





Score analysis of ankle joint laxity and the incidence of ankle injury in professional female athletes: A retrospective study

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ABSTRACT

Ankle injury occurs in 45% of sports injuries, and as many as 14% of them is severe injuries. This condition is quite common in athletes such as athletics. The current solution for athletes with joint instability is to take preventive measures to minimize the possibility of injury. This study aims to analyse the instability score on the incidence of ankle injuries in female professional athletes. This retrospective study analysed data from professional female athletes to assess the incidence of ankle injuries in relation to their history of ankle instability. The study involved evaluating ankle instability using the Beighton score, the AOFAS score, and a detailed history of prior ankle injuries. Out of the total sample, 168 female athletes were identified, with 141 (80%) reporting a history of ankle injuries. The most frequent injury was ankle-related, occurring in 28% of the sample. Among those with prior ankle injuries, 83% (30 out of 36) showed a positive result on the Beighton score. The AOFAS evaluation revealed that 25% (12 athletes) had excellent ankle function, while 75% (36 athletes) demonstrated superb function. The use of the Beighton score and AOFAS score for evaluating professional female athletes with a history of ankle injuries proves to be effective in identifying those at higher risk for future injuries, thereby aiding in prevention strategies.

Keywords: Sport medicine, Ankle injury, Female athlete, Beighton score, Joint laxity.

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INTRODUCTION

Incidence of ankle injury is one of the most common athletic injuries. This injury occurs in 45% of sports injuries, and as many as 14% of them can be considered severe injuries (Park et al. 2016; Yeo et al. 2017). This condition is quite common in athletes such as athletics. Many individuals with joint instability participate in athletic activity programs (Bullock et al. 2020; Halabchi and Hassabi 2020; Liaghat et al. 2021; Prieto-González et al. 2021). The impact that occurs if joint instability is not appropriately handled, from prevention to definitive therapy, will cause early osteoarthritis (OA). The incidence of early osteoarthritis in athletes can cause a decrease in performance. The most fatal can cause early retirement in athletes at an age due to joint instability that repeatedly occurs (Saccomanno et al. 2013; Sacks et al. 2019).

The current solution for athletes with joint instability is to take preventive measures to minimize the possibility of injury. Preventive measures other than stretching can also include screening in the form of a physical examination of the joints and a training program that is by the portion and needs of the athlete to prevent more severe injuries (Kemler, Valkenberg, and Goutteborge 2019; Saccomanno et al. 2013; Talpey and Siesmaa 2017).

This study aims to analyse the instability score on the incidence of ankle injuries in female professional athletes. The results of the score analysis is expected to provide benefits in the form of a description of the injury to professional female athletes with a particular score so that it can be used to prevent more severe injuries.

METHOD

Participants

The sample population in this study were female professional athletes with inclusion criteria as follows: Female Professional Athlete with a history of injury to the joints has a history of a previous ankle injury, is cooperative, can communicate, and can answer questions asked and is willing to be examined. Samples with a history of ankle surgery were excluded from the study criteria. The sample was then identified according to the inclusion criteria. Data was collected through an ankle instability examination based on the Beighton score criteria and a history of previous ankle injuries. Then, we analysed the scores on ankle instability and the incidence of injury in female professional athletes using the AOFAS. The data is presented in descriptive form.

Procedures

This study uses a descriptive observational design with retrospective data collection to determine the incidence of ankle injuries in professional female athletes adjusted for the results of an ankle instability examination (based on the Beighton score). The American Orthopedic Foot and Ankle Association (AOFAS) score determines the history of injury, examination injury screening, and the functional performance of female professional athletes. Letter of Exemption with Referral number 0819/LOE/301.4.2/III/2022 obtained on March 12th 2022.

Data analysis

The collected data was analysed using Statistical Package for the Social Sciences v.26 (SPSS; IBM, SPSS Inc., USA). The data was analysed in univariate and multivariate using chi-square and Mann Whitney. Statistical result $p < .05$ was determined as statistically significant.

RESULTS

In this study, from the distribution of samples by gender, the number of female athletes was 168 (51%), and male athletes were 159 (49%). Of those 168 female athletes, there were 141 who suffered injuries (80%) (Table 1).

Table 1. Patient demographic data.

Demographic	N (%)
Sex	
Male	159 (49)
Female	168 (51)
Injuring	
Suffered injuries	141 (48)
No injuries	27 (16)
Injuries location	
Ankle	48 (28)
Knee	45 (26)
Shoulder	21 (12.5)
Wrist	6 (3)
Hip	3 (1)
Others	18 (12.8)
Positive beighton score	
History of ankle injury	30 (62.5)
Without history of ankle injury	6 (12.5)
AOFAS	
Excellent	12 (25)
Good	36 (75)

From the results of the sample distribution of the types of joint injuries that often occur in female athletes, there were 48 (28%) cases of ankle joint injuries, followed by the second most frequent knee injuries (26%), then 21 cases of shoulder joint injuries. (12.5%), wrist joint injury in 6 cases (3%), hip joint injury in 3 cases (1%), and there are other types of injuries such as hamstring muscle injury and plantar fasciitis. The results were obtained from 48 athletes who had ankle injuries, 36 athletes who had a history of previous ankle injuries (75%), and 10 athletes who had positive Beighton scores from 36 athletes (83%). The highest number of ankle injuries is lateral ankle injury found in 43% of female athletes (21 athletes), followed by Chronic Ankle Injury (CAI) and medial ankle injury in 8 athletes (16%), and also talofibular syndesmosis tear and osteochondritis dissecans of the talus found in 8% and 2% of the athletes (4 and 1 athlete), respectively. From the data obtained, as many as 12 athletes who do not have a history of an ankle injury from 48 athletes (25%) received as many as 6 athletes who have a positive Beighton score out of 12 athletes (50%).

An evaluation was obtained with AOFAS scores on 48 athletes with ankle injuries, 12 athletes out of 48 athletes (25%) with ankle injuries in the excellent category. A total of 36 athletes out of 48 athletes (75%) who experienced ankle injuries were in a suitable class. In the evaluation with the AOFAS score, 75% of athletes have a reasonable interpretation.

DISCUSSIONS

From the overall sample, 168 (51%) female athletes were found, of which 141 (80%) had previous injuries. These data are in line with prior studies which stated that joint hypermobility, defined as the presence of an

excess range of motion (ROM) when associated with age, gender, and ethnic group, was more common in women than men (Francia et al. 2021; Gianakos et al. 2022). Women also have a higher chance of experiencing generalized joint laxity (GJL) and GJL. A positive Beighton score will tend to be more prone to ligament injuries and potentially have repeated injuries. Ankle injuries are the highest incidence in several sports in potential and professional athletes, and laxity has a high risk of ankle injuries and injuries to other appropriate joints for the sport.

Injuries most often occur in the ankle (28%) and knee (25%), several factors that can cause the ankle joint to be the most common joint injury experienced by professional female athletes are the type of movement in a sport that is dominated by running, jumping, and sudden changes in motion or while running suddenly are the highest contributing factors for ankle injuries (Arabnejad, Pourranjbar, and Yousefizarandi 2023; Hietamo et al. 2023).

The Beighton score is a measurement tool that is widely used to measure generalized joint laxity. These measurements are easy to perform and can provide reliable interobserver and interobserver results. In this study, after evaluating female professional athletes who had a positive Beighton score, then evaluating female professional athletes with positive Beighton scores who had a history of an ankle injury and no history of an ankle injury (Ganu and Tadge 2021; Malek, Reinhold, and Pearce 2021; Nathan, Davies, and Swaine 2018; Rejeb et al. 2019).

In this study, it was found that there was an increased risk of recurrent ankle injury in female professional athletes who had a previous history of ankle injury with a percentage of 74% based on the Beighton score. In addition, the Beighton Score was positive in 30 of 36 people (83%) who had a previous ankle injury and 6 of 12 people (50%) who did not have a prior ankle injury. From these results, female athletes with a history of an earlier ankle injury and a positive Beighton score were more at risk for recurrent ankle injuries. This may be due to several factors, but a Beighton score indicates a possible correlation between laxity represented by a positive Beighton score for ankle injuries, especially in athletes who have a history of previous ankle injuries.

The AOFAS score is the most widely used clinical scoring system to measure management outcomes in patients with ankle or back foot injuries, with 9 rating scales divided into 3 sub-scales of assessment pain, function, and alignment (Hijji et al. 2020; Paget et al. 2023). From the evaluation results with AOFAS scores on 48 athletes with ankle injuries, it was found that 12 athletes out of 48 athletes (25%) had ankle injuries in the excellent category and 36 athletes out of 48 athletes (75%) had ankle injuries in the excellent category. This is probably because some female professional athletes who have a history of ankle injuries complain of pain that only arises when doing specific movements during sports. The pain only appears when doing precise movements during sports but does not interfere functionally when used in daily activities. The professional athlete also did not find any anatomical misalignment in the ankle and back of the foot.

CONCLUSIONS

Evaluation of professional female athletes who have a history of ankle injury using the Beighton score and the AOFAS score is quite effective in assessing the risk of recurrent ankle injuries and a history of previous ankle injuries that affect the functional ability of the ankle.

AUTHOR CONTRIBUTIONS

ATD and RPP, both authors make the same contribution to data collection. RPP contributes more to manuscript preparation, writing, and data analysis. ATD contributes more to editing the manuscript and ethical clearance.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

ETHICAL APPROVAL

Letter of Exemption with Referral number 0819/LOE/301.4.2/II/2022 obtained from Dr. Soetomo General Hospital, Surabaya, Indonesia on March 12th 2022

REFERENCES

- Arabnejad, Najmeh, Mohammad Pourranjbar, and Mohammad Hosain Yousefizarandi. 2023. "Quantitative Study of Sports Injury Among Male and Female Athletes in Some Aerobic and Anaerobic Sports." *Journal of Population and Therapeutics and Clinical Pharmacology*. <https://doi.org/10.53555/jptcp.v30i17.2609>
- Bullock, Garrett S., Gary S. Collins, Nick Peirce, Nigel K. Arden, and Stephanie R. Filbay. 2020. "Playing Sport Injured Is Associated with Osteoarthritis, Joint Pain and Worse Health-Related Quality of Life: A Cross-Sectional Study." *BMC Musculoskeletal Disorders* 21(1). <https://doi.org/10.1186/s12891-020-3136-5>
- Francia, Piergiorgio, Sonia Toni, Giulia Iannone, Giuseppe Seghieri, Lorella Bonaccorsi, Ugo Santosuosso, and Barbara Piccini. 2021. "How Ankle Joint Mobility Changes in Young Soccer Players of Different Ages: A Time Series Analysis." *Journal of Physical Education and Sport* 21. <https://doi.org/10.7752/jpes.2021.s3277>
- Ganu, Sneha S., and Aishwarya B. Tadge. 2021. "Generalized Joint Hypermobility: A Review." *International Journal of Science and Healthcare Research* 6(3). <https://doi.org/10.52403/ijshr.20210708>
- Gianakos, Arianna L., Adam Abdelmoneim, Gino Kerkhoffs, and Mary K. Mulcahey. 2022. "Rehabilitation and Return to Sport of Female Athletes." *Arthroscopy, Sports Medicine, and Rehabilitation* 4(1). <https://doi.org/10.1016/j.asmr.2021.09.040>
- Halabchi, Farzin, and Mohammad Hassabi. 2020. "Acute Ankle Sprain in Athletes: Clinical Aspects and Algorithmic Approach." *World Journal of Orthopedics* 11(12). <https://doi.org/10.5312/wjo.v11.i12.534>
- Hietamo, Jussi, Anni Rantala, Jari Parkkari, Mari Leppänen, Marko Rossi, Ari Heinonen, Kathrin Steffen, Pekka Kannus, Ville Mattila, and Kati Pasanen. 2023. "Injury History and Perceived Knee Function as Risk Factors for Knee Injury in Youth Team-Sports Athletes." *Sports Health* 15(1). <https://doi.org/10.1177/19417381211065443>
- Hijji, Fady Y., Andrew D. Schneider, Michael Pyper, and Richard T. Laughlin. 2020. "The Popularity of Outcome Measures Used in the Foot and Ankle Literature." *Foot and Ankle Specialist* 13(1). <https://doi.org/10.1177/1938640019826680>

- Kemler, E., H. Valkenberg, and V. Goutteborge. 2019. "Stimulating Injury-Preventive Behaviour in Sports: The Systematic Development of Two Interventions." *BMC Sports Science, Medicine and Rehabilitation* 11(1). <https://doi.org/10.1186/s13102-019-0134-8>
- Liaghat, Behnam, Julie Rønne Pedersen, James J. Young, Jonas Bloch Thorlund, Birgit Juul-Kristensen, and Carsten Bogh Juhl. 2021. "Joint Hypermobility in Athletes Is Associated with Shoulder Injuries: A Systematic Review and Meta-Analysis." *BMC Musculoskeletal Disorders* 22(1). <https://doi.org/10.1186/s12891-021-04249-x>
- Malek, Sabeeha, Emma J. Reinhold, and Gemma S. Pearce. 2021. "The Beighton Score as a Measure of Generalised Joint Hypermobility." *Rheumatology International* 41(10). <https://doi.org/10.1007/s00296-021-04832-4>
- Nathan, Joseph Alexander, Kevin Davies, and Ian Swaine. 2018. "Hypermobility and Sports Injury." *BMJ Open Sport and Exercise Medicine* 4(1). <https://doi.org/10.1136/bmjsem-2018-000366>
- Paget, Liam D. A., Inger N. Siersevelt, Johannes L. Tol, Gino M. M. J. Kerkhoffs, and Gustaaf Reurink. 2023. "The Completely Patient-Reported Version of the American Orthopaedic Foot and Ankle Society (AOFAS) Score: A Valid and Reliable Measurement for Ankle Osteoarthritis." *Journal of ISAKOS* 8(5). <https://doi.org/10.1016/j.jisako.2023.07.003>
- Park, Kwang Hwan, Jin Woo Lee, Jae Wan Suh, Myung Ho Shin, and Woo Jin Choi. 2016. "Generalized Ligamentous Laxity Is an Independent Predictor of Poor Outcomes after the Modified Broström Procedure for Chronic Lateral Ankle Instability." *American Journal of Sports Medicine* 44(11). <https://doi.org/10.1177/0363546516656183>
- Prieto-González, Pablo, Jose Luis Martínez-Castillo, Luis Miguel Fernández-Galván, Arturo Casado, Sergio Soporki, and Jorge Sánchez-Infante. 2021. "Epidemiology of Sports-Related Injuries and Associated Risk Factors in Adolescent Athletes: An Injury Surveillance." *International Journal of Environmental Research and Public Health* 18(9). <https://doi.org/10.3390/ijerph18094857>
- Rejeb, Abdallah, Francois Fourchet, Olivier Materne, Amanda Johnson, Cosmin Horobeanu, Abdulaziz Farooq, Erik Witvrouw, and Rodney Whiteley. 2019. "Beighton Scoring of Joint Laxity and Injury Incidence in Middle Eastern Male Youth Athletes: A Cohort Study." *BMJ Open Sport and Exercise Medicine* 5(1). <https://doi.org/10.1136/bmjsem-2018-000482>
- Saccomanno, Maristella F., Mario Fodale, Luigi Capasso, Giampiero Cazzato, and Giuseppe Milano. 2013. "Generalized Joint Laxity and Multidirectional Instability of the Shoulder." *Joints* 1(4). <https://doi.org/10.11138/jts/2013.1.4.171>
- Sacks, Hayley A., Pooja Prabhakar, Lauren E. Wessel, Jessica Hettler, Sabrina M. Strickland, Hollis G. Potter, and Duretti T. Fufa. 2019. "Generalized Joint Laxity in Orthopaedic Patients." *Journal of Bone and Joint Surgery* 101(6). <https://doi.org/10.2106/JBJS.18.00458>
- Talpey, Scott W., and Emma J. Siesmaa. 2017. "Sports Injury Prevention: The Role of the Strength and Conditioning Coach." *Strength and Conditioning Journal* 39(3). <https://doi.org/10.1519/SSC.0000000000000301>
- Yeo, Eui Dong, Ji Young Park, Jin Hyeung Kim, and Young Koo Lee. 2017. "Comparison of Outcomes in Patients With Generalized Ligamentous Laxity and Without Generalized Laxity in the Arthroscopic Modified Broström Operation for Chronic Lateral Ankle Instability." *Foot and Ankle International* 38(12). <https://doi.org/10.1177/1071100717730336>



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