

## Visual Awareness and Its Impact on Sports Performance of Basketball Players in The Maldives

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### Abstract:

**Objective:** This study aimed to assess the visual awareness and its impact on basketball performance among Maldivian basketball players.

**Material and Methods:** A 16-item questionnaire about visual and ocular problems, perception towards eye health, and sports performance was distributed electronically to basketball players in the Maldives through various basketball organizations. Data collected were analyzed using descriptive statistics and the Chi-Square test in Statistical Package for the Social Sciences.

**Results:** Eighty two Maldivian basketball players aged between 10–40 years, with sixty males, participated in this study. Data showed that only 30.5% of the respondents wore vision correction when playing basketball, none had undergone any visual training, and 20.7% never had any eye examination. Majority of those who underwent eye examination had more than two years since their last eye check-up. Visual difficulties during games were reported by 41.5% of the respondents, with blurry vision and eye injury being the most commonly reported visual symptom and ocular problem, respectively. Moreover, 70.7% of the players experienced inconsistent performance level and loss of concentration during games. There was a significant relationship between experiencing visual difficulties and inconsistent sports performance  $\chi^2 (1, N=82) = 5.95$ ,  $p\text{-value}=0.02$ .

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**Conclusion:** The visual awareness among Maldivian basketball players is generally low and this seems to be associated with their sports performance. Importance of using corrective/protective eyewear and attending regular eye examinations should be cultivated among athletes in the Maldives, aiming to improve the sports field in this country.

**Keywords:** athlete visual awareness, basketball players, Maldives, sports performance factors, sports vision

## Introduction

Sports vision is a relatively less explored specialty in Optometry practice, dealing with optimizing athletes' visual function to enhance their performance in sports. It includes the use of vision correction or training to improve athletic performance, as well as the use of eyewear to avoid sports-related eye injuries. A vision examination for athletes was conducted for the first time in the 1984 Olympics in Los Angeles, and it later involved a large number of athletes for the first time in the 2004 Olympics in Athens<sup>1</sup>. Optometrists play a key role in determining athletes' visual fitness for sports participation, assisting athletes in improving their visual performance, providing appropriate eye protection, and managing sports-related eye conditions<sup>2</sup>. Lack of awareness about appropriate eye care, including the use of protective and corrective eyewear, may have an impact on the eye health and sports performance of athletes.

Previous studies have investigated various issues related to eye and vision among athletes. A study participated by 939 Olympic players discovered that 29% of them experienced visual symptoms and 28% had reduced visual acuity<sup>3</sup>. A good performance in sports requires the players to have an optimal visual acuity by correcting any refractive error<sup>4</sup>. A study in Malaysia showed that junior athletes in Klang Valley did not receive appropriate eye care before participating in sports<sup>4</sup>. It was observed that less than half (46%) of junior athletes had their eyes examined within the past six months, though 90% of them agreed on the importance of eye examination<sup>4</sup>. Visual symptoms, mainly

blurred vision, were experienced by 46.5% of the junior athletes, while red eye was the most commonly reported ocular symptom. More than 90% of them did not use any visual aids or eye protection for sports safety<sup>4</sup>.

Researchers attempted to determine the necessity for vision care services for athletes based on data from sports vision screening at the Amateur Athletic Union Junior Olympic Games (AAUJOG)<sup>5</sup>. Out of 116 athletes, 65.5% reported experiencing visual problems, with the most common one being difficulty seeing (18.1%), while problems with light sensitivity were reported by 14.7% of them. More than 20% of these athletes had never received a comprehensive eye examination, while 26% had their last eye examination more than two years ago. Most of these athletes (n=108) did not wear any refractive correction during sports, only 5% used their standard spectacles, and even none of them wore protective eyewear during sports<sup>5</sup>.

The lack of safety eyewear among athletes is concerning, given the high risk of eye injuries during sports competitions and training. Among all sports games, basketball is reported to be the most common cause of sports-related eye injury<sup>6-8</sup> with complications such as, but not limited to, orbital bone fracture and retinal detachment<sup>7</sup>. According to the American Academy of Ophthalmology, 90% of sports eye injuries can be avoided by wearing protective eyewear<sup>9</sup>. Sports researchers and eye care practitioners also emphasize the importance of protective eyewear while playing any sports with a high risk of eye injuries, such as basketball, baseball, field hockey, and football<sup>3,10</sup>.

Many studies have shown that vision is critical to optimizing athletic performance. Visual-motor abilities are important factors in sports performance. Hence, the sensorimotor skill is a good measure for assessing athletes<sup>11</sup>. Ball players, such as in basketball, acquire the majority of information through their eyes, and they must pay attention to more than two objects at once, especially the ball and other players. The players must have the skill to take in the information about the object in focus, i.e., the ball, and everything going on around it at the same time without having to move their eyes. This skill can be enhanced by incorporating aspects of visual optimization in the training programs for athletes<sup>1</sup>.

There is an increasing interest in the topic of sports vision due to the escalating demand for better sports performance and public health efforts for eye and vision wellness. Likewise, the number of published articles on sports vision has increased, primarily focusing on improving eye care awareness among athletes; however, none of these studies involve basketball players. In addition, eye care awareness among athletes of all sports in the Maldives remains unknown, despite the fact that sports is regarded as an important aspect of life by the general Maldivian population<sup>12</sup>. Therefore, this study was conducted to investigate the level of awareness among Maldivian athletes about their vision during basketball games and how vision can affect their on-court performance.

## Material and Methods

### Study design and study area

This study is a cross-sectional study conducted among Maldivian basketball players. The Maldives was chosen as the study location because it is a country with a relatively slow progression in the sports field. Hence, there is a need to gain an understanding of the factors limiting athletic performance in this country, including the visual factor. This study used a questionnaire as the data

collection tool, which was distributed online from July until November 2022.

### Sampling method and study sample

This study only included professional basketball players aged 10 to 40 years with a minimum of one year of experience, while casual players were excluded. For this study, participants were considered professional players if they had an experience playing in basketball competition at inter-club, national, or higher levels. Casual players were those playing basketball for recreational purposes and never played in at least inter-club games. Based on the estimated population of all professional basketball athletes in the whole Maldives, the Raosoft sample size calculator indicated that the required sample size for this study was 80 players. A non-probability purposive sampling method was used when recruiting the participants to ensure recruitment of suitable respondents.

### Procedure

Responses from the participants were collected through Google Forms, to which the link was distributed via electronic mail (e-mail) to individual basketball players. The link was also e-mailed to the basketball clubs in the country together with a cover letter and participant information sheets. Follow-up e-mails were also sent out to increase the response rate. Collected data included answers to the survey questions plus demographical information such as gender, age, basketball experience, and position played in basketball. Ethical approval (UCSI/IEC-2022-FMHS-048) was obtained from the Ethical Committee of the authors' institution before the survey was conducted. The participants' anonymity, confidentiality, and voluntary participation with informed consent were maintained throughout the data collection and analysis processes in adherence to the ethical principles outlined in the Declaration of Helsinki.

## Materials

This study investigated visual awareness among Maldivian basketball players using a validated questionnaire that was distributed electronically. This questionnaire was adopted from the National Athletic Trainers Association Vision Screening Protocols<sup>13</sup> provided by the Sports Vision section of the American Optometric Association. It consists of 10 closed-ended questions (Yes/No answers) and six open-ended questions.

To assess visual awareness among athletes, the questions ask about the respondents' history of eye examination, use of refractive correction, and attendance to vision training. For vision and eye-related issues, participants were asked if they experienced any visual difficulties, eye disease or disorder, loss of concentration, or inconsistent performance levels during their basketball games. Questions from the original questionnaire document in PDF format were transferred in their original structure into electronic format in Google Forms for online distribution to potential respondents.

For closed-ended questions in the Google Forms, participants could only click on either 'Yes' or 'No' options, since selecting both options was not allowed by the setting. For open-ended questions, a blank space was provided below each question for the participants to key in their subjective answers. After the electronic questionnaire was ready, the authors tested the link to the questionnaire to ensure that it was usable and all questions were accessible to the participants.

## data analysis

The dataset of respondents' answers in Google Forms was transferred into spreadsheets in Microsoft Excel and Statistics Package for Social Sciences (SPSS) version 29 for Windows (IBM Corp., Armonk, NY) for statistical analysis. Univariate descriptive analysis was employed

to generate the frequency and percentage distribution of responses in the form of a table or graph. In addition, a Chi-square test was employed to identify any association between years of experience in basketball and the use of vision correction when playing basketball.

## Results

Out of 82 respondents who completed the questionnaire, 73% were males (n=60) aged between 10 and 40 years. Table 1 displays the age and gender distribution of the respondents, as well as information on their years of experience and the positions they played in basketball. Among all respondents, 25.6% were seasoned athletes, 14.6% were junior athletes, and the rest had two to four years of professional basketball experience. In terms of the positions in basketball games, 25.6% of the respondents played shooting guard, while another 23.2%, 20.7%, 15.9%, and 14.6% played center, point guard, power forward, and small forward positions, respectively.

**Table 1** Demographical information of the respondents

Demography	n	%
Gender		
Male	60	73.2
Female	22	26.8
Age groups (years)		
10–18	32	39.0
19–29	36	43.9
30–40	14	17.1
Years of experience		
≤1 year	12	14.6
2 years	15	18.3
3 years	17	20.7
4 years	17	20.7
≥5 years	21	25.6
Position in basketball		
Point guard	17	20.7
Shooting guard	21	25.6
Small forward	12	14.6
Power forward	13	15.9
Center	19	23.2

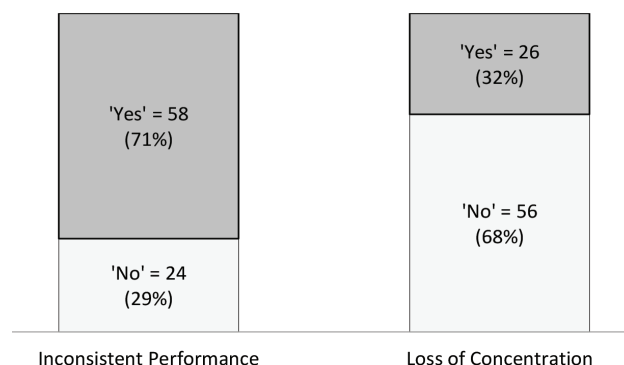
Analysis of visual awareness shows that 79.3% of the respondents had undergone an eye examination, while 20.7% never had an eye examination (Table 2). Greater than half of the 65 basketball players who underwent eye examination had their last eye checkup more than two years ago. It can also be seen that only a minority of the respondents used their spectacles and contact lenses during sports, and none of them had ever participated in a vision training program. In terms of ocular and visual problems, the most common ocular history was eye injury, as reported by 10 athletes, while the most common visual problem was blurred vision, as reported by 26 out of the 82 athletes.

**Table 2** Visual awareness and eye problems among basketballers in the Maldives

Questions on eye and vision awareness	Yes n (%)	No n (%)
Had Eye Examination	65 (79.3)	17 (20.7)
Within the last 6 months	13 (20.0)	
Within the last 1 year	12 (18.5)	
Within >2 years	40 (61.5)	
Visual Aids in Sports	25 (30.5)	57 (69.5)
Spectacles	16 (19.5)	
Contact lens	9 (11.0)	
Vision training	0 (0.0)	
History of ocular problem	19 (23.2)	63 (76.8)
Eye injury	10 (52.6)	
Eye surgery	2 (10.5)	
Eye infection	6 (31.6)	
Eye disease	1 (5.3)	
Visual difficulties	34 (41.5)	48 (58.5)
Blurred vision	29 (85.3)	
Diplopia	3 (8.8)	
Glare	2 (5.9)	

Figure 1 shows that 71% of the respondents had varied performance levels during basketball competitions, while 29.3% (n=24) reported that their performance was consistent during critical situations. It is also shown that 32% of respondents experienced loss of concentration during

games, with the most commonly reported causes of loss of concentration being blurry vision as well as physical and mental fatigue. Fortunately, a majority of the respondents did not experience a loss of concentration during games.



**Figure 1** Frequency distribution of participants experiencing inconsistent performance and loss of concentration during basketball games (n=82)

The Chi-square test was employed to identify any association between years of experience in basketball and the use of vision correction when playing basketball, with the hypothesis that the more experienced players would have a greater awareness of using vision correction during basketball games. However, the results showed no statistically significant relationship between basketball experience and the use of vision correction during games,  $\chi^2$  (1, N=82) =5.90, p-value=0.21, suggesting that even with longer experience, the players are not keen on using vision correction.

Similarly, there is no statistically significant relationship between players' age and the time of last eye examination,  $\chi^2$  (1, N=82) =3.53, p-value=0.17. Unsurprisingly, the presence of visual difficulties among the respondents is significantly associated with their inconsistent

performance during basketball competition,  $\chi^2$  (1,  $N=82$ ) =5.95,  $p$ -value=0.02. This suggests that the visual difficulties reported by the respondents, such as blurred vision, double vision, and glare issues, might cause the performance of players to vary by hindering their visual capabilities on the court.

## Discussion

This study investigated visual awareness among Maldivian basketball players and its association with their performance. Results showed that the majority of them did not use vision correction when playing basketball and reported inconsistent performance during the games. A fair proportion of respondents reported visual difficulties when playing basketball, which were significantly associated with inconsistent performance during basketball games.

The low level of awareness of wearing vision correction when playing basketball reported in the current study is consistent with the survey findings during AAUJOG, which showed that 93% of athletes did not use refractive correction during sports<sup>5</sup>. This suggests that a proportion of Maldivian basketball players may have a suboptimal vision, thus not being able to distinguish the little details when practicing or competing in basketball games. Basketball is a sports that requires good distance vision since it is played on a large court, usually 28 meters long and 15 meters wide, with a goal hoop at 10 feet high. Therefore, good vision is required to shoot the ball accurately and pass it to other players.

The high rate of Maldivian basketball players getting a previous eye examination supports findings from the previous studies, which found that 75–79% of athletes in their study populations had undergone a comprehensive eye examination<sup>3,5</sup>. However, in the current study, most respondents had their last eye examination more than two years ago, suggesting that awareness of regular eye examinations still needs to be improved.

In terms of visual difficulties during sports, respondents in the current study reported similar common difficulties as reported by participants in the previous study; namely blurred vision, diplopia, and glare<sup>4</sup>. Blurred vision is the most common difficulty reported, and this may correspond to the lack of vision correction worn by athletes when playing basketball. The rate of visual difficulties among Maldivian basketball players (41%) is slightly higher than that found in previous studies by Beckermen & Hitzeman and Morwood & Griffiths, which respectively reported 29% and 33% of athletes experiencing vision problems<sup>3,14</sup>. Sports researchers suggest that visual blurring has an impact on the particular skill, as seen in the shot proficiency curve linearity when shooting a basketball<sup>15</sup>. Considering almost half of the Maldivian basketball athletes reported experiencing visual difficulties during games, an intervention program to reduce the rate of vision-related problems is needed to improve their basketball performance.

The most common ocular problem experienced by the Maldivian basketball players in this study is an eye injury. Injuries might be expected when playing basketball since it is a game that requires players to have physical contact, causing possible injuries to the eyes and head. Previous authors have also reported that basketball is the most common cause of sports-related eye injuries<sup>6–8</sup>. Basketball players are at high risk of getting various complications of mechanical eye injury, including eye contusion, hyphema, orbital fracture, vitreous prolapse, and retinal detachment<sup>7</sup>. However, the impact of the injuries could be reduced by wearing safety eyewear during basketball games. The need to use sports protective eyewear is underscored by experts in sports vision, who also emphasize the demand for sports vision care services to be available for athletes<sup>3,7,8</sup>.

In addition, the visual difficulties experienced by nearly half of the respondents may also contribute to the eye injuries experienced during the games. The absence of protective eyewear during sports can be attributed to

the lack of awareness among the players on the possible consequences of not wearing it. Therefore, optometrists should play a role in promoting the importance of wearing protective eyewear when participating in sports, and regular eye examinations to overcome vision-related problems, as these could reduce the likelihood and impact of eye injuries among players.

The current study shows that the performance level of the majority of Maldivian basketball players varied during competition. It also reveals that inconsistent basketball performance was significantly associated with visual difficulties among the players. This can be due to the absence of vision correction during sports, which causes poor vision and consequently inconsistent performance because basketball is a visually demanding sport that relies a lot on good hand-eye coordination. Good vision plays an important role in basketball performance, as players are continually challenged to move at high speeds and navigate defenders while constantly scanning the court to find open teammates and scoring opportunities.

Loss of concentration was reported by 32% of Maldivian basketball athletes, which may cause their performance to reduce or vary during the games. This is because basketball players have just milliseconds to block or get a shot off, to make a precise pass, or to identify a certain offensive or defensive set-up. In fast-paced sports like basketball, it is critical to maintain a high degree of attention and concentration to perform well. Basketball players need to be able to quickly shift their attention as the ball is tossed their way or toward them. A slight break in focus can result in mistakes, missed shots, or being outraced to the basket by rival players. The visual focus of the basketball players can be improved by proper training, but none of the athletes in this study ever received any vision training.

Vision training for athletes can be conducted using special devices such as a computer-controlled rotating disc

(eg. P rotator) to improve visual speed; the Eyeport system to train eye fixation, divergence, and convergence; and D2 Dynavision Board to enhance visual-hand motor coordination and reaction as well as the peripheral perception<sup>16</sup>. However, these devices are not widely accessible by athletes due to the limited availability of institutions that cater to sports vision, as reported by previous authors<sup>17</sup>.

Visual difficulties may also cause vision to be suboptimal, hence the loss of concentration reported during the games. Proper eye examination and training programs might be beneficial in ensuring that the athlete's vision functions optimally during their sports activity. It is reported that low awareness of visual health among athletes is due to insufficient sports vision optometric services available to them<sup>18</sup>.

The overall findings of this study further highlight the necessity for sports vision care services, as emphasized by previous authors<sup>3,19</sup>, particularly for Maldivian athletes. Optometrists in the Maldives need to play their roles in improving the provision of sports vision care, along with improving awareness of the use of corrective and protective eyewear for sports purposes. Furthermore, Maldivian athletes should be made aware of the importance of regular eye examinations because vision plays a significant role in on-court performance<sup>20,21</sup>. Uncorrected refractive errors and other visual functions could have detrimental effects on sports performance<sup>17,20</sup>.

This study provides valuable insight to close an obvious gap in the literature within the field of sports vision in the Maldives. However, it is limited to only basketball athletes and thus recommends similar studies be conducted on a wider athletic population in the Maldives that includes larger sample sizes and more varieties of sports. Future studies could also examine the effects of visual aids and vision training, as well as how these factors can help Maldivian athletes perform better.



## Conclusion

This study reveals that visual awareness among basketball athletes in the Maldives is low, and many players have vision difficulties that impact their performance. To address this, there should be greater emphasis on regular eye examinations and the use of appropriate corrective and protective eyewear. Athletes should undergo eye examinations before participating in sports to identify and address any visual issues. Additionally, accessible vision training and sports vision services are needed to help athletes improve both their performance and eye safety. Nevertheless, the successful implementation of these measures can only be achieved with the active involvement of sports authorities, eyecare providers, and public health agencies.

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## Conflict of interest

There is no potential conflict of interest to declare.

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