowska et al. (2016) shows that the highest incidences of wrist/hand injuries were high and common among volleyball players by (33.3%), which results in overuse or 3 - 4 weeks time out for healing.

Research have revealed that an ankle sprain is often the result of player contact, that is, when a blocker lands on the foot of an opposing attacker, or a teammate, close to the net (Bere et al., 2015). Ankle injuries are among the most common musculoskeletal injuries, and account up to 70% of players' injuries, if not

well handled it may lead to lasting physical disability. Furthermore, ankle injuries happen at high proportions through all stages of sports involvement. Likewise, evidence proposes a strong association between a preceding ankle injury and an increased danger for a yet to come ankle injuries (Herzog et al., 2019). Head and face injuries among players in most important sport has been well studied in USA. Involvement in sports has been accredited to 3% to 29% of all head/face injuries between 10% and 42% of all head/facial fractures every year. Despite the well studied prevalence of sports associated head/facial injuries, volleyball injuries has slight equivalent studies while a projected 800 million individuals who play volleyball worldwide (Reich et al., 2021). Studies have acknowledged that from 2009 to 2018 (n = 235) volleyball-related head/face injuries were documented in the NEISS databank with a projected 10,424 (95% self-reliance break: 6158 - 14,690). The widely held of head/face injuries were among young people between the age of 20 to 29 years, encircling 52.3% of the model. Contrariwise, older people between the age of 60 years consisted of the lowermost (6%) size of hospital visits (Reich et al., 2021). Most injuries of the head and face (34%) in volleyball are sustained from spiking and falling to the ground in indoor courts (Migliorini et al., 2019).

Research have documented jumper's knee as a well known injury in volleyball, this injury is also known as patellar tendinopathy, patellar tendonitis/tendinitis, accounts to (37%) of injuries around the knee area (Skazalski et al., 2017). The knee is a multipart joint with several mechanisms, making it exposed to an assortment of injuries. Some of the utmost common knee injuries comprise of; ligaments, sprains, fractures, tears and dislocation (Erkes, 2012). Knee injury is common grievance that distresses players of all ages. Moreover, knee injury may be the outcome of an injury such as a shattered ligament or torn tendon (Briner & Gallo, 2015). Trunk injury is a common reason of performance restraint and time absent from sport in volleyball. At present evidence-based guiding principle for analysis and handling of trunk injuries in athletes are inadequate. Delayed in diagnosis and start of suitable treatment can rise injury sickness and return-on-court time (Gundersen et al., 2021). Recent forth coming proof supports the assumption that weakened trunk mechanism is a contributing influence to sports injuries of the backbone as well as sections of dynamic chain. The current perceptions about neuromuscular mechanism of trunk firmness are best defined from structures engineering viewpoint (Zazulak et al., 2008).

Research have shown that involvement and early concentration in overhead and throwing sports such as volleyball, baseball, tennis, football, javelin and football have steered to an increasing incidence of elbow injuries in a growing young sports population (Lin & Safran, 2022). Throwing of numerous athletic overhead motions can give physical pressure across the elbow region, which can influence to injury. Furthermore, tedious overhead motion without suitable rest or recuperation may result in long-lasting pathology. Elbow injuries can cause substantial incapacity during athletic activity in particular sports such as volleyball, and

can affect daily life activities (Lin & Safran, 2022). In many sports such as soccer, volleyball and American football, the foot has been found to absorb tremendous shearing and loading forces, sometimes reaching over 20 times the person's body weight (Rupp & Young, 2018).

Neck injuries in college players are comparatively common, players are at uppermost risk for neck and spine injuries as sporting is responsible for 15% of entirely spine injuries these injuries can vary from slight muscle twists to vertebral rupture with subsequent long-term debility or death (Chowdbury, 2020). The high prevalence of injuries in sports is though due to the inherent instability of the neck. Mutual contact mechanisms primary to pathology include hyperextension, axial loading, traction, solidity of the brachial plexus, eccentric muscle contraction, multiple repetitive traumatic episode or repetitive axial loading (Deckey et al., 2020).

5. Framework

The Grounded Theory of Sport Injury-Related Growth by Corbin & Strauss (2008) framed and informed the current study. This theory advocates a numeral of internal and external aspects allowing injured athletes to alter their injury into a chance for progress and growth. In addition, The Grounded Theory of Sport Injury-Related Growth is suitable for the current study as it steered and gave a comprehensive perspective to the phenomenon regarding location of injuries in upper and lower body extremities among volleyball players.

6. Research Methods

The current study used a cross-sectional approach which includes observing at data from a population at one particular point in time. The participants in this kind of study are constantly chosen based on specific variables of interest. Above and beyond, the researcher find this method appropriate for the current study as it allowed the researcher to gather data on few different variables such as; teams and gender (Cherry, 2019).

7. Population

Population is a cluster of people who have the same character traits that can be studied by researcher. The population of the current study consisted of male and female volleyball players from the Zambezi Volleyball Association in Katima Mulilo, Namibia.

8. Sample

Sample is section of the targeted cluster of participants that the research plans to include in the study for simplifying about the target group (Creswell, 2009). Therefore, for the current study a purposive sampling was employed in choosing the participants for the study. The (n = 141) participants were chosen based on their involvement, experiences and participation in league games, tournament competition and daily training sessions.

9. Data Collection Methods

Data was collected using questionnaire forms designed by the researcher. Data gathering procedure is a technique used in research to collect required information to be assessed and analyzed using regular authenticated procedures (Creswell, 2009).

10. Data Analysis

Data was analyzed using SPSS statistical software; percentages were used to interpret the results, which was presented in table. Data analysis is a process of arranging the data, examining the data, reporting the data, and understanding the results Creswell (2012).

This part of this study presents statistical interpretation and analysis of collected information as an outcome of application of data gathering.

11. Results

Table 1 shows the demographic information of participants. A total of (n = 141) of which (n = 37) 26.2% were female whereas (n = 104) 73.7% were male participants. Moreover, a total of (n = 10) volleyball teams from the Zambezi Volleyball Association participated in this study, whereas (n = 7) 70% comprised of male teams and (n = 3) 30% were made of female teams.

Table 2 below shows a total 141 volleyball players, of which a total number of 184 injuries (22% female, 77.9% male) were sustained from upper body extremities during the 2021-2022 seasons. Shoulder injury was the highest with 63 injuries (15.8% female, 53% male). The second highest was hand/wrist injury with 51 injuries (29.4 female, 36% male). The third highest was head/face injury with 29 injuries (24.1% female, 75.8% male). The fourth highest was trunk injury with 20

Table 1. Demographic key information.

Gender	(n = teams)	(n = players)	(n = %)
female	Hippo	14	10%
female	Vixens	11	8%
female	Unam Campus	12	8%
male	Katima Youth A	15	11%
male	Renegades 911	13	9%
male	Hippo	13	9%
male	Green Eagles	13	9%
male	Shadows	12	8%
male	Vixens	12	9%
male	Unam Campus	15	11%
male	Sneak Attack	11	8%
Total	10	141	100%

Table 2. Rate of injuries and location (*upper body extremities*).

Injury location	Common injuries location		
	Female (n = 37)	Male(n = 104)	Total (n = 141)
Hand/wrist	15 (29.4%)	36 (70.5%)	51
Head/face	7 (24.1%)	22 (75.8%)	29
Arm/elbow	3 (20%)	12 (80%)	15
Shoulder	10 (15.8%)	53 (84.1%)	63
Neck	2 (25%)	6 (75%)	8
Trunk	4 (20%)	16 (80%)	20
Total number of injuries	41	145	186

injuries (20% female, 80% male). The fifth highest was arm/elbow injuries with 15 injuries (20% female, 80% male). The sixth lowest score was neck injury with 8 injuries (25% female, 75 male).

Table 3 below shows a total of 141 volleyball players, of which a total number of 107 injuries (30% female, 70% male) sustained form lower body extremities during the 2021-2022 volleyball seasons. Ankle injury was the highest with an overall number of 47 (33% female 74% male), whereas the second highest was knee injuries with 26 injuries (30.7% female and 69% male). The third highest was foot injuries with 14 (35.7% female and 64.2% male injured players). The fourth injury was recorded under lower leg with 11 (36.3% female and 63.6% male). The last highest was hip/thigh/upper leg with 9 (33.3% female and 66.6% male injured).

Table 4 shows a summary of injury distribution of upper and lower body extremities with an occurrence comparison between female and male participants. Shoulder injury is the 1st highly sustained injury by most participants with a score frequency of 63 (53 more times in male occurrences compared to 10 times less in female participants) 44.6%. The 2nd sustained injury is hand/wrist injury with a frequency score of 51 (36 more times in male occurrences compared to 15 times lesser in female participants) 36%. The 3rdsustained injury is ankle injury with a frequency score of 47 (35 more times in male occurrences compared to 12 times less in female participants) 36%. The 4th sustained injury is head/face injury with a frequency score of 29 (22 more times in male occurrences compared to 7 times less in female participants) 20.5%. The 5th sustained injury is the knee injury with a score frequency of 26 (18 times more in male occurrences compared to 8 times less in female participants) 18.4%.

Moreover, the 6th sustained injury is the trunk injury with a frequency score of 20 (16 times more in male occurrences compared to 4 times lesser in female participants) 14.1%. The 7th sustained injury is the arm/elbow with a score frequency of 15 (12 times more in male occurrences compared to 4 times in female participants) 10.6%. The 8th sustained injury is the foot with a score frequency of 14 (9 times more in male occurrences compared to 5 times lesser in female participants) 9.9%. The 9th sustained injury is the lower leg injury with a frequency of

Table 3. Rate of injuries and location (*lower body extremities*).

Injury location	Common injuries location		
	female (n = 37)	male (n = 104)	total (n = 141)
Hip/thigh/upper leg	3 (33.3%)	6 (66.6%)	9
Foot	5 (35.7%)	9 (64.2%)	14
Knee	8 (30.7%)	18 (69%)	26
Ankle	12 (33%)	35 (74%)	47
Lower leg	4 (36.3%)	7 (63.6%)	11
Total number of injuries	32	75	107

Table 4. Overall injury location distribution (*upper and lower body extremities*).

Injury location	Injury location distribution			
	female	male	(n = frequency)	(n = %)
Shoulder	10	53	63	(44.6%)
Hand/wrist	15	36	51	(36.0%)
Ankle	12	35	47	(33.0%)
Head/face	7	22	29	(20.5%)
Knee	8	18	26	(18.4%)
Trunk	4	16	20	(14.1%)
Arm/elbow	3	12	15	(10.6%)
Foot	5	9	14	(9.9%)
Lower leg	4	7	11	(7.8%)
Hip/thigh/upper leg	3	6	9	(6.3%)
Neck	2	6	8	(5.6%)
Overall injuries	73	220	293	

11 (7 times more in male occurrences compared to 4 times less in female participants) 7.8%. The 10th sustained injury is the hip/thigh/upper leg with a frequency score of 9 (6 times more in male occurrences compared to 2 times less in female participants) 6.3%. The 11th sustained injury is the neck injury with a frequency score of 8 (6 more times in male occurrences compared to 2 times in female participants) 5.6%.

12. Discussion

The main findings of this study reflected in **Table 1** were that 184 injuries (22% female, 77.9% male) were sustained from upper body extremities during the 2021-2022 seasons. Shoulder injury was the highest with 63 injuries (15.8% female, 53% male). These results align with **Reeser et al. (2010)** alluding that roughly 60% of volleyball players recounted a history of shoulder injuries, also the findings further suggest that attackers and servers were more likely to have

shoulder injuries than setters, defensive players and “float” servers. Research shows that shoulder injuries are common complaints among volleyball players with fact occurrence and lifetime estimations as high as 26 and 67% correspondingly (Hodgetts et al., 2021).

The study results shows that the second highest was hand/wrist injury with 51 injuries (29.4 female, 36% male). These results are substantiated with Avery et al. (2016) to which they found that roughly 25% of all sports-associated injuries include the hand or wrist, moreover hand and wrist injuries in volleyball were found to be mutual and its vital impact affected numerous areas. The rate of volleyball injuries to the hand or wrist was 28.6% of all injuries, or 3545 per 100,000 people annually (Chowdbury, 2020).

The results further shows that the third highest was head/face injury with 29 injuries (24.1% female, 75.8% male). These results concur with Reich et al. (2021) findings which mentions that face/head injuries among athletes in most important sports codes such as volleyball has been well recorded in the globally, this involvement in sports has been recognized to 3% to 29% of all face/head rupture yearly. According to Augustsson et al. (2006) found that volleyball players report a ratio of 3.57 concussions per 10.000 experience. The fourth highest was trunk injury with 20 injuries (20% female, 80% male). These study results correspond with The Center for Injury Research and Policy (2019) which found that trunk injuries contributed up to 5.1% among high school volleyball players during the 2018-2019 school years. Moreover, Gundersen et al. (2021) suggested that trunk injuries are common among volleyball players and may result in dis cherniation or bone stress injuries if not well monitored.

The fifth highest was arm/elbow injuries with 15 injuries (20% female, 80% male). These results are supported by Dong (2013) suggesting that the arm and elbow injuries are associated with the push movement and maximum abduction angles in touch moment, the poor execution of the arm and elbow cause 16% injuries in upperbody parts. An arm/elbow injury can cause a serious amounts of destruction to a nerve at the arm/elbow joint can lead to everlasting difficulties with the muscles of the wrist, forearm, fingers and hand. The sixth lowest score was neck injury with 8 injuries (25% female, 75 male). These results harmonise with Chowdbury (2020) research outcomes which found that neck injuries in university players are reasonably common, players are at utmost risk for neck responsible for up to 15% every year, and these injuries can vary from slight muscle twists to vertebral rupture resulting in long-term debility or death. Lastly, 20% of neck injuries are usually associated with high-velocity collisions between players, causing acceleration or deceleration of the head on the neck (American Association of Neurological Surgeons, 2023).

The second main findings of this study are reflected in Table 3 which shows a total of 141 volleyball players, of which a total number of 107 injuries (30% female, 70% male) sustained form lower body extremities during the 2021-2022 volleyball seasons. Ankle injury was the highest with an overall number of 47

(33% female 74% male), these results are further supported by Herzog et al. (2019) suggesting that ankle injuries are among the most common musculoskeletal injuries, and account up to 70% of players who sustain severe ankle injuries may grow lasting physical disability, which may include long-lasting ankle flux. Ankle injuries happen at high proportions through all stages of sports involvement. Whereas the second highest was knee injuries with 26 injuries (30.7% female and 69% male). Research have documented jumper's knee as a well known injury in volleyball, this injury is also known as patellar tendinopathy, patellar tendonitis/tendinitis, accounts to (37%) of injuries around the knee area (Skazalski et al., 2017).

The third highest was foot injuries with 14 (35.7% female and 64.2% male injured players). These results agree with Rupp & Young (2018) indicating that in many sports such as soccer, volleyball and football, the foot injury have been found to absorb tremendous shearing and loading forces, sometimes reaching over 20 times the person's body weight. Moreover, Frey (2010) found that foot injuries cause 9% mobility and standing difficulties once sustained in any given sports events.

The fourth injury location was recorded under lower leg with 11 (36.3% female and 63.6% male). These results are supported by WHO (2019) which suggest that injuries of lower leg usually occur in sports that include a lot of running and jumping like volleyball and basketball, moreover these injuries are always acute or overused. Volleyball is a sport that require a lot of movement such as jumping, running and landing, these sports skills require timing and precision and may cause damage to the entire leg by 17% (American Association of Neurological Surgeons, 2023). The last highest was hip/thigh/upper leg with 9 (33.3% female and 66.6% male injured). These results are further supported by Kerbel et al. (2018) which suggest that hip injury is a common complain among athletes of all ages and has been estimated to account for 5% to 6% of all sports injuries.

Table 4 shows a summary of injury distribution of both upper and lower body extremities with an occurrence comparison between female and male participants and presented logically from most severe to less severe. Shoulder injury is the 1st highly sustained injury by most participants with a score frequency of 63 (44.6%). The 2nd sustained injury is hand/wrist injury with a frequency score of 51 (36%). The 3rd sustained injury is ankle injury with a frequency score of 47 (36%). The 4th sustained injury is head/face injury with a frequency score of 29 (20.5%). The 5th sustained injury is the knee injury with a score frequency of 26 (18.4%). These results are supported by Augustsson et al. (2006) alluding that the majority of injuries in volleyball were located in the regions of shoulders, hand/wrist, face and knee with an account of 15% - 62% overall.

Moreover, the 6th sustained injury is the trunk injury with a frequency score of 20 (14.1%). The 7th sustained injury is the arm/elbow with a score frequency of 15 (10.6%). The 8th sustained injury is the foot with a score frequency of 14 (9.9%). The 9th sustained injury is the lower leg injury with a frequency of 11

(7.8%). The 10th sustained injury is the hip/thigh/upper leg with a frequency score of 9 (6.3%). The 11th sustained injury is the neck injury with a frequency score of 8 (0.6%). These study results are further supported Cools & Reese (2017) referring minor injuries of lower body extremities such as truck, foot, arm/elbow lower and upper leg and the neck account to 6% to 19% of volleyball injuries.

13. Conclusion

This study concludes that there are more injury occurrences sustained among male compared to female participants within the same injury category. Moreover, common areas of injuries were sustained in body position such as shoulders, wrists and ankles among most volleyball players by (20% - 63%) of injuries in one season.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- American Association of Neurological Surgeons (2023). *Sports-Related Neck Injury*. AANS.
- Augustsson, S. R., Augustsson, J., Thomeé, R., & Svantesson, U. (2006). Injuries and Preventive Actions in Elite Swedish Volleyball. *Scandinavian Journal of Medicine & Science in Sports*, 16, 433-440.
- Avery, D. M., Rodner, C. M., & Edgar, C. M. (2016). Sports-Related Wrist and Hand Injuries: A Review. *Journal of Orthopaedic Surgery and Research*, 11, Article No. 99. <https://doi.org/10.1186/s13018-016-0432-8>
- Bere, T., Krucynski, J., Veintimilla, N., Hamu, Y., & Bahr, R. (2015). Injury Risk Is Low among World-Class Volleyball Players: 4-Year Data from the FIVB Injury Surveillance System. *British Journal of Sports Medicine*, 49, 1132-1137. <https://doi.org/10.1136/bjsports-2015-094959>
- Briner, W. W., & Gallo, R. (2015). *How Are Volleyball Injuries Treated?* (pp. 1-2). American Orthopaedic Society for Sports Medicine.
- Cherry, K. (2019). Verywellmind. <http://www.verywellmind.com>
- Chowdbury, D. H. (2020). Patterns of Sports Injuries & Associated Factors among the Volleyball Players of Selected Sports Institutes in Dhaka City. *International Journal of Science & Engineering Research*, 11, 333-344.
- Cools, M. J., & Reese, J. C. (2017). Shoulder Injuries in Volleyball. In J. C. Reeser, & R. Bahr (Eds.), *Handbook of Sports Medicine and Science: Volleyball* (2nd ed., pp. 93-108). International Olympic Committee.
- Corbin, J., & Strauss, A. (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (3rd ed.). Sage. <https://doi.org/10.4135/9781452230153>
- Creswell, J. W. (2009). *Designing and Conducting Quantitative Research*. Sage.
- Creswell, J. W. (2012). *Educational Research Planning, Conducting and Evaluating Quan-*

- titative and Qualitative Research* (4th ed.). Pearson.
- Deckey, D. D., Makovicka, J. L., Chung, A. S., Hassebrock, J. D., Patel, K. A., Tummal, S. V., Pena, A., Asprey, W., & Chhabra, A. (2020). Neck and Cervical Spine Injuries in National College Athletic Association Athletes: A 5-Year Epidemiologic Study. *Spine*, *45*, 55-64.
- Dong, F. (2013). Relative Analysis of Shoulder and Elbow Common Sports Injury Kinematics Parameters in Volleyball. *Journal of Chemical and Pharmaceutical Research*, *5*, 77-82.
- Erkes, K. (2012). Volleyball Injuries. *Current Sports Medicine Reports*, *11*, 251-265. <https://doi.org/10.1249/JSR.0b013e3182699037>
- Frey, C. (2010). Volleyball Injuries of the Foot and Ankle. *Minerva Ortopedica e Traumatologica*, *61*, 477-483.
- Gundersen, A., Borgstrom, H. D., & McInnis, K. (2021). Trunk Injuries. *Current Sports Medicine Report*, *20*, 150-156. <https://doi.org/10.1249/JSR.0000000000000819>
- Hamid, M. S. A., Puji, A., Salleh, Z., Jamalullail, Z., & Hussein, K. H. (2014). Patterns of Injuries and Illness among Malaysian Athletes during the XVII Asian Games 2014. *Sains Malaysiana*, *45*, 1531-1536.
- Herzog, M. M., Kerr, Z. Y., & Wikstrom, E. A. (2019). Epidemiology of Ankle Sprains and Chronic Ankle Instability. *NATA Journals*, *54*, 603-610. <https://doi.org/10.4085/1062-6050-447-17>
- Hodgetts, C. J., Leboeuf-Yde, C., & Walker, B. F. (2021). Shoulder Pain Prevalence by Age and within Occupational Groups: A Systematic Review. *Archives of Physiotherapy*, *11*, Article No. 24. <https://doi.org/10.1186/s40945-021-00119-w>
- Holoyda, K. A., Donato, D. P., & Magno-Padron, D. A. (2021). Hand and Wrist Injuries among Collegiate Athletes Vary with Athlete Division. *Injury Epidemiology*, *8*, Article No. 69. <https://doi.org/10.1186/s40621-021-00363-5>
- Kerbel, Y. E., Smith, C. M., Prodrromo, P. J., Nzeogu, M. I., & Mulcahey, M. K. (2018). Epidemiology of Hip and Groin Injuries in Collegiate Athletes in United States. *Orthopaedic Journal of Sports Medicine*, *6*, 23-79. <https://doi.org/10.1177/2325967118771676>
- Lin, K. M., & Safran, M. R. (2022). Rehabilitation and Return to Sport following Elbow Injuries. *Arthroscopy, Sports Medicine, and Rehabilitation*, *4*, 1245-1251. <https://doi.org/10.1016/j.asmr.2022.01.012>
- Migliorini, F., Rath, B., Tingart, M., Colarossi, G., Baroncini, A., & Eschweiler, J. (2019). Injuries among Volleyball Players: A Comprehensive Survey of the Literature. *Sport Sciences for Health*, *15*, 281-293. <https://doi.org/10.1007/s11332-019-00549-x>
- Minko, A., Hilicka, Z., Stepien, P., & Berenda, Z. (2021). Sports Injuries in Indoor Volleyball in People Who Play Professionally and as a Hobby. *Journal of Education, Health and Sport*, *11*, 101-108. <https://doi.org/10.12775/JEHS.2021.11.08.011>
- Opanowska, M., Wilka, B., Kusmierczyk, M., & Opanowski, K. (2016). Incidence of Injuries in the Opinion of Young Volleyball Players and Ways to Prevent Them. *Baltic Journal of Health and Physical Activity*, *8*, 32-40. <https://doi.org/10.29359/BIHPA.08.4.04>
- Reeser, C. J., Joy, E. A., Porucznik, C. A., Berg, R. L., Colliver, E. B., & Willick, S. E. (2010). Risk Factors for Volleyball-Related Shoulder Pain and Dysfunction. *American Academy of Physical Medicine and Rehabilitation*, *2*, 27-36. <https://doi.org/10.1016/j.pmrj.2009.11.010>
- Reeser, J. (2008). *A Brief History of the Sport of Volleyball*. Wiley Publishers.

- Reich, J. S., Cohn, J. E., Othman, S., Shokri, T., Ducic, Y., & Sokoya, M. (2021). Volleyball-Related Adult Maxillofacial Trauma Injuries: A NEISS Database Study. *Journal of Craniofacial Surgery*, *32*, 1564-1567. <https://doi.org/10.1097/SCS.0000000000006984>
- Reitmayer, H.-E. (2017). A Review on Volleyball Injuries. *Timisoara Physical Education and Rehabilitation Journal*, *10*, 189-194. <https://doi.org/10.1515/tperj-2017-0040>
- Rupp, J. T., & Young, C. C. (2018). *Athletic Foot Injuries*. Medscape.
- Skazalski, C., Khan, K., & Bahr, R. (2017). Knee and Ankle Injuries in Volleyball. In J. C. Reeser, & R. Bahr (Eds.), *Handbook of Sports Medicine and Science: Volleyball* (2nd ed., pp. 109-122). International Olympic Committee. <https://doi.org/10.1002/9781119227045.ch9>
- The Center for Injury Research and Policy (2019). *The Top 10 Most Volleyball Injuries*. Performance Health.
- Timpka, T., Jacobsson, J., Bicknbach, B., Finch, C. F., Ekberg, J., & Noedenfelt, L. (2014). What Is a Sports Injury? *Sports Medicine*, *44*, 423-428. <https://doi.org/10.1007/s40279-014-0143-4>
- WHO (2019). *Sports Injuries*. World Health Organization.
- Zarei, M., Eshghi, S., & Hosseinzadeh, M. (2021). The Effect of a Shoulder Injury Prevention Programme on Proprioception and Dynamic Stability of Young Volleyball Players; A Randomized Controlled Trials. *BMC Sports Science, Medicine and Rehabilitation*, *13*, Article No. 71. <https://doi.org/10.1186/s13102-021-00300-5>
- Zazulak, B., Cholewicki, J., & Reeves, N. P. (2008). Neuromuscular Control of Trunk Stability: Clinical Implications for Sports Injury Prevention. *Journal of the American Academy of Orthopaedic Surgeons*, *16*, 497-505. <https://doi.org/10.5435/00124635-200808000-00011>