Proceedings of Scientific Research Universidad Anáhuac, 2022, 2(4): 29-41.
ISSN-e: 2954-3541.

Review Article

Anatomical zone where more injuries occur in four different dance styles: Hip-Hop, Classical Ballet, Contemporary dance and Irish dancing: a systematic review

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https://doi.org/10.36105/psrua.2022v2n4.04

ABSTRACT

Introduction: To this date there is no systematic study that reviews which anatomical zone has a higher incidence of injuries in four different dance styles: hip-hop, classical ballet, contemporary dance, and Irish dancing. **Objective:** Summarize and determine the incidence of injuries by anatomical zones in elite, pre-professional and professional dancers who practice one of the following dance styles: ballet, contemporary dance, hip-hop and Irish dancing. **Methods:** Articles were searched according to the following criteria: year of publication (between 2016 and 2022), observational and cohort studies published in English, full text available, and analysis of the incidence of injuries in the dance styles of hip-hop, classical ballet, contemporary dance, and Irish dancing. MESH terms and Boolean operators used for the search were "injury AND dancers AND incidence". Data sources: Databases used were ProQuest, Pubmed, Google Scholar, Elsevier, Clinical Key and ScienceDirect. **Results:** A total of 511 records were identified, and only 19 were included for the analysis. The results of the reviewed literature revealed that the ankle was the anatomical zone with the highest incidence to suffer an injury (62.9%), overuse injuries had a higher incidence rate (63%), and the joint/ligament was the most common musculoskeletal type of injury (36.84%). **Conclusion:** Overall, the lower extremity had the highest injury incidence rate; even though the four different dance styles have different techniques and biomechanics, the most reported anatomical zone to suffer an injury was the ankle.

Key words: injury; dancers; incidence.

RESUMEN

Introducción: Actualmente no existe una revisión sistemática cuyo enfoque sea identificar qué zona anatómica tiene mayor incidencia a lesiones al practicar cuatro estilos diferentes de danza: hip-hop, ballet clásico, danza contemporánea y

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Received: June 24, 2022.
Accepted: August 22, 2022.

danza irlandesa. **Objetivo:** Determinar y resumir la incidencia de lesiones por zonas anatómicas en bailarines semi-profesionales y profesionales que practican alguno de los siguientes estilos de danza: ballet, danza contemporánea, hip-hop y danza irlandesa. **Métodos:** Los artículos se seleccionaron de acuerdo con los siguientes criterios: año de publicación (entre 2016 y 2022), estudios observacionales de cohorte en idioma inglés, texto completo disponible y análisis de la zona anatómica con mayor incidencia a lesiones en uno de los cuatro estilos de danza mencionados anteriormente. Los términos MESH y operadores booleanos utilizados para la búsqueda fueron: "lesiones, bailarines e incidencia". Fuentes de información: Proquest, Pubmed, Google Scholar, Elsevier, Clinical Key, ScienceDirect. **Resultados:** Un total de 511 artículos fueron identificados, de los cuales solo 19 fueron incluidos en el análisis. El resultado de la literatura analizada reveló que el tobillo es la zona anatómica con mayor incidencia de lesión (62.9%), las lesiones crónicas y de sobreuso presentan una mayor tasa de incidencia (63%) y el tipo de lesión musculoesquelética más común es el del ligamento/articulación (36.84%). **Conclusión:** La extremidad inferior tuvo la mayor tasa de incidencia de lesiones. A pesar de que los cuatro estilos de danza seleccionados tienen una técnica y una biomecánica distinta, la zona anatómica que reporta mayor incidencia a sufrir una lesión es el tobillo.

Palabras clave: lesión; bailarines; incidencia.

INTRODUCTION

Dancing is a discipline that combines high athletic physical performance and in most dance styles, an aesthetic value. There are different styles of dance around the world, with different techniques and each style with a different vocabulary of movements, emphasizing the biomechanics of the movements and the attributes that each dance style has.[2,3,4]

Classical ballet is known for its rigorous technique, aesthetic, precise and fluid movements. Dancers who practice this discipline start from a young age and at approximately 15 years of age they can become a full-time dancer. This dance technique is the base for many other dance styles, and it has seven base movements: "étendre", "plié", "relevé", "toruner", "glisser" and "élance". These are key movements for the execution of the ballet method; it requires muscular resistance, balance, coordination, strength, and flexibility.[1,2,4,6]

Hip-Hop originated in the 70's in New York, United States, mainly practiced on the streets and nightclubs. Today it combines different techniques such as "breaking", "popping", "locking" and "freestyle". This movement technique is generally synchronized to the music, rhythm and often is exaggerated.[16,22,23,24]

Contemporary dance, also known as modern dance, is a style in which the dancer expressions come through the use of classical ballet techniques, incorporating free fluid movements; movements that make an aesthetic emphasis, which are versatile, demanding, and sometimes exceed the anatomical limits in certain positions.[9,15,26]

Finally, Irish dancing, known as "Riverdance" is a typically Gaelic dance. The movements of this dance style are characterized by an upright trunk, accompanied by rhythmic movements in the arms and explosive, rapid, rhythmic, and coordinated movements in the lower extremities.[11,12,13]

Due to the long hours of training, the repetitive and explosive movements, biomechanics and the demand of practice, dancers find themselves at risk of suffering an injury. The incidence of injuries in dancers is difficult to establish, since they vary depending on the dance style and the levels of difficulty, whether it is recreational, pre-professional or done at a professional level. Ballet, hip-hop, contemporary and Irish dancing were chosen to be analyzed in this study because of the past existing research, as they have a greater number of publications.

Dance injuries and anatomical zones with most incidences

Musculoskeletal injury is an inherent risk when practicing a physical activity. There is a higher risk of injury with increased levels of difficulty of a certain activity and time spent on the same activity. Across athletic populations there are different operational definitions of musculoskeletal injury, "dance injury" has been a topic of research,

https://doi.org/10.36105/psrua.2022v2n4.04

however there is a lack of information because researchers have not agreed on how to define the term injury in the dancing population.[2,4,17]

Soft tissue pain and injury to muscle, ligament, and tendon, account for the mayor reported complaints with most pain and injury.[12] Past research has demonstrated that overuse and chronic injuries are the most common injuries in dancers since they develop progressively. The definition of an overuse injury is based on the concept of an injury that occurs in the absence of a single, undefinable traumatic cause.[2,17] There are three different definitions that have been used in the epidemiological research of sports to categorize the different injuries that can occur in athletes.[11,17,19]

1. *Time-loss injury:* anatomical tissue level impairment that results in the incapacity to participate in training, performance, or competition.

2. *Medical-attention injury:* anatomical tissue level impairment that results in the individual seeking the care of a health professional.

3. *All-complaints injury:* any physical complaint leading to difficulties participating in normal physical activity.

There are different factors that put dancers at risk of suffering an injury. According to different authors such as Steinberg, Vassallo, and Gamboa, the most common risk factors are increased hours of training, a previous injury, hypermobility, and poor technique.[1,3,4] Many studies relate the greater exposure to dance, whether in training, rehearsals, presentations, or competitions, to a greater vulnerability to injury.[3,8,9,11,13]

The objective of this review is to determine the incidence of injuries by anatomical zones in elite, pre-professional and professional dancers who practice one of the following dance styles: ballet, contemporary dance, hip-hop and Irish dancing.

METHODS

Literature search

This review was done according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.[30,31,32]

Search strategy

The databases used to search for records were ProQuest, PubMed, Google Scholar, Elsevier, ClinicalKey, and ScienceDirect. MESH terms and Booleans operators used for search were “injury AND dance AND incidence”, studies published in English and Spanish.

Eligibility criteria

Studies with the year of publication between 2016 and 2022, observational studies published in English and Spanish, which studied injury incidence in elite, pre-professional and/or professional dancers, and which included injury definition and classification of the anatomical zone that is most likely to suffer an injury in the dance styles of hip-hop, classical ballet, contemporary dance and Irish dancing. In addition, studies that reported injuries per 1000 hours of dance exposure were also included in the study. Systematic reviews, articles that studied dance in a recreational level, that had a pediatric population and did not register injuries reported per dance exposure hours, were excluded.

Study selection

Three researchers individually identified records, and if necessary, decisions to include or not a record were made through consensus.

Quality assessment

The appraisal of the records was done by one researcher using the Appraisal Tool for Cross-Sectional Studies (AXIS tool).[33] Researchers had full access to all records, appraisal, and data extraction spreadsheets through a Google Drive folder. A meta-analysis was not possible due to the heterogeneity of the sample size, population, outcomes, and measurement instruments.

RESULTS

Figure 1 shows the record selection process. A total of 511 records were identified. After duplicates were removed, 466 records remained and 436 records were excluded after the tittle and/or abstracts review was performed. The

full texts of the remaining records (30) were assessed. After the full text assessment, 11 records were further excluded: six for the population studied, three for not including injury definition, and two for the amount of hours exposed to dance. Only 19 records were included in the analysis. The data is summarized in Table 1.

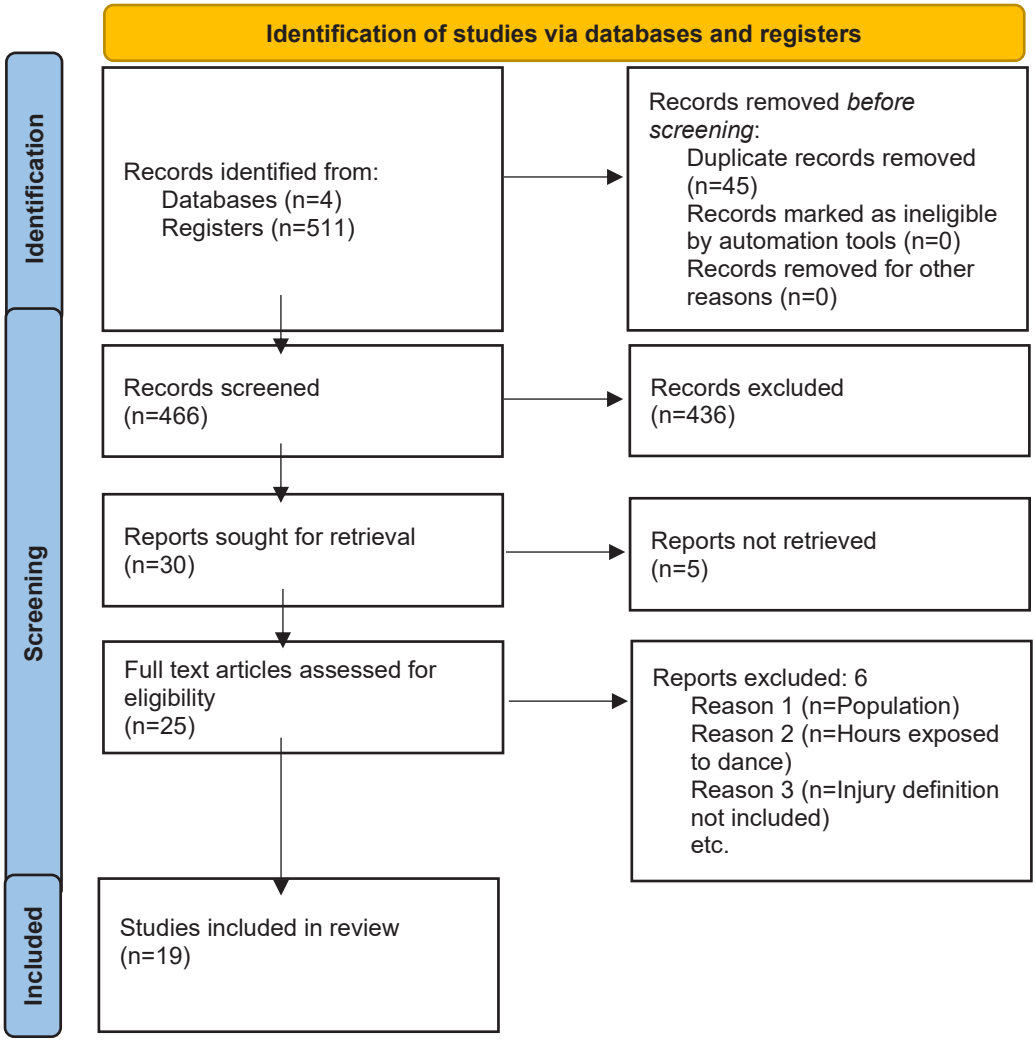

FIGURE 1. Diagram of search Strategy. PRISMA flow diagram depicting the literature search for this systematic literature.

https://doi.org/10.36105/psrua.2022v2n4.04

Table 1. Overview of the outcome and main findings in 19 studies included in the systematic review.

	Author	Year	Country	Dance Style	Population	Anatomical zone with most incidence	Injury Definition with most incidence	Instrument of measure
1	Adinda K E Mailuhu And Van Rijin, Rogier	2021	Netherlands	Contemporary Dance	N=91 (All male study)	Ankle Injury 78%	Time Loss Injury	Oslo Sports Trauma Research Centre Questionnaire (OSTRC)
2	Bronner, Shaw and Bauer, Naomi	2016	United States of American	Contemporary Dance	N=180 (140 female, 40 male)	Hip/Groin - 20.17% Knee - 12.29% Foot - 12.17%	Medical Attention	Beighton scoring Functional Movement Screen (FMS)
3	Bronner, Shaw and McBride Caroline	2021	United States of America	Contemporary Dance	N=180 (140 female, 40 male)	Medical Attention 1. Low back 2. Pelvis 3. Sacrum Time Loss 1. Low Back, pelvis and sacrum (10.99%) 2. Ankle 10.64% 3. Knee /10-28%)	Medical Attention 58% TL 41%	Self-made questionnaire
4	Cahalan, Roisin and Kearney Phillip	2018	Ireland	Irish and Contemporary Dance	Contemporary Dancers (CD) N=30 (28 female, 1 male) Irish Dancers (ID) N=27 (20 female, 1 male)	CD=17.4 % Knee Injuries, 12.9% Ankle injuries ID=23.9 % Ankle injuries, 15.9% knee injuries	TL	Oslo Sports Trauma Research Centre Questionnaire (OSTRC)
5	Cahalan, Roisin and Bargary Norma	2019	Ireland	Irish Dance	N=37 (33 female and 4 male)	86.5% ankle/foot Injury	TL	Oslo Sports Trauma Research Centre Questionnaire (OSTRC) and Athletic Sleep Questionnaire
6	Cahalan Roisin; Bargary Norma and O'Sullivan Kieran	2018	Ireland	Irish Dance	N=37 (33 female, 4 male)	Ankle/Foot (42.8%) Knee (11.1%) Calf (9.6%)	MA	Subjective Health Complaints Inventory Coping Strategies Questionnaire
7	Fuller M; Moygle G, and Minett G.	2019	Australia	Ballet and Contemporary dance	N=19 (16 female, 1 male)	Ankle - 17.69% Knee - 16.81% Hip - 13.45%	MA	Orchard Sports Injury Classification System (OSICS) Subsequent Injury Categorization (SIC)

8	Jeffries, Annie C and Coutts, Aaron J	2020	Australia	Contemporary dance	N = 16 (9 female, 7 male)	Medical Attention Injury 1. Knee 16-5% Time Loss Injury 1. Ankle 25.5%	MA - 95% TL - 95%	Orchard Sports Injury Classification System (OSICS)
9	Jubb, Caroline and Leann Bell	2019	United Kingdom	Hip-Hop	N = 73 (45 females, 28 males)	Knee - 36% Lumbar spine (L5-S1) - 19% Ankle - 15%	MA	Orchard Sports Injury Classification System (OSICS)
10	Kenny, Sarah J and Critchley, Meghan L	2021	Canada	Ballet and Contemporary dance	Ballet N = 85.77 Contemporary N= 60.58 (135 females, ? males)	Ankle - 22% Knee - 21% Foot 12%	SC	Modified Oslo Sports Trauma Research Centre Questionnaire on Health Problems; (mOSTRCQ)
11	Lee, Linda and Reid Duncan	2017	New Zealand	Ballet and Contemporary dance	N = 66 (40 females, 26 males)	Lower Limb – 68% 1. Ankle 2. Knee 3. Foot 4. Hip	TL	MCS screening and scoring
12	Mattiussi, Adam M and Shaw, Joseph W	2021	United Kingdom	Ballet	N = 123 (66 females, 57 men)	Ankle 100%	MA 63% TL 50%	Orchard Sports Injury Classification System (OSICS)
13	Novosel Bozidar and Sekulic Damir	2019	Croatia and Slovenia	Ballet	N = 99 (58 female, 41 male)	Ankle - 36.5% Calf - 14.6% Knee - 12.5% Foot - 12.5%	TL	Self-made questionnaire
14	Pi-Yin Huang and Chia-Wei Lin	2022	Taiwan	Ballet	N = 249 (all female)	Ankle - 34.5% Knee - 27.7% Foot - 12-7%	MA	Self-made questionnaire
15	Tjukov, Olga and Engeroff	2020	Germany	Hip-Hop	N = 146 (67 female, 79 male)	Knee - 52% Groin - 13% Ankle - 9%	TL	Self-made questionnaire
16	Tsiouti Nefeli and Wyon Matthew	2021	United Kingdom	Hip-Hop (break dance)	N = 320 (48 female, 272 male)	Arm-Hand (40.6%) Shoulder (35.9%) Knee (32.3%) Ankle (15.6)	TL	Fit to Dance 2 Dancers & Dance Students survey by Dance UK
17	Ursej, Eva and Sekulic, Damir	2019	Slovenia	Hip-Hop	N = 129 (114 females, 15 male)	Knee - 42% Lower back - 32% Ankle - 15%	TL	Oslo Sports Trauma Research Center Overuse Injury Questionnaire (OSTRC)
18	Van Seters Christine and Van Rijn Rogier	2017	Netherlands	Contemporary dance	N = 45 (28 females, 17 male)	Ankle/Foot - 20.5 to 28% Knee - 16 to 21.4% Lower back - 13.4 to 17%	TL	Oslo Sports Trauma Research Center Overuse Injury Questionnaire (OSTRC)
19	Van Winden Diana, and Van Rijn Rogier	2019	Netherlands	Contemporary dance	N = 134 (all female)	Ankle/Foot - 30% Lower back - 17% Knee – 15%	TL	Oslo Sports Trauma Research Center Overuse Injury Questionnaire (OSTRC)

N, sample; TL, time-loss; MA, medical attention; SC, self-complaint, OSTRC, Oslo Sports Trauma Research Centre Overuse Injury Questionnaire; OSICS, Orchard Sports Injury Classification System; mOSTRCQ, Modified Oslo Sports Trauma Research Centre Questionnaire on Health Problems.

https://doi.org/10.36105/psrua.2022v2n4.04

As a result of the reviewed literature, the anatomical zone with the highest incidence to suffer an injury is the ankle (62.9%). Throughout this research it was observed that ballet, contemporary and Irish dance, had a higher incidence injury rate located in the ankle (70.12%), followed by the knee (29.8%). While in hip-hop, the ankle was the second or third anatomical zone to suffer a musculoskeletal injury (25.1%); in this specific dance style, the knee was the anatomical region with a higher percentage (74.8%) of suffering an injury. The type of musculoskeletal injury with the highest incidence of injury is the joint/ligament (36.84%), followed by the muscle (26.31%).

In the reviewed studies, we found that 63% of the injuries were classified as overuse.[8,9,10,11,13,14,18,19,20,21,24,26]

Study characteristics

Publication dates range from 2016 to 2022. Three records were from the Netherlands, three from the United Kingdom, three from Ireland, two from the United States of America, two from Australia, one from Slovenia, one from Croatia, one from Canada, one from Germany, one from New Zealand and one from Taiwan.

Population studied

Regarding the population (Total n=2,147), five records only involved contemporary dancers (n=646; 451 female and 195 male);[8,9,10,15,25,26] two records involved Irish dancers (n=74, 66 female and 8 male),[12,13] and one record studied both contemporary and Irish dancers (n=57, 55 female and 2 male).[11] Three records only involved classical ballet dancers (n=471, 373 female and 98 male),[19,20,21] and three combined contemporary and ballet dancers (n=230, 190 females and 40 males).[14,17,18] The rest involved hip-hop dancers (n=595, 229 female and 366 male).[16,22,23,24]

Instruments used to measure

Six records used the Oslo Sports Trauma Research Centre Questionnaire (OSTRC), four used the Orchard Sports Injury Classification System (OSICS), one used the Modified Oslo Sports Trauma Research Centre Questionnaire on Health Problems (mOSTRCS). Four used a self-made questionnaire, another used the Fit to Dance 2 Dancers & Dance Students survey by Dance UK, another used the MCS screening and scoring and one used the Beighton Scoring Functional Movement Screen (FMS). One record used two questionnaires, the Subjective Health Complaints Inventory and the Coping Strategies Questionnaire.

Record appraisal

All records had clear objectives and had an appropriate study design for those aims.[8-26] Only eleven records studied pre-professional dancers,[8-26] six involved professional dancers[15,16,18,19,20,22,23] and the last two elite dancers.[12,13]

All risk factors and outcome variables were properly measured according to the aims of the studies.[8-26] Dance exposure was measured by weekly hours over /1000 hrs.[8-26] Two records examined the dancing population for five years,[16,22] other two records for four years,[9,10] one record during three years,14 another one during two years,[21] and the rest during a year.[8-26] All records were assessed through AXIS tool, the record appraisal. The summary of the record appraisal is shown in Table 2,3.

TABLE 2. Record appraisal.

	Authors	Aims/ Clear objectives	Study design appropriate for the stated aim(s)	Sample size justified	Target population defined	Sample appropriate to represent the target population	Selection process of participants likely to represent the target population	Measures undertaken to address non responders	Risk factors and outcome variable measure appropriately to the aims	Clear statistical significance defined
1	Adinda K E Mailuhu	YES	YES	NO	YES	YES	YES	NO	YES	YES
2	Bronner, Shaw and Bauer, Naomi	YES	YES	YES	YES	YES	YES	NO	YES	YES
3	Bronner, Shaw and McBride Caroline	YES	YES	YES	YES	YES	YES	NO	YES	YES
4	Cahalan, Roisin and Kearney Phillip	YES	YES	NO	YES	NO	YES	NO	YES	YES
5	Cahalan, Roisin and Bargary Norma	NO	YES	YES	YES	NO	YES	No non-responders	YES	YES
6	Cahalan Roisin; Bargary Norma and O'Sullivan Kieran	YES	YES	YES	YES	NO	NO	No non-responders	YES	YES
7	Fuller M; Moygle G, and Minett G	YES	YES	NO	YES	NO	YES	No non- responders	YES	YES
8	Jeffries, Annie C and Coutts, Aaron J	YES	YES	YES	YES	YES	YES	No non-responders	YES	YES
9	Jubb, Caroline and Leann Bell	YES	YES	YES	YES	YES	YES	No non-responders	YES	YES
10	Kenny, Sarah J and Critchley, Meghan L	YES	YES	YES	YES	YES	YES	NO	YES	YES

https://doi.org/10.36105/psrua.2022v2n4.04

11	Lee, Linda and Reid Duncan	YES	YES	NO	YES	NO	YES	NO	YES	YES
12	Mattiussi, Adam M and Shaw, Joseph W	YES	YES	NO	YES	YES	YES	YES	YES	YES
13	Novosel Bozidar and Sekulic Damir	YES	YES	NO	YES	YES	YES	NO	YES	YES
14	Pi-Yin Huang and Chia-Wei Lin	YES	YES	YES	YES	YES	YES	No non-responders	YES	YES
15	Tjukov, Olga and Engeroff	NO	YES	NO	YES	YES	YES	NO	YES	YES
16	Tsiouti Nefeli and Wyon Matthew	YES	YES	NO	YES	YES	YES	NO	YES	YES
17	Ursej, Eva and Sekulic, Damir	YES	YES	NO	YES	YES	YES	No non-responders	YES	YES
18	Van Seters Christine and Van Rijn Rogier	YES	YES	YES	YES	YES	YES	No non-responders	YES	YES
19	Van Winden Diana, and Van Rijn Rogier	YES	YES	YES	YES	YES	YES	YES	YES	YES

TABLE 3. Continuation of record appraisal.

	Methods described sufficiently to be repeated	**Basic data described**	**Response rate described**	**Ifappropriate, information about non responders described**	**Results internally consistent**	**Presence of results for the analyses described**	**Discussion and conclusions justified**	**Limitations discussed**	**Fundingor conflict of interests that could affect results**	**Ethical approval or informed consent attained**
1	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES
2	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES
3	YES	YES	NO	YES	YES	YES	YES	YES	NO	NO
4	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES
5	YES	YES	YES	No non-responders	YES	YES	YES	YES	NO	YES

6	YES	YES	YES	No non-responders	YES	YES	YES	YES	YES	YES
7	YES	YES	YES	No non-responders	YES	YES	YES	YES	NO	YES
8	YES	YES	YES	No non-responders	YES	YES	YES	YES	NO	YES
9	NO	YES	YES	No non-responders	YES	YES	YES	YES	NO	YES
10	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES
11	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES
12	YES	YES	NO	YES	YES	YES	YES	YES	NO	YES
13	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES
14	YES	YES	YES	No non-responders	YES	YES	YES	YES	YES	YES
15	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES
16	YES	YES	YES	NO	YES	YES	YES	YES	NO	YES
17	YES	YES	No non-responders	YES	YES	YES	YES	YES	YES	YES
18	YES	YES	YES	No non-responders	YES	YES	YES	YES	NO	YES
19	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

DISCUSSION

Generally, in dancers, the injuries in the distal lower extremity and joint/ligament tissue types demonstrate the greatest burden across all dancers.[19] The findings of this review indicate that the ankle is the anatomical zone with the highest incidence injury rate in elite, pre-professional and professional dancers while participating in one of the following dance styles: classical ballet, contemporary or modern dance, Irish dancing and hip-hop. The ankle has a 62.9% injury incidence, followed by the knee with 37%. This proves that the information granted in other systematic reviews, like Moita and Smith is correct.[1,5,6]

Each one of the dance styles analyzed in this review has a different movement pattern, a corresponding technique, and specific biomechanics. Thus, being essential to question if the same anatomical zone will have the same exposure to suffering an injury in different dance styles. Past systematic reviews and observational studies have analyzed separately one or two dance styles, this may be because there is a similarity in the technique of some dances, like ballet, contemporary and Irish dancing. Throughout this research it was observed that these three dances (ballet, contemporary and Irish dancing) had a higher injury incidence rate located in the ankle (70.12%), followed by the knee (29.8%). While in hip-hop, the ankle was the second or third anatomical zone to suffer a musculoskeletal injury (25.1%). In this specific dance style, the knee was the anatomical region with a higher percentage (74.8%) of suffering an injury.

The ankle significantly contributes to the function of the entire lower limb, supporting the weight of the body while being static during movement. This joint plays an important role in the biomechanics when dancing; it requires stability and mobility for the performance to be aesthetically pleasing, but with explosive movements. Dancers spend most of the time in extreme positions, especially during plantar flexion and dorsiflexion of their ankle. The common and expected plantar flexion range of motion in average adults is 35 degrees, while the expected dorsiflexion is 20 degrees. In elite, pre-professional and professional dancers the range of motion of these movements can go up to 90 degrees.[28,29] Dancers use the foot to reach extreme external rotations while the ankle needs to twist either on the air or on the ground, as a result, the stress placed in this joint leads to a higher risk of injury. Also, during *pointe* positions, the dancers have a reduced base of support, causing an overload in the joint, ligaments and muscles.[21,25]

Elite, pre-professional and professional dancers go through individualized exposure hours of class, rehearsals and performance.[19] Usually the amount of hours of dance exposure may increase when performance season and competitions

https://doi.org/10.36105/psrua.2022v2n4.04

begin. Past research has demonstrated that there is a relationship between increased dance exposure and dance injury. The reviewed studies defined dance exposure as the time during which the individuals studied were at risk of injury, therefore the hours exposed to dance were taken into consideration in the different studies.[2,7,17]

Injury definitions and registration methods are very important to the athletic community, the severity of injuries impacting elite, pre-professional and professional dancers can vary depending on the definition of injury. Recent studies involving pre-professional and professional dancers have reported that the injury prevalence can vary depending on the definition of injury used.[12,13,14,17]

Sadly, some dancers think they can manage their own injuries, and are not willing to access professional medical help, which leads to dancers being reluctant to cease dancing when injured.[11,12] Unfortunately, in the dancing community there is a limited number of studies that factor in the classification of injury definition, this is a burden because it creates a lack of information. It is imperative that injury surveillance systems consider injury definitions.

Strengths

To the authors knowledge, this is the first systematic review that analyzes the anatomical zone with higher injury incidence in elite, pre-professional and professional dancers who participate in one of the four different dance styles analyzed: ballet, hip-hop, contemporary and Irish dancing. Another major strength of this research is the inclusion of injury definition as an important variable in many of the articles; it is a step forward for researchers to include in future studies.

Limitations

One of the limitations of this study was the heterogeneity of the reviewed studies as well as the lack of information in the dance styles of hip-hop and Irish dancing, compared with classical ballet and contemporary dance. There is not much research about the injury incidence in the first two dance styles mentioned above.

Another limitation for this study as seen in the reviewed literature, is the lack of specific injury instrument measurements and questionnaires for dancers. Due to the lack of specific instruments, many of the studies used different types of surveys to measure injuries in dancers, which extend from validated instruments to self-made questionnaires, thus adding some bias to the reported results. In addition, the population in some studies experienced negative consequences when reporting an injury, and did not answer adequately the given surveys, out of fear of not being able to participate in a performance.[11,12,19] Therefore, the authors consider essential for surveys to include a classification of injury definition, as well as the type of injury the dancer is suffering (ligament, joint, fracture, sprain, muscle, tear, etc.) for a clear understanding of the studies.

CONCLUSIONS

The findings of this study reveal that the lower extremity has a higher incidence rate to suffer an injury in four different dance styles with different techniques. The ankle was the anatomical zone with the highest incidence rate to suffer an injury, followed by the knee. Still, the incidence of injuries in elite, pre-professional and professional dancers can vary depending on the biomechanics, dance exposure and injury definition.

The main contribution of this study found that the lower extremity presented the highest injury incidence rate in the four dance styles analyzed. Concluding that dancers, instructors, physicians, and physical therapists must dedicate a greater attention to the anatomical zones in the lower extremity, in order to prevent injuries and to extend dancers artistic life and career.

CONFLICTS OF INTEREST

The authors declare no conflict of interests.

FUNDING

No funding was received for the completion of this paper.

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