

The Examination of Injuries in Dancers

E. Anagnostopoulou, Eir. Argiriadou, F. Mavrovouniotis, A. Mavrovouniotis

Abstract—The purpose of the present study was to examine the incidence of the injuries in dancers. A hundred and sixty eight dancers (135 women and 33 men) 23.17 ± 6.43 years old, members of different dancing clubs, participated in the research. All the subjects participated only in dancing programs for learning, performing and practicing in any kind of dance and no other form of physical activity, and filled the instrument of measurements concerning general questions as well as questions about injury incidence. For data analysis, *descriptive analysis* and *Pearson chi-square test* of the *SPSS version 17 for windows*, were used. From the results it was shown that the biggest percentage of dancers take hip-hop (25.1%) and Latin American lessons (18.6%). Moreover, the dancers are involved in European dances, classic ballet, modern dance, oriental dances and Greek dances. The subjects participated in dance programs for 4.44 ± 4.45 years, 3.16 ± 1.63 days a week, for 2.29 ± 1.30 hours a day. According to the dancers' statements, 44.62% of them have suffered an injury. The most usual kinds of injuries are muscle strains (22.9%), muscular spasms-cramps (20.15%), callus (13.18%), sprains (12.53%), blisters (11.80%) and abrasions (11.10%). Also, in smaller percentages follow the fractures (3.48%), hematomas (3.48%) and dislocations (1.38%). The most significant causes of the injuries are poor warming-up (21.92%), fatigue (16.64%), clumsiness (15.68%), bad technique (10.48%), and concentration (10%), and in smaller percentages performance pressure (7.12%), shoes (5.2%), partner and floor (4.8% both), hour of the day (1.44%), as well as competition and space tightness (7.96% both). Most of the dancers of the present sample (34%), who had an injury, overcame it with medication, 25% needed further medical examinations and 20% overcame the injury with rehabilitation. 16% of the dancers needed rest, while fortunately, only 5% overcame the injury with a surgery. Finally, most of the dancers of the present sample (63.76%) consider that dance teachers, as well as dancing clubs, are concerned very much with injuries prevention (63.76%). Consequently, recognizing, resolving, but above all, preventing the causes of injuries is very important concerning injuries' avoidance, good physical condition of dancers, reduction of training time loss, continuation of professional career, and continuation of dancing activity of those who have finished their career or are not professionally engaged in dancing.

Index Terms—hip-hop, latin American dances, European dances, classic ballet, modern dance, Greek dances, oriental.

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I. INTRODUCTION

Dancing is a performing art form consisting of purposefully selected sequences of human movement. This movement has aesthetic and symbolic value, and is acknowledged as dancing by performers and observers within a particular culture. Dancing can be categorized and described by its choreography, by its repertoire of movements, or by its historical period or place of origin. An important distinction is to be drawn between the contexts of theatrical and participatory dancing, although these two categories are not always completely separate; both may have special functions, whether social, ceremonial, competitive, erotic, martial, or sacred/liturgical. Other forms of human movement are sometimes said to have a dance-like quality, including martial arts, gymnastics, cheerleading, figure skating, synchronized swimming, marching bands, and many other forms of athletics [1].

Dancing is the movement of the body in a rhythmic way, usually to music and within a given space, for the purpose of expressing an idea or emotion, releasing energy, or simply taking delight in the movement itself [2]. Dancing is a set of actions that requires muscular assembly, the right distribution of energy, control and strength, the unification and harmonization of the inner and psycho-emotional world with the conscious movement in order to create a balanced and "thinking" dancer [3].

Dancing is an artistic creation that is directly connected to the natural environment, the society, the history of every place, but at the same time serves the individual need for entertainment, rest and pause from everyday life's monotony. It is a collective form of expression of emotions, a source of popular culture, a way of physical exercise [4]. Dancing as a physical activity is consisted of individual elements, such as music, rhythm and movement, which complement each other and together constitute an indissoluble and unique whole [5]. In addition, dancing is a physical activity, highly demanding in most styles, that represents a unique balance of sports and artistry.

Moreover, dancing is one of the most practiced activities among children and adolescents. Dancers are among the 30 to 50 million unpaid performers in the U.S. who entertain the spectators with their grace, beauty, and talent every year [6]. In the UK approximately 16 thousand young people study dance, while approximately 3000 young dancers are currently engaged in fulltime dance training and close to 100 universities offer dance as a single subject area. As an industry, dance employs in region of 30 thousand individuals in the UK alone, as dancers, teachers, managers and choreographers [7], [8].

Dancing, as a physical exercise always involves the risk of an injury. The risk of injury appears to be proportional to

the level of the dancer (beginner-experienced), because as the training hours increase, the risk of exposure to injury becomes greater [9]. The sports accident usually occurs during the maximum performance of the human body. It usually injures the musculoskeletal system, but also the injured dancer's psyche is affected [10]. The injury results in lost hours of practice and performances, but beyond that, due to the injury the dancer loses his personal pleasure [11].

Injuries that incurred during sports and recreation represent a significant public health problem, and while much information is available about the major organized sports, there is little information about activities which are more loosely organized or have lower injury or participation rates. So, dancers have received little attention in the health literature [12], [13], [14]. In addition, most information is available from ballet which has probably been the most studied dance style regarding injuries and contributes to the understanding of the dance injury mechanisms and can be useful in the treatment and diagnosis of injuries in other dancing disciplines [13]. However, more research is needed in order to examine injuries of different dancing styles.

Thus, due to the problems resulting from an injury and also because of the massive participation in various dancing styles, the importance of the injuries to the evolution of the dancers is revealed. For these reasons, the present study is concerned with the kind, causes and treatment of dancing-related injuries, with ultimate goal the prevention of injuries.

II. MATERIALS AND METHOD

A. Subjects

From all the dancing clubs in the city of Thessaloniki, 10 were chosen randomly. From the lists of the members kept in each club, 200 members, 20 members from each club, that fulfilled the inclusion criterion, that is participating only in dancing programs for learning, performing and practicing in any kind of dance for professional or recreational purpose and no other form of physical activity, were randomly chosen. Subsequently, a communication/invitation to each chosen member, in regard to the research was made. After that, a total of a hundred and eighty three (183) dancers volunteered to participate in the research.

A written consent for the participation in the research was obtained from each subject. Fifteen subjects, who were found to fulfil the exclusion criterion, meaning extra participation in exercise programs, were excluded from the research. Finally, a hundred and sixty eight (168) healthy members (135 women and 33 men) participated in the research. Subjects' age ranged from 12 to 50 years ($M=23.17$, $SD=6.43$).

B. Procedures

An approval for conducting the research was given from the responsible person of each dancing club, after the aim and the conditions of the research were described. The procedures were in agreement with the ethical standards of the Declaration of Helsinki of the World Medical Association (2000).

All the dancers came to the club where they were members, in scheduled hours. Before the beginning of the

research, a description of general requirements was given and the aim of the research was also described to the participants without any briefing relative to previous research findings. The instrument was also presented and the instructions were given. The need for absolute honesty and precision was particularly emphasized. A research assistant was present while the subjects were filling in the questionnaires in order to give any essential clarifications if needed.

C. Instrument of measurements

The instrument of measurement is a self-report scale designed to examine the incidence of factors affecting dancers' injuries. The instrument of measurement includes general questions like dancers' anthropomorphological characteristics, times of involvement with dancing, warming up implementation, duration of warming up, as well as questions concerning injuries occurrence, kind of injuries, injuries cause and treatment etc. The instrument of measurement was completed in scheduled hours in each dancer's club.

D. Data Analysis

For the statistical analysis the statistic packet SPSS/PC Version 17.0 for windows was used. Descriptive analysis, frequencies, as well as the non-parametric test chi square (χ^2) were used. The level of significance was set to $p<0.05$.

III. RESULTS

In Table I are presented the anthropomorphological characteristics of the subjects of our sample.

Table I. Sample's anthropomorphological characteristics

Variables	Dancers (N=168)
Age (year)	23.17±6.43
Height (m)	1.68±0.09
Weight (Kg)	58.68±12.27
Body Mass Index (BMI) (Kg/m ²)	20.69±2.82

In Fig. 1 is presented the distribution of the sample according to their age.

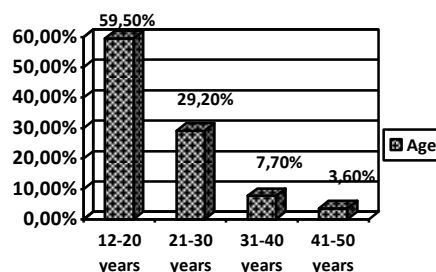


Figure 1. Sample's distribution according to age

As it is shown in Fig. 1 the age of the biggest percentage of the sample ranges from 12 to 20 years. Moreover, the time that the subjects participate in dancing programs is presented in Table II.

Table II. Participation in dancing programs

Variables	Dancers (N=168)
Years	4.44±4.45
Days a week	3.16±1.63
Hours a day	2.29±1.30

As it is shown in Table II, the subjects have been participating in dancing programs for several years (4.44±4.45 years), with maximum participation 31 years that is a whole life. The mean number of days the subjects participate in dancing programs is 3.16±1.63 days a week, for 2.29±1.30 hours a day. In addition, in Fig. 2 is presented the kind of dance the dancers participate in.

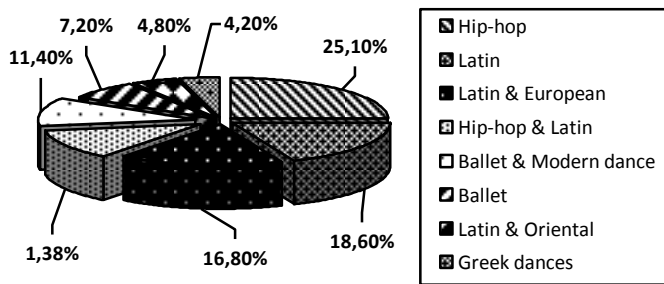


Figure 2. Kind of dance

As it is shown in Fig. 2, dancers' bigger percentage is involved with hip-hop, as well as hip-hop and Latin American dances (25.1% and 12%, respectively), with Latin American dances (18.6%), with Latin American dances and European dances (16.8%), and with classic ballet and modern dance (11.4%). In addition, in a smaller percentage dancers engage only in classic ballet (7.2%), in Latin American and oriental dances (4.8%) and in Greek dances (4.2%). In Fig. 3 are presented the statements of the subjects of whether they warm up before the dance training or not.

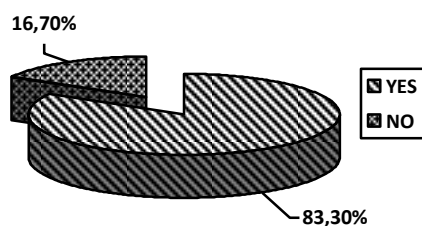


Figure 3. Sample's statements of warming up implementation

As it is shown in Fig. 3, the 5/6 of the sample declares that during dancing sessions warming up is implemented. Subsequently, in Fig. 4 is presented the duration of warming up, concerning the dancers who do a warming up.

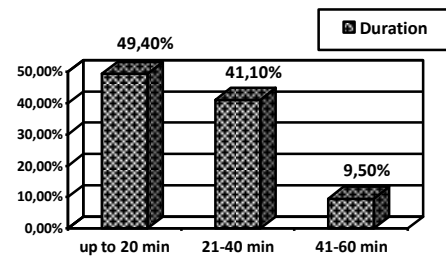


Figure 4. The duration of warming up

As it is shown in Fig. 4, almost half of the dancers, prepare for the dance training, warming up for approximately 20 minutes. In addition, 4/10 of the dancers who warm up, prepare themselves doing a warming up for 21 to 40 minutes, while almost 1/10 warm up for approximately an hour. In addition, in Fig. 5 is presented the frequency of the injuries.

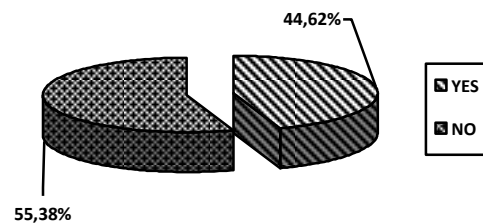


Figure 5. Sample's statements of injury occurrence

As it is shown in Fig. 5, the biggest percentage of the dancers of the present sample didn't refer to any injury (55.38%). In contrast, 44.62% of the dancers, a very significant percentage, have suffered an injury, according to their statements. In addition, possible differences and correlations between warming-up implementation and the occurrence of injuries were examined by *Pearson chi-square test* (χ^2). The analyses did not show a significant effect of warming-up on injuries' existence. Subsequently, in Fig. 6, is presented the part of the body that is injured, according to the dancers who have been injured.

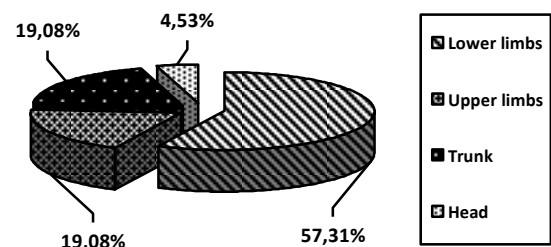


Figure 6. Injured part of the body

As it is shown in Fig. 6, the most usually injured part of the body, according to the dancers who have been injured, are lower limbs (57.31%), upper limbs and trunk with the same percentages (19.08% both), and head with a much smaller percentage (4.53%). In addition, in Fig. 7, is presented the kind of injury according to the dancers who have been injured.

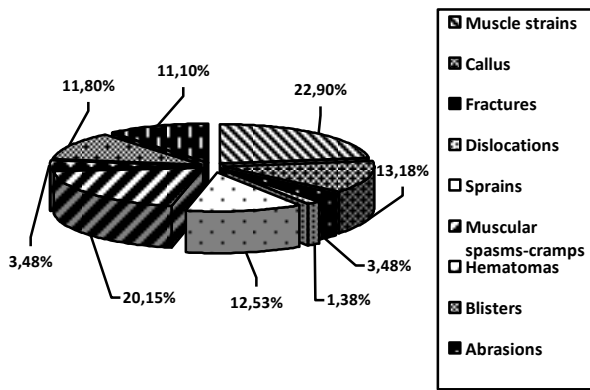


Figure 7. Kind of injury

As it is shown in Fig. 7, the most usual kinds of injuries, according to the dancers who have been injured, are muscle strains (22.9%), muscular spasms-cramps (20.15%), callus (13.18%), sprains (12.53%), blisters (11.80%) and abrasions (11.10%). Then follow in smaller percentages the fractures (3.48%), hematomas (3.48%) and dislocations (1.38%). Moreover, in Fig. 8 are presented the causes of the injuries according to the subjects' statements.

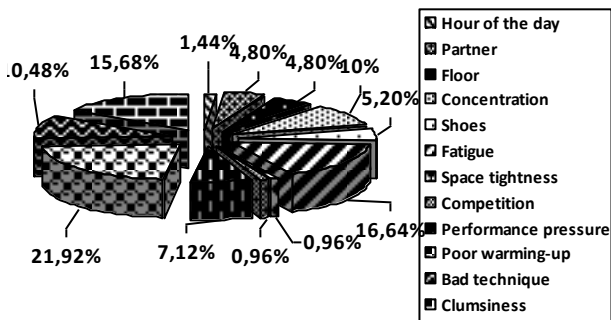


Figure 8. Injuries cause

As it is shown in Fig. 8, the most significant causes of the injuries are the poor warming-up (21.92%), fatigue (16.64%), clumsiness (15.68%), bad technique (10.48%), and concentration (10%). Then follow, in smaller percentages, performance pressure (7.12%), shoes (5.2%), partner and floor (4.8% both), hour of the day (1.44%), as well as competition and space tightness (7.96% both). In Fig. 9 is presented the treatment of the injuries according to the subjects' statements.

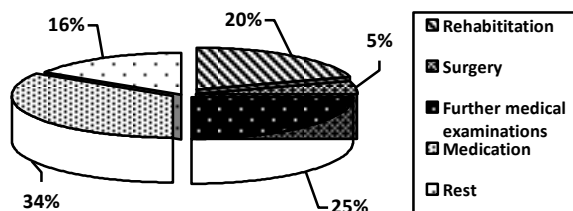


Figure 9. Injuries treatment

As it is shown in Fig. 9, most of the dancers of the present sample (34%) who had an injury, overcame it with medication. 25% of the dancers needed further medical examinations and 20% overcame the injury with rehabilitation. 16% of the dancers needed rest, while

fortunately, only 5% overcame the injury with a surgery. Finally, in Fig. 10 are presented subjects' opinions as for the concern of dance teachers and clubs about the prevention of the injuries.

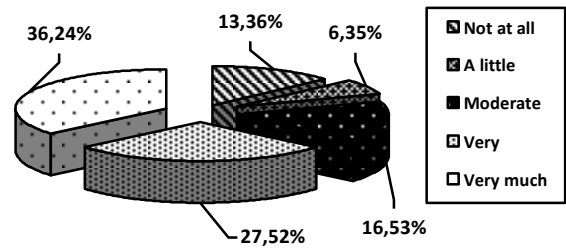


Figure 10. Teachers' and clubs' concern as for injuries' prevention

As it is shown in Fig. 10, most of the dancers of the present sample (63.76%) consider that dance teachers, as well as dancing clubs, are concerned very and very much with injuries' prevention (63.76%). In addition, 1/6 of the sample (16.53%) consider that teachers' and clubs' concern about injuries prevention is moderate, while 1/5 of the sample (19.71%) consider that there is a little or/and no care about injuries' prevention from the side of teachers and clubs.

IV. DISCUSSION

From the results of the present research it has been shown that the subjects of the sample are lovers of dancing in general and are involved with dancing for many years. So, the subjects participate in dancing programs on average 4.44±4.45 years, with maximum participation 31 years that is a whole life. The mean number of days the subjects participate in dancing programs is 3.16±1.63 days a week, for 2.29±1.30 hours a day. Moreover, most dancers do not engage only in one kind of dance, but in more.

Therefore, dancers' bigger percentage is involved with hip-hop, as well as hip-hop and Latin American dances (25.1% and 12%, respectively), with Latin American dances (18.6%), with Latin American dances and European dances (16.8%), and with classic ballet and modern dance (11.4%). In addition, in a smaller percentage dancers are involved only with classic ballet (7.2%), with Latin American and oriental dances (4.8%) and with Greek dances (4.2%).

In addition, from the results of the present research it appeared that 44.62% of the dancers have been injured. Consistently and other researchers have reported the existence of injury in dancers of hip-hop [15], break dance [16], [17], flamenco [18], modern dance [19], [20], [21], classic dance [22], [23], [24], [25], dancing on ice [26], aerobic dancing [27], Greek dances [28], and Latin American dances [29]. It is worth to be mentioned that the rate of injury is similar among professional dancers of various kinds and styles of dancing [20]. In contrast, according to [15] hip hop dancers report injury rates that are higher than other dance forms but similar to gymnastics.

The injuries' frequency in dancers reveals the significance of injuries for everyone involved with dance. This happens because an injury leads to loss of hours of practice and performances [11], which affects both the professional career of a dancer and their psyche. In agreement, [30], who studied the incidence of injuries in aerobic dance

instructors, found out that most of the injured instructors were absent from class up to a month, 21.8% over a month and 12.9% up to a week. In hip-hop dancers, annual injury incidence was 237% [15]. As for the dancers of modern dance, a total of 82% of the dancers had suffered between one and seven injuries during a 12 month period, with a rate of 0.59 injuries per 1,000 hours of class and rehearsal. It is worth to be mentioned that injured male dancers returned to full dancing after 21 days on average, while females returned after 18 days on average [20]. In addition, over 95% of the dancers of classical ballet suffer from a musculoskeletal injury for long periods [22], resulting in impaired performance.

Usually, is the musculoskeletal system that injured [10]. The most commonly reported injuries concern the hips, knee joint, spine and lower limbs [22]. In agreement, in the present study the dancers reported as more frequent injuries those of the lower limbs (57.31%) with significantly bigger percentage, the trunk and the upper limbs (19.08% both) and the head in a much smaller percentage (4.53%).

However, according to [31] the most common injuries reported by amateur break dance dancers, with decreasing frequency, were in the spine, knee, shoulder, skin, and ankle and foot extremities. Professional break dance dancers reported significantly more injuries mainly to the wrist, knee, hips, ankle and toe legs, and elbow. Moreover, pain was most common in the wrist, spine, shoulder and ankle joint [31]. In addition, lower extremity injuries were 52% and upper extremity injuries 32% of the total injuries in hip-hop dancers [15].

According to the dancers' training in aerobic dance, most of their injuries were located to the tibia (24.5%), the lower trunk/back (12.90%) and the ankle joint (12.2%) [27]. In addition, male and female dancers of classical and modern dance report injuries to the lower limbs with more significant the sprains, especially of ankle, and tendinitis [25]. A relative study in modern dance dancers showed that the foot and ankle (40%) were the most common parts of injury, followed by the lower back (17%) and the knee (16%) [20].

Regarding traditional dances, in a study of musculoskeletal injuries among Greek folk dancers, 41.62% experienced serious injuries in the lower extremities, specifically in the feet and ankles [28]. In agreement, in a study of musculoskeletal injuries among Irish folk dancers the most commonly reported injuries were that of the ankle joint (31%) and foot (25%) [32].

In addition, according to the dancers of Latin American dance, the lower extremity was the most commonly affected body region (64.5% and 71.2%, for males and females, respectively), followed by upper extremity (21.2% and 17.6%, for males and females, respectively) and spinal column/trunk region (12.0% and 8.5%, for males and females, respectively) [29].

The recorded injuries of the ankle joint highlight its importance and significance for dancers. The bones of the tibia are connected with the bones of the foot limb with this angular articulation of the ankle joint [33]. Throughout dancing, the articulation of the ankle allows the plantar flexion and dorsi flexion of the foot during the plié in classical and modern dance. It also allows the leg to be reversed to produce intense outward and inward rotation of the foot tip. The 26 bones of the skeleton of the foot tip in conjunction with the ligaments and muscles form three

arches, which play an important role in the absorption of crashes by jumps and hops [34]. It also participates in the support, propulsion and transportation of weight during movement [24]. On the foot tip is supported and carried the whole body of the dancer. Thus, the transmitted loads are multiple of the body weight and acceleration developed by the dancer [35]. Besides, it is no coincidence that 40% of ankle injuries result in chronic instability. This instability is usually due to overuse of the joint, lack of warm-up and application of incorrect technique [36].

Injuries in the myotenontia region are of the most common conditions faced by doctors involved in sports injuries [11]. Furthermore, sprains are the most common injuries of the ankle joint and concern the dilatation or rupture of one or more of the ligaments connecting the bones around the ankle joint [35]. In agreement, according to the dancers of the present sample, the most usual kinds of injuries are muscle strains (22.9%), muscular spasms-cramps (20.15%), callus (13.18%), sprains (12.53%), blisters (11.80%) and abrasions (11.10%). Then follow in smaller percentages the fractures (3.48%), hematomas (3.48%) and dislocations (1.38%).

In addition, from the musculoskeletal injuries of classical ballet dancers, 64% refers to injuries of the ankle joint, with more frequent the sprains (28%) and tarsus fractures due to fatigue. In addition, female classical ballet dancers compared to male dancers are more prone to ankle injuries due to frequent use of pointe [36]. In general, male dancers usually experience acute injuries in the upper extremities during lifting maneuvers and in the lower extremities both male and female dancers experience injuries while performing difficult jumps or landings [37]. In addition, according to the dancers of Latin American dance, blockages and pulled muscles were the most common complaints reported by males with contusions and pulled muscles were reported by females [29].

There are several aggravating factors for the occurrence of an injury, which can operate together. Thus, the muscle may be insufficiently prepared because of poor training or inadequate warm-up. The muscle may have developed scarred, inelastic tissue at the point of previous muscle strain. The muscle may be weak due to previous injury and incomplete recovery or is overloaded and has reached a high point of fatigue. Tight muscles, or muscles exposed to cold, are easier to be injured [11].

The dancers of the present sample identify as more significant causes of the injuries, in the following order: poor warming-up (21.92%), fatigue (16.64%), clumsiness (15.68%), bad technique (10.48%), and decreased concentration (10%). Then follow in smaller percentages performance pressure (7.12%), shoes (5.2%), partner and floor (4.8% both), hour of the day (1.44%), as well as competition and space tightness (7.96% both).

In agreement, causes of dance injuries like anatomic alignment, poor training, technical errors, unfamiliar choreography or style, and environmental factors including floor surfaces and theater temperature have been implicated as contributing factors to dance injuries [38]. Incorrect performance of dance movements is a potential cause for acute injuries to which may have contributed secondary factors such as, tiredness, muscle fatigue, or loss of balance [39]. The use of improper dance technique, attributable to poor application or lack of knowledge of the correct approach, has been suggested as a risk factor for injury. For

those injuries related to technique, any "cure" is only temporary until the fault is corrected [40]. As for hip-hop dancers, who report injury rates that are higher than other dance forms, they should be educated concerning injury prevention, biomechanics, and use of protective equipment [15].

Furthermore, in dancers of Irish traditional dances has been observed a significant reduction in the incidence of injuries of the ankle joint with warm-up [32], a fact that highlights the importance of warming-up. It is worth to be mentioned that an important relation between the rate of injuries and the duration of the warm up and cool down has been found in a study concerning injuries in aerobic instructors. More specifically, when the warming up and cooling down during the program is about 15 minutes, the number of injured instructors appears significantly smaller. In addition, when instructors performed a private warm up and cool down before and after the program, the rate of injury decreased even further [30]. However, although most of the dancers of our study consider warming-up as a cause for injury occurrence, statistical analyses did not show a significant effect of warming-up on injuries occurrence.

Another very important factor in injuries existence, according to the statements of the dancers of the present study, is fatigue. In agreement, [41] found that classical ballet dancers' injuries at the anterior ligament usually take place late in the day and towards the end of the season, indicating that fatigue might be responsible. So, injuries are also more likely to occur in the late afternoon, as a reflection of muscular and psychological fatigue. In addition, rigorous rehearsal schedules, lengthy show runs, and intensive summer dance programs that require an increase in daily class and rehearsal time have been associated with a higher frequency of injuries [42].

Moreover, poor warm-up or a very tough program is responsible for the occurrence of Achilles tendinitis often seen in dancers aged over 25 [24]. In addition, the frequency of the practice of aerobic dancers was associated with injuries. Those dancers who were practicing less than four times a week reported fewer injuries than those who were exercising four times a week (60%) or more (66%) [27].

In addition, traditional Irish dancers have also noticed that the use of anti-vibration dance shoes has reduced the incidence of injuries of the ankle joint [32]. The role and importance of the floor to prevent injuries to dancers is also emphasized [43]. In contrast, [44] who studied injuries to dancing aerobic dancers, reported that the brand of shoes or the type of dance floor did not affect the frequency of the injuries.

According to Cretan dances' dancers, injuries are usually due to lack of experience, ignorance of teacher's instructions, poor physical condition and weak muscular system of some dancers that is sensitive to stress, excessive exhaustion of the dancers due to previous laborious exercising, poor technique, as well as to steep and demonstrative dance movements. In addition, Cretan dances' dancers also report other factors which contribute to injuries, such as the hazardous environment such as inappropriate or wet floor, insufficient space exercise, inappropriate shoes, that do not "support" the foot, or do not have good contact with the floor, inadequate rehabilitation of prior injuries, to the incompleteness of the physicians'

instructions and return to dance in a shorter time than the required [45].

The clinical picture of the injuries depends on the extent of the injury and the part of the musculoskeletal system that is injured. The usual manifestations are: pain, swelling of the area, hematoma, difficulty in walking (lameness) or difficulty in the use of the hands or, finally, failure to move in the case of fracture. Symptoms depend on the type and extent of the lesion. Pain is encountered in all injuries as well as swelling. Skin abrasion and hematoma are among the most common symptoms of athletic injury. The deformation of the body limb or deviation from the normal axis follows [10].

It is worth noting that the inadequate rehabilitation of previous injuries or the overuse syndromes are a great concern for dancers. Thus, it has been found that even if the injury was serious, the dancers stopped practicing only for limited periods of time [31], [16], resulting in continuous pain and injury repetition possibly in a wider range. Dancers may attempt to dance through the injury without seeking medical attention or may return to work before full recovery when still prone to get injured again [19]. In agreement, [20] refer that after an injury most dancers return to a partial level of dancing several weeks before attempting full-capacity dancing.

Shin and Davis [21] report the case of a high-level teen dancer who has a recurrent dislocation of the left patella. According to her medical history, after the fifth dislocation, there was a delay in her recovery, which was due to intense weakness and atrophy of the quadriceps muscle. Electrodiagnostic examinations and magnetic radiography showed signs of subacute femoral neuropathy, which was chronologically related to the last patellar dislocation [21]. Therefore, it can be said that the existence of earlier orthopedic problems increases the incidence of injuries [44].

The overdose syndrome is the chronic inflammation of specific organs of the musculoskeletal system, usually by overload. Situations which facilitate its appearance are the anatomical abnormalities (e.g., varus or valgus), disturbances in functional muscle and tendon co-operation, poor physical condition and various external factors such as inappropriate shoes, uneven rough ground, and inappropriate training program. Depending on the organs involved, it is distinguished by overload in bones and cartilages, in muscles, tendons and ligaments and in serum sacs, sheaths and hymenes [46].

On a more challenging level the repetitive movements of dance may lead to overuse injuries such as tendinitis, neuritis and stress fractures. Overuse injuries arise from repetitive microtrauma to bone or soft tissue structures, in which structure and function may be rendered insufficient when the injury cycle persists and the offending factors are not eliminated [40], [47].

The effective treatment of overuse injuries in dancers of classical ballet is based on the understanding of their art, the perfect knowledge of the human anatomy and the body awareness in certain situations [23]. Thus, with regard to the dancers, there is much more stress on the ankle and the foot limbs than the other parts of the body, making restoration more difficult and discharging more necessary [35]. Most of the ballet-related fatigue syndromes respond well to conservative treatment. The dancers, whose injuries

require surgery, rely heavily on very specific for them rehabilitation programs [23].

Injuries result in the inability to exercise, or even in the decline of daily activity. Appropriate treatment in the first 24-72 hours may have a significant effect on the extent of injury concerning the motor system [10]. Thus, 90% of the sprains of all types will be fully healed with conservative treatment. Of the remaining 10%, 2-3% will experience instability of ankle or subtalar joint [35]. As for the dancers of the present sample, most of them (34%), who had an injury, overcame it with medication. 25% of the dancers needed further medical examinations and 20% overcame the injury with rehabilitation. 16% of the dancers needed rest, while fortunately, only 5% overcame the injury with a surgery.

The treatment of athletic injuries requires knowledge and understanding of the etiology of various musculoskeletal injuries, both at cellular and clinical level. Rehabilitation protocols are based on the normal response of the tissues of the injury and on the full knowledge of how the various tissues heal [48].

It is worth mentioning that the overall treatment of injuries is very important, as it significantly reduces both the loss of working days for the dancers (-60%) and the number of financial allowances per year (from 81% to 17%). The benefits of comprehensive care include also the timely and effective management of problems caused by overuse before they become serious injuries [19].

The good physical condition, continuous training and good health of a dancer for his whole life is a major issue [49]. Thus, injuries' prevention is a very significant factor concerning dance injuries and dancers' performance. It is positive that most of the dancers of the present sample (63.76%) consider that dance teachers, as well as dancing clubs, are concerned very and very much with injuries' prevention (63.76%). In addition, 1/6 of the sample (16.53%) consider that teachers' and clubs' concern about injuries' prevention is moderate, while 1/5 of the sample (19.71%) consider that there is a little or/and no care about injuries' prevention.

So, it is important that there is interest and concern by dance teachers and dancing clubs for injury prevention, because this interest may lead to the appropriate interventions and actions. As for preventive procedures, sprung and even floors and warmer studios should be provided. Moreover, teachers and choreographers should be more aware of a dancer's limitations and of dancers' needs to rest as soon as injuries occur. Finally, dancers need immediate access to adequate treatment [43].

Thus, prevention is the keystone to avoid injuries, and for dance injuries, preventive strategies may be directed towards previously identified risk factors. When emphasizing prevention of new injuries, a supervised training regimen should be monitored for gradual progression of intensity (length and frequency) and type of activity (eg, initiating a new dance style) [50]. Furthermore, dancers should be educated concerning injury prevention, biomechanics, and use of protective equipment [15], according to the requirements of the particular kind of dance.

V. CONCLUSION

Due to the fact that most dancers start training at a very young age, and there is potential for a great impact on their future health, the injury problems of dancers are worth more attention. Also, the interplay of physical and aesthetic demands in dance may lead to various health issues such as a variety of musculoskeletal, metabolic, and nutritional disorders which have been described among dancers and this may have a significant impact on their health-related quality of life [51].

Dancers will frequently try to work through pain and injury and will seek treatment only when they are no longer able to dance. Dance injuries are generally classified into two types, acute traumatic injuries and overuse injuries resulting from repetitive microtrauma. It is important to recognize the severity of the dancer's presenting injuries and the injuries' potential to limit the dancer's career. An understanding of the mechanism of injury and predisposing factors will help the clinician optimize the diagnosis and treatment of dance injuries [39].

In the professional or experienced dancer, different techniques, choreography, floor, shoes and the specialized cultivation of physical abilities in a way that serves this technique differentiates the mechanism of the injuries, the consequences on the progression and the course of the dancer and certainly the perfectly specialized way of treatment and rehabilitation [24].

Consequently, recognizing, resolving, but above all, preventing the causes of injuries is very important as for injuries' avoidance, good physical condition of dancers, reduction of training time loss, continuation of professional career, and continuation of dancing activity for those who have finished their career or are not professionally engaged in dancing.

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