Original Article

The Effect of Visual Training on the Rate of Performance Accuracy in Girl Soccer Players

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Abstract

Aims: The purpose of this study was to determine the effect of visual training on the performance of shooting skills of soccer girl players. **Materials and Methods:** The research method was quasi-experimental, in which the participants were assigned into experimental and control groups, with pre-test and post-test design. The participants were girl soccer players in Alborz province. In this study, among the community, 45 athletes with an average age of 19.3 ± 1.4 years were selected from club in Alborz province. The research tool was based on Raven and Gibor's vision exercises and a researcher-made exercise protocol (colored gates, colored caissons). Specific visual training and researcher-made sports vision exercises were performed for 2 weeks (three sessions per week and 12 min each session). The covariance analysis and Bonferron's *post hoc* test were used to analyze the data. **Results:** The results of the study showed that there was a significant difference between the rate of performance accuracy of soccer players in visual training, athletic-based visual training, and control groups ($P = 0.000$). It was also indicated that visual training had no significant effect on the performance of soccer girls' shots ($P = 0.003$). However, sports–visual exercises improved their shooting skills ($P = 0.002$). **Conclusion:** Specific visual training could be more beneficial in improving the performance of soccer girls' shots.

Keywords: Athlete, performance, practice, vision

Introduction

One of the key issues with effective design of learning and practice situations is the information resources used to control motor skills; for example, recognizing the sources of information used by skilled people to control movements can help guide the attention of athletes to these resources. Vision is one of the main sensory systems involved in the implementation of many sports skills. This system has a direct connection with brain's sensory centers.[1] These centers are responsible for controlling the position of the body in space, which is especially important during physical activity and exercise; however, despite their fundamental role, during the design of training programs, their importance is less known to educators and athletes.[2] This may be due to the limited time available for training or the lack of research to demonstrate the benefits of visual training.[3] Although visual exercises in sports are not new concepts, these exercises have done more in laboratories and clinical environments that cost a lot to the athlete.[2] On the other hand, the results of laboratory research are most widely used in clinical conditions and their application in sporting environments has not yet reached the stage of implementation.[4] In general, research shows that athletes carry out specific exercises to enhance their visual skills and increase their decision-making skills, by which they have a much better performance than beginners.[5] Therefore, identifying the mechanisms involved in this better performance can help researchers to provide more accurate and applied planning for the purpose of talent detection and educating athletes.[6] In general, it has been accepted that skilled performers do not have vision skills; instead, they have the

Received: 19-Feb-2019 **Revised:** 10-Mar-2019 **Accepted:** 11-Mar-2019

Access this article online

Quick Response Code:

Website: http://iahs.kaums.ac.ir

DOI: 10.4103/iahs.iahs_5_19

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How to cite this article: Afshar A, Baqerli J, Taheri M. The effect of visual training on the rate of performance accuracy in girl soccer players. Int Arch Health Sci 2019;6:108-13.

cognitive foundations of the advances that enable them to receive perceptual information more efficiently than their counterparts who are less skilled.[7] Abernethy and Wood staed that visual skills could not be influenced by training, since they are inherently acquired.[3] Ludeke and Ferreira declared that visual hardware skills include perspicuity, matching, and profound perception that are more intrinsic, and software or cognitive components include vision perception, vision focus, visual response time, peripheral awareness, and visualization.[8] These skills are more influenced by practice and experience and can be improved and upgraded. Regardless of whether visual skills are practicable or not, research suggests that visual exercises can develop brain-related visual areas such as visual memory, background shape perception, and direction. This helps the athletes to be able to use them well in their sports field.[1] In many skills, if athletes do not pay attention to important symptoms at the start of their work, their chances of success in the performance will be greatly reduced. Skills such as determining the place of sending pass in soccer or deciding what kind of move a defender should do in basketball or soccer depend entirely on the player's attention to the visual symptoms of action.[9] To participate in a competitive sports, such as cricket and soccer, one of the important aspects that every coachman must always remember is to achieve the best possible performance of the entire body, including the visual system. The influence of the player's ability to act quickly and correctly depends on how effective his/her visual system can process the information. Effective visual skills are one of the most important assets that a player can have. When we consider the selected sports that the athlete is participating in, the odds are those visual skills that play a very important role in that particular activity.[10] Several researchers like Rio, Maki, and Fuber (1986) stated that individuals rely on vision as main source of information if possible, even if the information is not accurate enough to lead to successful performance. To retrieve information from the external environment, we strongly rely on our vision system. There is no doubt that athletic performance is related to perceptual-cognitive skills as well as motor and physical abilities. Over the past years, perceptual skills have received significant research interest in sports. One of the main differences between good and elite athletes is that elite athletes move their eyes more quickly and more adequately.[11] Although evidence of the effectiveness of visual exercises is available on sports performances,[12] there are some contradictory findings in this regard; for example, studies by Wood and Abernethy showed that the utility of these programs is not more than that of physical exercises.[3,13]

In this regard, Fallen (2017) reported the positive effect of visual and skill training on skills performance, retention, and transfer of badminton short backhand service.[14] Farsi *et al*. (2014) examined the Effect of visual and skill exercises on learning the effect of table tennis forehand;[15] Azimzadeh, Ghasemi, and Gholami (2014) examined the effect of a selected vision exercise program and two tennis skills [Table 1]; Hopwood *et al*. examined the effect of perceived vision exercise on the performance of skilled cricket players;[16] Veale *et al*. examined the effect of vision program on visual skills of professional soccer players;[17] and Abernethy and Wood examined the effect of generalized vision training on the performance of two groups of athletes in rocket sports.[3]

Previous research regarding the effects of visual training, has been mostly considered rocket sports rather than soccer sport. Because soccer is a popular sport and a political, cultural, social, and sporting event and, today, the success of soccer teams is a measure of the development of a country, research in its various domains, in particular psychological and psychoanalysis, can contribute to the development of this field and its strategies should be used by players, coaches, etc. Conducting research in this regard could be the reason for future research. Therefore, in order to study the effectiveness of visual and physical exercises on the performance of the sports, especially in the women's soccer field that has recently gained great honors, it seems necessary to provide valuable information. In this regard, this study is to investigate whether sports–vision exercises would influence the performance of shooting skill of girl soccer players in Karaj Branch, Alborz, Iran.

Materials and Methods

Participants

The research method was quasi-experimental with pretest and posttest design, in which the participants were categorized into experimental and control groups. The convenience sampling method was used in this study. The population of this study was all girl students of soccer school in Alborz province in 2018. A total of 45 female soccer players with an average age of 19.3 ± 1.4 years were selected from club teams in Alborz province (Karaj) with <1 month of training and were randomly divided into three groups (two experimental groups and one control group). The inclusion criteria were being beginners in terms of performance levels, physical characteristics (body mass index: ranging from 18 to 25 kg/m^2), and lack of any disorder in vision. The instruments used in this study included the standard futsal hall, ball, goalkeeper, standard stopwatch, Revien and Gabor's vision exercises test, and researcher-made sports–vision exercises (colored goalkeepers and colored caissons).[1]

Procedure

The sports–vision exercises consisted of four colored goalkeepers, each randomly lit for 3 s, shot at the futsal goal, according to colored caissons, for visual acuity and shoot. These exercises lasted for 12 min. In order to avoid differences in instructional guidelines and feedback, an Asian Football Confederation (AFC) official soccer coach was used in the experimental groups. The formal validity of this exercise was confirmed by the three AFC official soccer coaches and three faculty members in the field of physical education and sports science.

Visual training

A set of visual instructions were employed to perform visual training exercises that include the following:

1. Exercise for stimulation of light: In this exercise, a manual flashlight turns on and off to allow the central cells of the retina to enhance the light and darkness, which ultimately improves the sharpness
2. Snail rotation workout: In this exercise, the person looks for a rotating spiral for a long time. This creates an illusion of increasing size in seeing objects. In this way, the perceptual system of the athlete becomes familiar with this illusion, and this illusion is not temporary in sporting movements that require head rotation
3. Twine attached to the ball workout: In this exercise, the participants must move their kenning from the ball on the twine to the other ball (at a distance of approximately 3 m) and *vice versa*. This exercise improves adaptive ease and convergence of eyes' skills
4. Practice with swing balls: Participants should follow a fluctuating ball with their heads immobile. This exercise improves fluent motion of the eyes
5. Chasing a ball with a finger: In this exercise, the participants should follow the swing ball with their fingertip. This exercise can improve the coordination of the athlete's eyes and hands.
6. Practice rotating colors: In this exercise, there is a round plate with different black spots (in terms of shape and size) on it, rotating at different speeds. The athlete should follow the points on the screen. This exercise improves environmental awareness
7. Practice the ball in the carton: In this exercise, there is a cardboard box with 6–12 colored orbs. In the middle of the cardboard, there is a black spot that the participants must, while setting their eyes on it, move the orbs in the card with their fingers on specific paths
8. Back and forth workouts: In this exercise, which is used to improve visual memory, there are between 50 and 100 cards. In the middle of each one, a black circle and, on the two sides of the circle, two multidigit numbers are spaced from the same distance, but their spacing varies in different cards. As the cards move quickly to the examiner's hands, participants must read the numbers on the cards. Revien and Gabor (1981) described that this exercise improves the speed of assessment and peripheral vision
9. Practice of pulling the rope: An 8-m rope is connected to two sides of a wall at a distance of 4 m from the participant so that the participant can capture both ends of the head with two hands. The purpose of this exercise is to insert colored orbs in each of the ropes so that they are spaced equally to one another. This practice improves perception of the depth of athletes. Before and after the visual training, the participants must perform warm-up and chill exercises in accordance with the Revien and Gabor's Practice Guide (1981).

More-Christian's shoot skill test

In the test, there is a distance of 120 cm betwen goal keeper and gate. standard test is characterized by a distance of 120 cm away from the goalkeepers. Then, they were asked to shoot four identical circle targets. They were asked to shoot four circle targets. From a distance of 16 m in four stages, in each stage, four shoots are shot. The balls placed on the ground will not receive points. The final score is 16 points. So far, no specific norm has been proposed for it, and in Iran, this test has been used repeatedly in various researches.[18]

Data collection method

First, after receiving the reference, coordination with the managers and coaches of the selected soccer clubs of Alborz province (Karaj) was carried out. Then, 45 female soccer players (who are familiar with the basic skills 1 month from the date of registration) with a mean age of 19.3 ± 1.4 years volunteered to participate in the study and were randomly divided into three groups (two experimental and one control groups). The generalities of the research process and the purpose were fully explained to the participants, and they were assured that all information would be kept confidential. Then, all the participants completed the consent form of the participation in the research and were present with full satisfaction in the research. Researchers provided the best possible environmental conditions for participation in the research to the extent possible and for the participants to meet all the ethical value aspects of the research. The participants were also given the opportunity to withdraw at any stage of the study for any reason. This research was conducted in three stages, namely pretest, intervention, and posttest.

Pretest stage

The participants performed a 3rd attempt block as a pretest from the first penalty point of the Futsal ground before they started their training efforts. This was done while they did not undergo any visual training. At this stage, the scores of each participant were recorded.

Acquisition stage

The acquisition stage consisted of eight sessions of practice, in which participants participated in each session according to the training table under the supervision of a trained coach. The visual training group received three visual training sessions per week (2 weeks and 12 min for each session). Visual–sports exercise group received two training sessions per week (2 weeks and 12 min for each session), by which 50 exercises were performed.

Posttest stage

The transfer test was performed after 48 hours. they performed the secant penalty task from 10m distance. Each participant performed eight shoots (10 m) with a superior leg. In this test, the accuracy of the shoot was examined. It should be noted that the control group did not perform any other physical and mental exercises, except for its usual exercises. The intervention involved six sessions, including one session of the pretest, eight sessions of the acquisition phase, and one session of the posttest. It should be noted that, to increase the accuracy of the results after the end of each week of training, samples were tested.

In this research, descriptive statistics were used. Shapiro–Wilk test was used to verify the normality of data, and covariance

Table 1: Description of researcher-made sports-visual exercises

	Tools	Description of exercise	Targets
1	Three color barriers - Balls to the number of players - one gate	The player begins to move from the start point with the ball, and then he/she shoots into the penalty area in the designated obstacle by the coach.	Increasing sharpness - increasing decision speed - increasing the accuracy of the ball hit
2	Three barriers whit different colors - ball - gate	Players from the back of the obstacle shoot the colored obstacles inside the goal, which are determined by the coach.	Reinforcement of sharpness - reinforcement of puncture accuracy
3	Two balls - 2 players	The player in possession of the ball must throw the ball simultaneously with the hand and foot for the opponent and the opponent also receives both balls simultaneously	Environmental awareness - nerve and muscle coordination - precision in the pass - precision in receiving pass
4	Balls to the number of players - small gate	Players place their balls in the marked areas and shoot to the marked areas of the goal. The next time the players change their place to shoot from different locations.	Increased accuracy in impact - increases sharpness
5	Three different cones in different colors - balls in the number of players - 3 different flags in different colors - one gate	The players are divided into three groups, then each group stands behind the barrier with a marked color, and the player of each group shoots by the coach to see the color of the flag.	Precision in Shot - visually involving - speed in decision-making
6	Eleven players - 11 hats - 6 balls	11 players are divided into two groups of 5 and 6 each, and each 11 players have hats during the training. Group 6 has balls and 5 others without balls. The players begin to move in the designated area, then with the coach's whistle, 6 players holding the ball should give the ball to the players without a ball. A player who cannot pass the ball gets a negative score	Environmental awareness - hold your head up - see the team player -fast in pass - accurate pass
7	Four colored gates - 2 colored barriers - 6 players - balls	On the pitch, two teams are with three players. In each pitch, two gates are in different colors. The players start playing with the whistle of the coach, and when they enter the opponent's ground, they must hit the gate that the coach specifies. As long as there is a chance to hit the goal, the ball does not leave the opponent's ground	Increasing the speed of the game - enhancing environmental awareness - game development - transfer game - counterattack - accuracy on impact
8	Four small gates - 6 players	The player inside the circle in the middle of the ground moves with the ball, then the coach announces the color of the goal and the player must enter the goal in the shortest possible time. The coach stands with six balls next to the ground and passes the ball every time the ball goes out	Accuracy pass - speed pass

test and Bonferroni's *post hoc* test were used to test hypotheses at 95% confidence level using SPSS software (Version 16, SPSS, Inc, Chicago, IL, USA).

Results

The performance of groups in pre-test and post-test can be seen in Table 2.

Table 3 shows the results of the Shapiro–Wilk test that the distribution of the performance data of the research groups in the pre- and post-test groups was normal ($P < 0.05$).

Table 4 shows the results of the covariance analysis of the performance of soccer girls' shots.

The results indicated that there was a significant difference between the average adjusted performance of shooters of soccer girls in the group of visual training, visual–sports exercises, and control exercises ($F_{(2,40)} = 9.36$, $P = 0.000$, $r^2 = 0.31$). The results of Bonferroni's *post hoc* test to determine the source of the differences showed no significant difference between the average corrected shoot performance of soccer players in the visual training and control groups ($P = 0.30$), which means that visual exercises had no significant effect on the performance of soccer girls' shots.

Table 2: The variable performance of soccer shoot skill

Performance	Control	Visual training	Visual-sport training
	Mean±SD	Mean±SD	Mean±SD
Pretest	9.73±8.7	11.11±7.6	19.4±2.6
Posttest	8.13±8.1	11.28±13.7	29.6±2.9

There was also a significant difference between the average adjusted performance of shooters of soccer girls in visual–sport and control exercises ($P = 0.002$), which means that visual–sport exercises improved the performance of soccer girls' shots.

There was a significant difference between the average adjusted performance of female soccer shootings in the group of visual training and visual–sport exercises ($P = 0.005$), which means that sports–visual exercises when compared with visual exercises resulted in a significant improvement in the skill of soccer girls' shots.

Discussion

The purpose of this study was to compare the effect of visual–sports exercises on the performance of shooting skills of

Table 3: Shapiro-Wilk test results

Performance	Control			Visual training			Visual-sport training		
	Significant	df	D	Significant	df	D	Significant	df	D
Pretest	0.077	15	0.894	0.251	14	0.924	0.100	15	0.901
Posttest	0.059	15	0.888	0.212	14	0.919	0.410	15	0.942

SD: Standard deviation

Table 4: Results of covariance analysis

Source	MS	*F*	r^2	Significant
Pretest	1258.1	16.007	0.28	0.000
Training	736.01	9.36	0.31	0.000
Error	78.6			

female soccer players in Karaj. The results showed that visual training had no significant effect on the performance of female soccer players' shooting skill; however, the accuracy rate of shooting performance of female soccer players was improved. Furthermore, visual–sport exercises when compared to visual exercises led to a significant improvement in the female soccer players' shooting skills.

The results of this study were compared with those of Fallen (2017), Mahmudi and Badami (2017), Farsi *et al*. (2014), Azimzadeh *et al*. (2015), Shoja (2015), and Hopwood *et al*., which were similar.[1,14-16,19,20] The present study findings were also consistent with the findings of Sherman and Balasaheb *et al*.[12,21] Sherman found the effect of visual–sports exercises on static visual acuity, dynamic visual acuity (depth perception), three-dimensional vision, accurate mental imagery, eye movement and speed, environmental perception, and visualization in his research. He stated that all of these visual abilities are taught and improved with visual training.[21] In a study, Balasaheb *et al*. showed that, if the visual exercises are designed in accordance with the requirements of the task, their impact on the performance will be highly increased that is consistent with our study.[12]

Wilson and Falchel (2009) stated that recovery from visual training exercises in eye movements, focusing skills, visual perceptual environments, and visual perceptual skills will be transferred to the playground; therefore, it does help athletes to achieve optimal performance and reach the next level, regardless of how rigorously they were at the given level. They believe that, in order to engage in a competitive sports such as cricket and soccer, one of the important aspects that every coachman must always remember is to achieve the best possible performance of the entire body, including the visual system. The effectiveness of the athlete's ability to act quickly and correctly depends on how effective the visual system can process the information. Effective visual skills are one of the most important tools an athlete can have. When we consider the selected sports that the athlete is taking on, chances are those visual skills that play a crucial role in that particular activity.[4] Ayoubi *et al*. stated that skilled athletes are in better position than ordinary athletes in terms of depth perception. Vision is superior to perceptual-motor responses, which are superior to other sensory qualities. Effective motion behavior is entirely dependent on perception. Perception of vision is also a problem that scientists have been focusing on for centuries. In order to effectively carry out many of the tasks in motion, accurate judgments about moving objects in space are necessary. On the other hand, this ability depends on vision perception. Moreover, the ability to recognize the distance to have an effective performance plays a decisive role. In fact, deep-seated perception is a determining factor in all dynamic responsive exercises, which require the evaluation of appropriate visual factors that are vital for understanding depth. In addition to speed assessment, reappraisal is also important in all of these sports because athletes need to process fast information to determine the best stimulated response. Therefore, according to the results, we conclude that the performance of this study is similar to that of Ayoubi, *et al*. due to both hereditary factors and their related exercises or sports.[10]

The results of this study showed that visual exercises have no significant effect on the performance of female soccer players' shots. It can be said that, in order to enhance the visual skills of a sporting skill, the practice of that skill alone is not enough. Rather, exercising with visual training can bring the best results. In this case, the perceived motor skills of the desired skill will be improved through specialized sporting exercises, and also visual training can be used as an auxiliary factor to develop the skill needs of the vision.[1] Shore-term exercise sessions could be the reason for divergent results of the current study compared to that of Abernathy and Wood.[3] One of the study limitations deals with nutrition status as an important factor in mental processes[22] and the level of physical fitness[23] that was not controlled. Considering the mentioned factors is highly recommended in future studies. The other consideration refers to body composition,[24,25] especially body fat percentage.[26]

Conclusion

Specific visual training could be more beneficial in improving the performance of female soccer players' shots.

Acknowledgment

The authors would like to specially thank all female soccer players who generously devoted their valuable time for the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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