The 1st ISOPHS
eISSN 3026-4863
October, 2024
https://jurnalnew.unimus.ac.id/index.php/prosidingfkm/issue/view/31
International Seminar on Public Health and Sports

# Training Model for Injury Prevention in Archery: A Literature Study

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## Abstract

**Background**: Sports injuries are a problem that occurs in athletes both during, competing, and after training. The injury gets worse If incorrectly treated. This research explores a literature review study on injury management training models for archery athletes. **Method**: This research is limited to injuries that often occur in archery sports, analysis of the physical needs of archery sports, and archery injury prevention training models taken in 20 journals, both international and national. **Result**: The results showed that in archery, injuries to the upper body are the most common (shoulder, finger, and hand injuries) and are also frequently reported. The factors that cause most injuries are internal factors (technical errors or movements when playing) and external factors (the environment or bad weather while playing). Injury management models include the sequence of prevention of sports injuries; dynamic and recursive models of sports injury etiology; and comprehensive models of injury causes. The training models for Injury Prevention in Archery were Body Mass Density (BMD); Range of Motion (ROM); Translation Research Model of Injury Prevention Practice (TRIPP), the Haddon Matrix model, the decision-based RTP model; and the Team-sport Injury Prevention (TIP) model. **Conclusion**: The literature on injury prevention in archery reveals that, although the sport is generally considered low-impact, it presents unique physical demands that can lead to both acute and chronic injuries, particularly in the shoulder, elbow, and back.

**Keywords**: archery sports, injury prevention, sport injury

## INTRODUCTION

Archery is an activity using a bow to shoot arrows [1] or sports that use bows and arrows [2] As a sport, archery has a quite deep philosophy, it is not only makes our bodies fit, but also full of meaning. Archery is basically a sport that is determined by 3 components, namely: bow, arrow and target board [3]. Of these three elements, the bow and arrow are under the athlete's control, while the target board is not under the athlete's control.

Sports injuries are a problem that occurs in athletes both during training [4], competing and after training. If the injury is handled incorrectly [5], it can result in the injury getting worse [6]. For example, treating a sprained foot using hot balm (hot oil) or by directly bandaging the foot is considered inappropriate, you should use an ice compress [7]. Injury management acute soft tissue directly to reduce pain and swelling [8].

Proper injury treatment is a determining factor in the length of the injury healing process [7] . Improper handling results in untreated injuries [5], the risk of limited activity, hampered movement, and even long rest [9]. Therefore, it is very important to implement an injury management model to minimize the risk of injury and improve athlete performance.

Injury management also applies to the archery sport. Archery is a sport that requires high technical skills, concentration and physical strength [10]. Although it appears to be a relatively safe

sport, archery also carries the risk of injury, especially to the upper body and lower back [3]. Repetitive archery movements that occur during practice[4] and competition will pose a risk of injury. Archery technique is closely related to anatomy and movement mechanics which determine the movement process (axis) as the axis of movement [11]. The axis of motion when pulling the bowstring, the arm will pull the muscles in the arm which will contract [12]. Therefore, the arm used to pull the bowstring must be maintained or strengthened to withstand the pull on the bowstring [13], especially when pulling it for the first time.

In archery, injuries to the upper body are the most common [14]. The towing arm is particularly susceptible to injury from overuse [12]. This can be caused by too much training, often accompanied by insufficient rest and recovery time. Repeated activity in this position can cause irritation to these muscles, causing pain [15]. An archer's neck, chest, and back are also susceptible to injury and pain [16]. Common injuries that occur in sports include: neck pain, back pain, and rorator cuff impingement.

Based on the facts above, it can be concluded that archery movements involve the anatomical structure of the body, especially the arm structure [12], where the weight of the bow is supported by the arm that holds the bow [13]. Therefore, injury prevention training models must be designed to take into account various aspects that are effective in reducing the risk of injury [17] and improving athlete performance. In an effort to minimize the risk of injury and improve athlete performance [18], the development of effective training models for injury prevention is critical. This literature review study on injury prevention training models in archery aims to investigate and evaluate various training approaches that have been proposed and used in the context of injury prevention [19]. Through a literature review of the latest scientific literature, this study will identify training models that have been developed and tested to reduce the risk of injury in archery athletes.

Research gaps in literature review studies on injury prevention training models in archery sports can include several aspects: first, gaps in the training models analyzed, so far have only focused on certain types of training, such as warm-up, cool-down, strength, or flexibility. Second, the multidisciplinary aspect. Injury prevention in archery involves multiple disciplines, including sports science, physiotherapy, biomechanics, and sports psychology. With this literature review study [20], it is hoped that it can provide valuable insight for archery coaches, researchers and practitioners in developing more effective and sustainable training programs. In addition, a better [19] understanding of injury prevention training models can also help increase awareness of the importance of injury prevention aspects in archery [21], thereby improving the well-being and performance of athletes..

## METHOD

This research employed the literature study method to develop theoretical aspects and aspects of practical benefits as well as looking for basic foundations for obtaining and building a theoretical basis [20] and framework for thinking about sports injury treatment models. So researchers can group, allocate, organize and use a variety of libraries in their field. The subjects of this study were texts taken from international journals. This research employed a literature review procedure by Machi and

McEvoy [22]. Based theory, there are several steps in a literature study.

Table 1. Step of literature review procedure

| Step | Action |
|---|---|
| 1 | Choose a specific topic for research. In this research, a literature search was carried out through scientific databases such as PubMed, ScienceDirect, and Google Scholar using keywords such as 'Sport Injury Prevention models in Archery', 'archery injury', and 'types of archery injury', |
| 2 | Develop a coherent argument for the review. Based on the results of previous research, preventing injuries [23] in archery is very urgent to improve athlete performance and performance. The aim of this literature review is to focus on types of archery injuries, factors that cause injuries, and models for managing archery injuries [24]. |
| 3 | Conduct a comprehensive search of relevant literature. After identification, literature selection is then carried out based on predetermined inclusion criteria. Inclusion criteria are sample criteria from articles selected by researchers based on research objectives. Inclusion criteria involved topic relevance to injury management, year of publication, and research methodology. The selected articles must focus on the factors that cause injuries, types of injuries and models for managing archery injuries [24]. In addition, the selected articles must have a web address so that they can be tracked on the internet. |
| 4 | Survey the collected literature to extract the necessary information [20]. This method suggests that international and national literature searches be carried out in the Scopus and Google Scholar databases. Search results for the period 1987 – 2024 found 20 articles from international and national journals. |

Data from the literature that has been analyzed is synthesized to form a conceptual framework. Consistent and significant findings from various literature sources are integrated to provide a comprehensive picture of the archery sport injury management model. To obtain correct and precise results in analyzing data, researchers used content analysis techniques [11]. Content analysis is research that is an in-depth discussion of the content of written or printed information in the mass media. The data in content analysis is in the form of text from journals. The final stage is writing the review results. The preparation of the literature review is based on the results of analysis and synthesis. The literature review is structured according to a clear structure, including background, objectives, main findings, and implications for understanding the importance of the archery sports injury management model.

## RESULTS AND DISCUSSION

Injury prevention is an effort that includes risk assessment, hazard analysis, and environmental inspections [25]. In archery, injuries to the upper body [26] are the most common [21]. This is caused by training too much, often accompanied by insufficient rest and recovery time. Shoulder, finger and hand injuries are also frequently reported [27]. In the shoulders, the rotator cuff muscles are most

susceptible to injury [15]. An archer's neck, chest, and back are also susceptible to injury and pain [16]. Shoulder and back injuries also often occur in archers due to excessive use of the shoulder [28] and rotator cuff muscles [24].

The most common archery injuries [24] include tendinitis, strains, sprains, abrasions, and calluses. These injuries can range from mild to severe and affect various parts of the body, such as the shoulders, elbows, wrists, back, neck, and fingers [13]. Archery injuries [28] can be caused by improper technique, overuse, or accidents. The following are some common archery injuries as well as prevention and treatment techniques [9]. Wrist injuries can be caused by improper technique or overuse [13]. To prevent wrist injuries, use proper technique and make sure your bow grip is correct [11]. If you have a wrist injury, rest the injured arm [12], apply ice to reduce swelling [8], and do gentle range of motion exercises [29].

Rotator Cuff Injuries, the shoulder joint is particularly susceptible to injury from archery [21] because aiming puts consistent stress on the ligaments and muscles. Specifically, the top of the humerus is round and rests on the shoulder joint. A network of muscles, ligaments, and tendons hold the shoulder and arm together [30]. This structure allows a wide range of movement and helps the archer raise the bow for precise aiming [13]. However, due to their complex construction and the many connected muscles in the back, arms, chest, and neck, rotators are particularly susceptible to injury from repetitive movements [15]. Rotator cuff injuries vary widely [28], so treatment is rarely done directly. In severe cases, such as when a muscle tears [15], steroids and surgery may be necessary. However, often rest and ice do the trick [8]. To avoid injury in this area, do smart exercises. Be sure to complete stretches before and after shooting or using a bow trainer [13]. When returning to sports after an injury, try using an archery rehabilitation device to prevent further archery shoulder pain [27]. Finally, adjust the load resistance on the bow gradually to prevent sudden overtension.

The most common causes of injury come from internal factors, due to technical errors or movements when playing archery and from external factors due to the environment or bad weather while playing archery [31]. Archery injuries can be caused by a variety of factors [24], such as poor technique, improper equipment, overtraining, or lack of physical conditioning [32]. The following is how to apply the Haddon Matrix [28] in treating archery sports injuries.

Table 2. Haddon Matrix theory in treating archery sports injuries

| Phase | Implementation |
|---|---|
| Pre-event phase | a. Host factors: Focuses on athlete characteristics such as physical condition, technical proficiency, and experience level [33]. In archery, ensuring athletes have proper training, have good technique, and are in top physical condition can reduce the risk of injury [21].<br>b. Agent factor: Refers to the equipment used, including bows, arrows, and protective gear [13]. Ensuring the equipment is well maintained and appropriate to the athlete's skill level and body is very important [34].<br>c. Environmental factors: Includes training and competition environments. |

| | |
|---|---|
| | Ensuring that the exercise area is safe, secure, and free from hazards can prevent injuries before they occur [29]. |
| Phase during the event | a. Host factors: During events, monitoring the athlete's physical and mental condition is essential [4] Fatigue, stress, or distraction can increase the risk of injury in archery [35], where concentration and muscle control are critical [15].<br>b. Agent factors: These involve the immediate circumstances of the injury event, such as the specific action or movement that caused the injury (e.g., overexertion or improper technique).<br>c. Environmental factors: Factors such as weather conditions or unexpected disturbances can affect performance and potentially cause injury [18]. |
| Phase after the event | a. Host factors: After injury, rehabilitation and recovery of the athlete becomes very important. Understanding an athlete's individual response to injury and ensuring they receive appropriate medical and rehabilitation care can facilitate recovery.<br>b. Agent factors: Analyzing the details of an injury event helps identify preventive measures for the future, such as adjustments to equipment or training methods.<br>c. Environmental factors: Reviewing the circumstances surrounding an injury event can reveal environmental improvements needed to prevent similar incidents in the future. |

Among the injury management models include: 'the sequence of prevention of sports injuries' or the sequence of preventing sports injuries; dynamic and recursive model of sports injury etiology [36]; comprehensive model of injury causes. BMD (Body Mass Density); (ROM, range of motion) [23]. Translational research model of injury prevention practice (TRIPP) developed by Finch [37], Haddon Matrix model in sport (Haddon) [9], decision-based RTP model (Creighton); and the team-sport injury prevention (TIP) cycle model [38].

Table 3. Dynamic and recursive model of sports injury etiology (Meeuwisse)

| Stage | Actions |
|---|---|
| 1 | Early Detection: Identifying injuries early through monitoring [28] the archers for possible symptoms and signs. |
| 2 | In-Depth Evaluation: Conduct a thorough evaluation of the injury, including considering factors that may have contributed to the injury [39]. |
| 3 | Appropriate Treatment: Providing appropriate treatment appropriate to the type and severity of injury experienced by the archer [40]. |
| 4 | Rehabilitation: Develop and follow an appropriate rehabilitation program to assist in full recovery from injury [41] and prevent recurrence. |
| 5 | Relapse Prevention: Identifying and addressing risk factors that may lead to re-injury, as well as implementing prevention strategies to prevent it [36]. |

| | |
|---|---|
| 6 | Education and Training: Educate archers about injury prevention, safe training techniques [11], and warning signs to pay attention. Appropriate training is also important to teach proper shooting techniques and reduce the risk of injury [40]. |
| 7 | Monitoring and Evaluation: Continuous monitoring of the physical condition and health of archers, as well as evaluating the effectiveness of injury prevention strategies that have been implemented [42]. By monitoring regularly, we can identify potential changes or problems that require further attention. |

A comprehensive model of injury causes is important to understand the interactions between intrinsic and extrinsic factors in evaluating injury risk and designing effective preventive interventions [35]. These factors are interconnected and can influence each other in determining the likelihood of injury in sports activities.

Table 4. A comprehensive model of injury causes

| Model of injuries causes | Explanation |
|---|---|
| Body Mass Density (BMD). | BMD refers to how dense and strong [22]. Low BMD can increase the risk of bone injuries and other injuries because bones become more susceptible to fracture or injury when exposed to pressure or stress [28]. |
| Range of Motion (ROM). | ROM refers to how far or flexibly a person can move in their joints. A good range of motion is important for preventing injury because it can help the body adapt to different movements and reduce stress placed on the joints [23]. |
| Translational Research Practice Injury Prevention (TRIPP) model [37]. | TRIPP adds two additional steps to the prevention sequence, (1) the need to understand the context of implementation (personal, environmental, social and sporting factors), and (2) evaluation of the process of implementing preventive actions. The need to evaluate implementation processes highlights the limited understanding of sport context as a potential driver of preventive behavior. Therefore, knowledge is needed about the environment, culture and infrastructure associated with sports injuries, which can be contextual determinants in the injury prevention process. |
| Haddon Matrix model in sports. | This model is based on the fact that the injury process is naturally divided into three stages before, during and after interaction, namely 'precrash', 'crash' and 'postcrash' [4]. The Haddon Matrix is a framework used in injury prevention and control for the field of public health. It helps analyze the factors that contribute to injury through three phases [43]: before the event, during the event, and after the event, taking into account host (injury carrier), agent (injury cause), and environmental factors [44]. By applying the Haddon Matrix to archery, each phase |

| | |
|---|---|
| | helps identify strategies to prevent injury [21], improve athlete safety, and optimize performance [18]. By addressing host, agent, and environmental factors in all of these phases, coaches, medical staff, and athletes can work together to minimize the risk of injury during training and competition in archery [21]. |
| Decision-based RTP model. | The decision-based RTP model provides a holistic and structured approach to treating sports injuries, with the primary goal of maximizing athlete recovery while minimizing the risk of injury recurrence [45]. By using this model, decision making regarding when athletes can return to participating in sports can be more measurable and based on a comprehensive evaluation. |
| Team-sport injury prevention (TIP) cycle model | The Team Sports Injury Prevention (TIP) Cycle emphasizes the importance of a holistic approach [38] in minimizing the risk of injury at the team or sports group level [33]. |

(Re)evaluation is an important process in the sports injury prevention cycle that involves reassessment of physical condition, technique, and risk factors [45] that may have influenced the injury. Identification: This stage includes recognition and assessment of potential injury risks [25] in a sporting context. Identification is carried out by collecting data about injuries that frequently occur, injury patterns that may occur [46], as well as individual or team characteristics that can influence the risk [47]. Intervention: Intervention refers to preventive actions or steps based on information and evaluation obtained to reduce the risk of injury that has been identified [45].

## CONCLUSION

The literature on injury prevention in archery reveals that, although the sport is generally considered low-impact, it presents unique physical demands that can lead to acute and chronic injuries, particularly in the shoulder, elbow, and back. As archers strive for precision and consistency, the repetitive nature of the sport increases the risk of overuse injuries. In conclusion, the research emphasizes the need for a holistic approach to injury prevention in archery. Training models that combine biomechanical assessments, strength and conditioning, flexibility, proper technique, recovery strategies, and psychological resilience are most effective in minimizing injury risks. Implementing such integrated programs can help ensure that archers maintain peak performance while reducing the likelihood of sustaining debilitating injuries. To conclude, injury management models include the sequence of prevention of sports injuries; Dynamic and recursive models of sports injury etiology; and Comprehensive models of injury causes: BMD, ROM, TRIPP, the Haddon Matrix model in sport, the decision-based RTP model; and the team-sport injury prevention (TIP) cycle model.

## REFERENCES

[1] Melyza Melyza, Agus A. *Teknik Dasar Panahan*. Jakarta: Pustaka Populer, 2021.

[2] Eka Eka. *Memanah : Seni dan Olahraga*. Jakarta: Pustaka Jaya, 2020.

[3] Artanayasa IW. *Panahan*. Yogyakarta: Graha Ilmu, 2014.

[4] Alberolla-zorilla I. F-SM. & MME. Injury profile and risk factors in archery: A systematic review and meta-analysis. *J Sports Sci Med* 2022; 21: 1--11.

[5] Harmer PA. Preventing penetrating hand injuries in sabre fencing: An application and critique of the van Mechelen model by the Fédération Internationale d'Escrime. *Br J Sports Med* 2015; 49: 1138–1143.

[6] Yuliani SD. Manajemen Cedera Olahraga Atlet Pekan Olahraga Provinsi IPSI Kota Pontianak Tahun 2018. 2019; 1: 1–9.

[7] Susanti YT. Pengetahuan Guru Pendidikan Jasmani Tentang Penanganan Dini Cedera Olahraga Dengan Metode Protect Rest Ice Compression Elevation Support (Prices) Di SMA/MA Negeri Se-Kabupaten Kulon Progo Tahun 2017. 2018; 3: 1–10.

[8] Bleakley C, McDonough S, MacAuley D. The Use of Ice in the Treatment of Acute Soft-Tissue Injury. *Am J Sports Med* 2004; 32: 251–261.

[9] Setiawan A. Faktor Timbulnya Cedera Olahraga. Media Ilmu Keolahragaan Indonesia. 1.

[10] Saleh, M.B.M., Linoby, A., Razak, F.A.B.A., Kasim NABA. The relationship between arm muscle strength, muscle endurance, balance and draw force length on archery performance. 2022; 1: 202–218.

[11] Al-Khered QA. Teknik Memanah dalam Islam. Solo.

[12] Despraz J. Archery and the Arm. In book: Behaviour in our Bones: How Human Behaviour Influences Skeletal Morphology.

[13] Ariffin, M.S., Rambely, A.S. & Ariff NM. Wrist muscle activity of khatrah approach in Mameluke technique using traditional bow archery. 2018.

[14] Faris N.A. AK. Analisis aktivasi otot pada otot ekstermitas atas saat memanah menggunakan elektromiografi: review analysis muscle activation of upper limbmuscle during archery shooting with electromyography. 1.

[15] Azhar, R.C., Sukamti, E.R., Subekti, O.B., & Arianto AC. Muscle Endurance, Muscle Strength, Coordination, and Balance as Predictors of Archery Accuracy. 2023; 5: 125-129.

[16] Kim, R.N, Lee, J.H, Hong, S.H, Jeon, J.H, Jeong WK. Ciri-Ciri Otot Bahu Pada Atlet Panahan. Siku Bahu Clin. 2018; 3: 145–150.

[17] Ross, A., Donaldson, A. & Poulos R. Nationwide sports injury prevention strategies: A scoping review. 2020; 31.

[18] Kim, H.B., Kim, S.H., So WY. The relative importance of performance factors in Korean archery. 5: 1211-1219.

[19] Sutoro Sutoro. Cidera Olahraga Panahan dan Upaya Pencegahannya. *Semin Nas Sos Ekon Pendidikan, Penelitian, Pengabdi dan Kesehat* 2021; 1: 113–118.

[20] Bianchi, S., Gitto, S., Draghi F. Fitur USG jari pelatuk: Tinjauan literatur.

[21] Akbar, A. K., & Nurhayati A. Analisis Persepsi Kinestetik Terhadap Kemampuan Memanah Atlet Panahan Kota Palopo. 2018, pp. 206–214.

[22] Machi LA. *The Literature Review: Six Steps to Success*. 3rd ed. Corwin Press, 2016.

[23] Bahr, R. & Krosshaug T. *Understanding injury mechanisms: a key component of preventing injuries in sport. British Journal of Sports Medicine*. 2005.

[24] Agranovich O.E., Petrova E.V., Trofimova S.I., Sapogovskiy A.V., Melchenko E.V., Blagovechtchenski E.D. AKA. *A literature review. Pediatric Traumatology, Orthopaedics and Reconstructive Surgery.* 2024.

[25] Ji X, Arzalluz I, Gao X, et al. Exploring injury assessment using motion tracking technology and ergonomic tools in archery performance. *Front Med Eng*; 2. Epub ahead of print March 2024. DOI: 10.3389/fmede.2024.1375520.

[26] Tengah J. Analisis Aktivasi Otot Pada Otot Ekstermitas Atas Saat Memanah Menggunakan Elektromiografi: Review Analysis Muscle Activation of Upper Limb Muscle during Archery Shooting With Electromyograph. 1.

[27] Kim, Y.S., Kim, D.S., Shin, J.S., Kim, S.H, Lee, B.S., Park, J.S., Cho W. Shoulder Pain Caused by Injuries in Korean Elite Archers. 2021; 4: 146-153.

[28] Aicale, R., Tarantino, D., Maffulli N. Cedera berlebihan dalam olahraga: gambaran komprehensif.

[29] Turna B, Bayazit B, Eryücel ME, et al. Acute effect of dynamic and static stretching exercises on targeting performance in archery. *Prog Nutr*; 23. Epub ahead of print 2021. DOI: 10.23751/pn.v23iS1.11385.

[30] Bayram K, Levent Ö, Hayri E, Ýsmail K AA. Penilaian sonografi tendon fleksor jari pada pemanah olimpiade. 2012; 85–87.

[31] Ravella, K.C., Hutchinson MR. Shooting Sports and Archery.

[32] Demografi dan statistik pemanah.

[33] Gönen M. Investigation of Injury Anxiety Level of Archers According to Various Parameters: Students of Faculty of Sport Sciences and Club Athletes. 2021; 4: 506-513.

[34] Vasilis, N., Kyriakides, A., Vasilopoulos, G., Chatzitimotheou, M.,Gonidakis, G., Kotsakis, A., Paraskevopoulos, E., Kapreli E. Injuries and Persistent Pain in Elite Adolescent Archery Athletes: A Cross-Sectional Epidemiological Study. 2024; 12: 101.

[35] Sirufo, M.M., Bassino, E.M., De Pietro, F., Ginaldi, L., De Martinis M. Microvascular Damage in a Young Female Archer Assessed by Nailfold Videocapillaroscopy: A Case Report. 2020; 12: 4218.

[36] Meeuwisse WH et al. A dynamic model of etiology in sport injury: the recursive nature of risk

and causation. Clinical journal of sport medicine : official journal of the Canadian Academy of Sport Medicine,. 2007; 3: 215–219.

[37] Finch C. A new framework for research leading to sports injury prevention. 2006; 1: 3-9,.

[38] O'Brien, J., Finch, C. F., Pruna, R., & McCall A. A new model for injury prevention in team sports: the Team-sport Injury Prevention (TIP) cycle. 2018; 1: 77–80.

[39] Aysan HA. *The Effects of Archery as a Sports Branch on*. 2016.

[40] Enea B. Towards an Aesthetics of Archery. 2024; 1: 33–48.

[41] Hita, I.P.A.D., Rusmayani, N.G.A.L., Krisna IMA. Fisiologis dalam Cabang Olahraga Panahan. 2023; 2: 12–17.

[42] Arisman, Y., Firmansyah, D., Dede, D. P, Ardo, O., Alonzo LM. The Success of Archery Training in the New Normal Era. 2024; 1: 113–119.

[43] Basuki S. Kontribusi Tingkat Konsentrasi Terhadap Ketepatan Hasil Panahan Ronde Nasional Jarak 40 Meter (Studi Pada Atlet Putra Unit Kegiatan Mahasiswa Panahan Universitas Negeri Surabaya). 2019; 7: 383–390.

[44] Arovah NI. *Dasar-Dasar Fisioterapi pada Cedera Olahraga.* Yogyakarta: FIK UNY, 2010.

[45] Konda, M., Mangal, R., Daniel, A., Stead, T.S., Ganti L. Archery-Related Musculoskeletal Injuries: An Epidemiological Study Revealing Injury Sites, Risk Factors, and Implications for Prevention. Orthop Rev (Pavia). 15.

[46] Ertan, Hayri & Tüzün M. Injury Patterns among Turkish Archers. 2006, p. 1.

[47] Prine, B.R., Pazik, M.N., Prine, A., Haley, H., Bruner, M.L., Vincent HK. Characteristics and reported injuries of recreational and competitive archers. 2023; 11: 1202–1207.