



SHORT REPORT

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Sports injuries among adolescent basketball players according to position on the court

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Abstract

Background: The participation of children and adolescents in sports, including basketball, is becoming increasingly common, and this increased involvement raises concerns about the potential risk of sports injuries.

Objective: To analyze the occurrence of sports injuries among young basketball players according to their position on the court and to associate these injuries with risk factors.

Method: A retrospective, epidemiological study. A sample consisting of 204 basketball players with a mean age of 14.33 ± 1.19 years participated in the study. The players were interviewed using a reported condition questionnaire containing anthropometric and training data as well as information on injuries during the previous 12 months.

Results: The frequency of injury was highest among the shooting guards (47.8%), followed by the centers (34.8%) and point guards (17.4%). Among the 204 participants, 40 players reported a total of 46 injuries, representing 0.22 injuries per participant and 1.15 injuries per injured participant. For the shooting guards and centers, statistically significant differences between injured and non-injured players were found related to age, weight, height, length of time in training and number of weekly practice hours ($p < 0.05$). For point guards, a statistically significant difference between injured and non-injured players was found based on weight alone ($p < 0.05$).

Conclusion: The occurrence of injuries among basketball players was low. Injuries were associated with both intrinsic and extrinsic factors among shooting guards and centers, whereas injuries were only associated with weight among point guards.

Keywords: Trauma in athletes, Risk factors, Morbidity surveys

Background

Basketball is a popular sport played worldwide [1] which requires dynamic, explosive actions. The constant practice of this sport involves repetitive motor actions and excessive joint load, which increases the vulnerability to injury [2]. Although practiced by millions of individuals, including adolescents [1,2], there is a lack of information to enable the determination of associations between sports injuries and personal and training characteristics as well as position on the court.

Studies have shown that the most common injuries in basketball affect the lower limbs, specifically the knee and ankle sprains [3,4]. This is due to the fact that basketball is

a sport characterized by actions involving running, changes of direction, lateral movements, jumping, and, in particular, the impact of landing, which are conducive to the onset of injuries in these regions [4].

The aim of this study was to analyze the occurrence of injuries among adolescent basketball players according to position on the court and to associate these injuries with intrinsic (age, height and weight) and extrinsic factors (length of time in training, and number of hours practice per week).

Materials and Methods

This study was approved by the local Human Research Ethics Committee (protocol: 08/2010). Two hundred four randomly selected basketball players (62 females and 142 males) in the city of Presidente Prudente (State of São Paulo, Brazil) with a mean age of 14.33 ± 1.19 years

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participated in the study. All the volunteers who were part of the sample attended Sports Initiation Schools provided by the Municipal Sports Secretariat in the city, and presented a low level of training and competitiveness. Data were collected retrospectively using a modified reported condition questionnaire [5], which included personal data (gender, age, weight and height), training data (length of time in training, and number of hours practice per week) and information on the occurrence of injury.

We included volunteers from local authority sports schools provided by the Municipality of Presidente Prudente, aged up to 18 years, who had practiced basketball for at least one year and who accepted the invitation to participate in the study and whose consent was authorized by a legal guardian. It was stipulated that, once selected, volunteers who experienced difficulty understanding the questions of the survey or who presented injuries at other times unrelated to training and/or sports competitions would be excluded, since these factors could interfere with the quality of response or the reliability of the findings. In the event, none of those previously selected was excluded.

A sports injury was considered to be any physical complaint resulting from training and/or competition which limited the participation of the individual for at least one day, regardless of the need for medical attention [6,7]. For the purposes of analysis, the participants were grouped separately, based on their respective positions on the court: shooting guard, center and point guard.

The data were analyzed using descriptive statistics. Depending on the normality of the data, either the *Student's t-test* for unpaired data or the *Mann-Whitney test* was used. *Odds ratios* (OR) and 95% confidence intervals were calculated for the comparison between genders. The level of significance was set at 5% ($p < 0.05$) for all analyses.

Results

No significant differences were found between genders with regard to the position on the court (shooting guard – OR: 1.07; 95% CI: 0.36 to 3.17; center – OR: 2.69; 95% CI: 0.83 to 8.75; point guard – OR: 6.00; 95% CI: 0.95 to 38.08). The greatest frequency of injury was found among the shooting guards, followed by the centers and point guards (Table 1).

Statistically higher values were found relating to age, height, length of time in training and number of weekly practice hours among the shooting guards and centers who had suffered injuries in the previous 12 months in comparison to non-injured participants. Regarding weight, heavier athletes in all positions reported more injuries in comparison to lighter athletes (Table 2).

Discussion

The main findings demonstrate a greater frequency of injuries among shooting guards, followed by centers and point guards. Moreover, individual and training characteristics may be associated with risk factors for shooting guards and centers, and body mass may be a risk factor for all positions.

In adolescent basketball players the highest frequency of injuries was among shooting guards, followed by centers and point guards. Cohen et al., 1999 [8] found no significant differences regarding the occurrence of injuries among the different positions of adult players. Moreira et al., 2003 [9] analyzed professional adult players with a mean age of 24.5 years and found a greater frequency of injuries among centers, followed by shooting guards and point guards. The differences between research findings may be related to the age group studied.

While there are five positions relating to both offense and defense, the point guard is responsible for the transition from defense to offense, with speed and agility and creating opportunities for his/her teammates to prepare the shots. This style of play predisposes the point guard to sprained ankles [6,9]. Shooting guards are responsible for the preparation of the shot and therefore play more in terms of volume, blending agility, speed, strength and power [9,10]. As decisive offensive players, shooting guards suffer more checking, which may explain the occurrence of injuries. Centers are responsible for shots within the key, which involve disputes for defensive and offensive rebounds and shots that require the use of brute force when vying for space. As a position in which constant physical contact occurs, the majority of injuries are more traumatic [6,7,9].

Table 1 Distribution of injured athletes, reported injuries, rate of injury per athlete and rate of injury per injured athlete

| Variables | Position | | | Total (n = 204) |
|------------------------------------|--------------------------|-----------------|----------------------|-----------------|
| | Shooting guard (n = 103) | Center (n = 72) | Point guard (n = 29) | |
| Injured athletes | 18 (45%) | 15 (37.5%) | 7 (17.5%) | 40 (100%) |
| Reported injury | 22 (47.8%) | 16 (34.8%) | 8 (17.4%) | 46 (100%) |
| Rate of injury per athlete | 0.21 | 0.22 | 0.27 | 0.22 |
| Rate of injury per injured athlete | 1.22 | 1.06 | 1.14 | 1.15 |

Note: Rate of injury per athlete = total number of injuries divided by total number of athletes interviewed; rate of injury per injured athlete = total number of injuries divided by total number of injured athletes.

Table 2 Values of mean, standard deviation and median of anthropometric data and training variables according to position and occurrence of injury

| Variables | Position | Injury | | p-value |
|---------------------------|----------------|-------------------------|-----------------------|---------|
| | | Present (n = 164) | Absent (n = 46) | |
| Age (years) | Shooting guard | 15.54 ± 1.18 (15.00) * | 13.95 ± 0.98 (14.00) | 0.0001 |
| | Center | 15.37 ± 0.71 (15.00) * | 14.15 ± 1.20 (14.00) | 0.0003 |
| | Point guard | 14.33 ± 0.70 (14.00) | 14.30 ± 1.18 (14.00) | 0.89 |
| Weight (Kg) | Shooting guard | 67.44 ± 14.29 † (68.80) | 58.34 ± 10.11 (58.00) | 0.009 |
| | Center | 74.91 ± 15.34 † (72.00) | 62.62 ± 14.82 (58.00) | 0.004 |
| | Point guard | 67.24 ± 13.32 † (62.00) | 58.33 ± 8.75 (56.00) | 0.03 |
| Height (m) | Shooting guard | 1.73 ± 0.10 † (1.71) | 1.65 ± 0.07 (1.66) | 0.003 |
| | Center | 1.77 ± 0.07 † (1.77) | 1.67 ± 0.07 (1.69) | 0.0001 |
| | Point guard | 1.72 ± 0.09 (1.71) | 1.66 ± 0.05 (1.68) | 0.10 |
| Training duration (years) | Shooting guard | 3.84 ± 1.93 (3.00) * | 1.91 ± 1.30 (1.50) | 0.0001 |
| | Center | 3.87 ± 1.54 (3.00) * | 2.57 ± 1.64 (2.00) | 0.003 |
| | Point guard | 2.88 ± 1.53 (3.00) | 2.30 ± 1.22 (2.00) | 0.30 |
| Weekly hours of practice | Shooting guard | 5.86 ± 2.46 (6.00) * | 4.89 ± 2.36 (4.50) | 0.02 |
| | Center | 6.12 ± 2.17 (6.00) * | 4.49 ± 2.47 (4.00) | 0.005 |
| | Point guard | 6.72 ± 5.35 (4.50) | 4.91 ± 1.49 (6.00) | 0.89 |

* Significant difference in relation to non-injured participants (*Mann-Whitney test*); † Significant difference in relation to non-injured participants (*Student's t-test for unpaired*).

The biotype of players is considered to be a determining factor regarding the position played on the court [11]. The study demonstrated that individual characteristics of the players may be related to the occurrence of injuries. For point guards, height was not associated with injuries. The main function of these players is to set up the offensive actions and advance the ball with speed and agility. While the occurrence of injury was not associated with height, shorter players are required to be faster in order to achieve these tasks [11,12]. For centers and shooting guards, taller athletes reported more injuries than shorter athletes. Athletes with offensive functions play closer to the basket. Thus, a greater height is needed in order to perfect the handling of rebounds and score a field goal. These actions require greater physical contact, which predisposes players to injury and explains the greater occurrence of injuries among taller players [11].

Regarding body mass, a greater frequency of injuries occurred among heavier athletes. Point guards normally play further away from the net and consequently execute fewer jumps and absorb less impact [11]. Thus, the dynamics of this position does not explain the greater occurrence of injury among heavier point guards; however, body weight is no less an important factor with regard to the occurrence of injuries among these players. Centers, on the other hand, need greater weight for blocking and occupying space close to the basket during offensive and defensive rebounds. The absorption of impact during the constant jumping and

landing promotes the occurrence of injuries among heavier players. Thus, body mass should be taken into consideration within the dynamics of the game in all positions that require force, speed and muscle strength [11].

The results show that the average age of the players is associated with injury risk factors. The reasons for this occurrence are related to greater inclusion in sports due to specific interests, which occurs with the development age, associated with the characteristics of body composition, muscular strength and explosiveness and enthusiasm to compete in the chosen sport [13]. It is believed that the growth occurring as the players' age increases is closely related to increased risk of injury due to the emergence of a combination of multiple factors, such as, increased musculotendinous strain, decreased epiphyseal strength and decline in bone mineralization [14,15].

In relation to length of time in training, we observed that players who train longer have more injuries compared with those who train less. The increased exposure may be related to an increased risk of injury due to repetitive and cumulative trauma [16].

The sample size according to position was small and the analyses of the study were only able to infer characteristics that may influence the occurrence of injury. Another limitation of the study was the retrospective factor. However, the results of the study underline the need for programs geared to strategies that can control risk factors and reduce the occurrence of injuries, taking the player's position into consideration.

Conclusion

The findings demonstrate a greater frequency of injuries among shooting guards, followed by centers and point guards. Moreover, individual (age, height and weight) and training (length of time in training and number of practice hours per week) characteristics may be associated with intrinsic and extrinsic risk factors for shooting guards and centers, and body mass may be a risk factor for all positions.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CMP and FMV conceived of the study, participated in its design and coordination and helped to draft the manuscript. CMP, FMV, LCMV, FNB, IRL and JNJ performed the statistical analysis and interpretation of data and prepared the draft manuscript. All authors participated in the design of the study and in critical review of the manuscript. All authors read and approved the final manuscript.

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