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Effect of Visual Skills Training on Abilities of Balance and Depth Perception among the Players of Badminton

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Abstract:

Whatever may be the nature of sports, visual skills are the basic requirements for the players invariably. In sport, players with excellent visual skills can able to process the information and respond to what they see faster and better. In badminton, the moment, the player serve the ball, opponent player must evaluate the ball's trajectory and speed to clear successfully. All these actions would occur within a split of second. Here, the depth perception plays a very crucial role. Besides in considering the other situations such as smash and clear in addition to depth perception to execute the visual skills, the individual needs sufficient amount of balance. Thus, the present study was framed to study the effect of visual skills training on select visual skills of depth perception and ability of static and dynamic balance among the badminton players at school level. Samples: As samples (N=129), students studying in schools who were the participants of inter- school competitions at primary level were selected. The age group of was fixed in the range of 12 to 14. Depth perception and ability of balance namely, static and dynamic were selected as variables for this study to study the effect of visual skills training. Experimental design: Pre-post random experiment group design was used as experimental design in this study. By assessing the performance on overall playing ability samples (N=129), 64 samples exists in the range 3.5 to 5 on the performance of overall playing abilities and 30 samples were further screened and randomly assigned into two groups equally. Thus each group consists of 15 subjects. Group-1 named as Visual Skills Training (VST) and Group -2 named as Traditional Training (TT). Following this, samples of experimental group-I was treated with visual skills training and experimental group – 2 treated with traditional training alone. The collected data from pre- test and post-test were tested with paired t- test and analysis of covariance, so as to test the individualized effects and comparative effects of Visual skills training and traditional training alone on select abilities of balance (static and dynamic) and depth perception. To test the significance of the results derived, 0.05 level was chosen as level of significance. The results of the study confirmed the effect of visual skills training positively on visual abilities of depth perception and ability of balance such as static and dynamic.

Key Words:Visual ability, Visual skill, Depth perception, Balance, Visual attention, Sensory system

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Now- a –days, need of visual skills increasing its demands over the controlling of skillful activities in sports (Harris & Jenkin, 1998). Research investigation is continuing to identify the role of visual skills and its impact in the performance of sport (Montagne, Laurent and Ripoll, 1993).Visual skill in one of the sensory systems in the human body,when a player wants to observe the fast movements of ball in the game of badminton, it requires great demand on his visual systems. Here, eyes sends information to the brain, where it integrated and interpreted as a three dimensional nature. Visual skills are necessary in decision making, since accurate decision making is in need in sport situations specifically learning the complex task in which the level of attention, scanning for opportunities whereby functioning upon them(Greenword,1993). According to Suter and Harvey(2001), visual skills involves combined efforts of eyes, eyelids, extra and intra ocular muscles, several cranial nerves and sub cordial brain stem, spatial audition and kinesthetic perception and balance. Vision is the principal source of information for planning and executing the fundamental and advanced skills in sports. (Abernethy, 1996). Vision is one among the most essential source of information nearly 80 percent of its input goes to brain which enable a player to make sense of and interpret what they are seeing(Hodge et al 1999). Focusing visual attention on important cues enables the player to take good appropriate decisions in competitions. In the game of tennis, visual strategies are used by players in the expectation of the kind of tennis serve and consequently trajectory of the ball to specific cues. Thus the visual strategies make the player to develop their skills of anticipation in racket sport by pointing out relevant cues (Abernethy and Wollstein, 1989).

Visual skill training is not a therapeutic mode rather it is a mode to enhance the visual efficiency in sports. Using visual skill exercises, brain learns to respond more accurately and efficiently. Being a muscle memory, having experience over the visual elements, player in sport can know and refine exactly how to react (Atkins, 1988). Visual system in sport playing is guiding the players on searching the essential information underlying skillful behavior. Visual search strategies refer to the way that the eyes move around the field with the aim to direct visual attention towards relevant sources of information. According to Hodge et al (1999) nearly three fourth of the information from the environment perceived through the visual system and send to the brain. He has also stressed that due importance is to be given to the visual skills as in the case of other physical and psychological abilities. For developing the physical and psychological abilities also player is in need of visual skills such as observing and identify the elements from the situations. In fact the duration to be taken to develop the psychological skills like mental toughness and coping is comparatively lesser than the duration needed for visual skills. Like physical abilities, visual abilities assistthe player in sport to excel better and bring their full potential.

In the game of badminton, visual information is very essential when the players' movements must coincide with a changing environment, such as hitting the ball or in motor activities requiring precise movements of the limbs in regards to a target. Hopfingeretet al (2000) explained that dynamic interplay between the attention control system and the sensory brain structures correlates to selective visual attention. In the game of badminton, one among the fundamental skills of serving used normally in two different moves such as high serve and low serve. Each one of it has merits and demerits for the opponents of the game. In case of high serve where the opponent is having opportunities to strengthen their attacking abilities, whereas in the case of low serve, successful execution of receiving the ball and placing in front of the court by opponent players will be the possibilities of score. During this course, player in the opponent court, has to judge the speed of the ball, direction in which travel, trajectory of the ball and span of apprehension while receive the shuttle. If a player is not having the visual acuity, efforts over the visual abilities might have an opportunity to move earlier resulting failure to meet the shuttle. Likewise in the remaining skills of clear and smash where the player should have the ability to take guide decision in placing the shuttle in the opponent court using facing movements quickly. Thus the need of visual skills such as eye hand coordination, span of apprehension, visual reaction time, depth perception and balance are to be considered for the players in the game of badminton to show their excellence in addition to the other performance related fitness components.

In the present study, selected visual skills such as depth perception and ability of balance have been studied to find the effect of visual skills training.Depth perception is one of the visual abilities related to two eyed aiming in the athlete's judgment of distance and speed.Depth sensation enables the individual to sense the distance of an object so as to move accurately and respond consistently according to the distance (Howard, Ian (2012). Depth perception arises from a variety of depth cues (Swanston, and Gogel, 1986), which are typically classified into monocular and binocular cues. Likewise the other perceptual element of balance being the movement skill serves as a function of the nervous system, directlyinfluenced by the five senses. The body's balance centers the eyes, ears and feet works together to sense imbalance and help correct posture. Ability of balance is inherited with the individual paying attention totheproprioceptiveand visualclues(Ashton et al, 2004). Balance can be segmented into static and dynamic based on its nature of existence. Thus,bothstaticand dynamic balance need theintegrationof senses of visual,vestibularand proprioceptive inputs so as toproduce an efficient responseto control the bodywithinitsbaseof support(Olmsted et al,2002), (RossandGuskiewicz , 2004). The ability of balance as it seemed to be the motor fitness components, in nature its requirements over the sensory abilities it would be considered as sensory skill. In the game situations, the ability of balance is the primary factor in executing the skills of visual acuity which is needed for perceiving the objects in distance. Thus, with the aim to make the awareness on need of visual skills training in sport, the present study is designed to find the effect of visual skill training on selected visual abilities of depth perception and balance among the players of badminton at the school level.

Materials and Methods

To achieve the objectives formulated in the present study, the means and methodsused are as follows. In the present study, the investigator aimed at to study the effects of visual skills training and traditional training on the abilities of balance and depth perception. Pre-post random group experiment research design was employed. In the selection of samples, convenience sampling method is used. The students participating in the school level tournament were selected randomly (N=129). The age of the samples was fixed in the range of 12-14. Since the present study is to validate the efficiency of visual skills training on variables of ability of balance and depth perception (visual skills) to establish the homogeneity among the samples selected for experimental groups, performance on overall playing ability was measured initially using the selected fundamental skills in badminton by expert rating method. In measuring the overall playing ability, the performance over the fundamental skills of serving, smash, clear were considered. The subject's performance on fundamental skills of serving, smashing, and clear were tested with three experts using ten point rating scale and average of the three experts considered as score. From the selection of samples (N =129), samples exists in the range 3.5 to 5 on the performance of overall playing abilities were further screened. Thus, the selected samples totally 64 were identified. Among them (N = 64), 30 samples were randomly selected and assigned in to two groups equally. Thus, each group consists of 15 subjects. Group-1 named as Visual Skills Training (VST) and Group -2 named as Traditional Training (TT). As variables, the performance of subjects on abilities of balance (dynamic and static) and depth perception were selected. The selected variables were measured with the help of research scholar in physical education using standardized tests. Thus,depth perception apparatusis used for measuring the depth perception and Stork hand test (In sec) and Modified Bass Balance test (in scores) is used to measure the static and dynamic balance. This was considered as pre- test score.

Following this, samples of experimental group-I was treated with visual skills training and experimental group – 2 was treated with traditional training alone. Subjects of traditional training group were allowed to practice their own traditional training schedule without any specific training related to visual skills. Subjects of visual skills training group were treated with their respective program for about twelve weeks in alternative days a week. For employing visual skills, the drills related to coordinative abilities and basic fundamental skills were used with duration of 40 minutes. After completion of treatment period, the samples of both groups were tested on variables such as in the pre-test and considered as post- test score. The collected data were tested with paired t- test and analysis of covariance so as to test the individualized effects and comparative effects of visual skills training and traditional training alone on selected abilities of balance (static and dynamic) and depth

perception. Totest the significance of the results derived, 0.05 level was chosen as level of significance. The results of the study are as follows.

Results

Table-1 Significance of Mean gains or losses on abilitiesof balance (dynamic and static)and depth perception of Visual Skills Training Group

	Source	Mean	S.D	SEM	MD	t-ratio	Sig.
Dynamic Balance	Pre-test	64.80	4.57	1.18	3.13	8.32*	0.00
	Post -test	67.93	4.43	1.14			
Static Balance	Pre-test	45.40	3.62	0.94	3.86	9.12*	0. 00
	Post -test	49.27	3.77	0.97			
Depth Perception	Pre-test	1.71	1.36	0.35	0.78	2.48*	0.026
	Post -test	0.93	0.38	0.10			

S.D: Standard Deviation SEM: Standard Error of Mean
MD: Mean Difference * Significant at 0.05 level

Table -1 explains the results on measuring the changes over the twelve weeks of Visual Skills Training period on the abilities of balance and depth perception. Thus, the descriptive measures such as mean and standard deviation on changes from baseline to post treatment are: for dynamic balance 64.80 ± 4.57 (Pre-test), 67.93 ± 4.43(Post- test) [Fig.1], for static balance 45.40 ± 3.62 (Pre-test), 49.27 ± 3.77 (Post -test) [Fig.2] and for depth perception 1.71 ± 1.36 (Pre-test), 0.93 ± 0.38 (Post- test) [Fig.3]. In testing the changes from the baseline to post- test (3.13 for dynamic balance, 3.86 for static balance and 0.78 for depth perception) on the abilities of balance such as dynamic and static and depth perception, the observed t-value are:8.32(dynamic balance), 9.12 (static balance) and 2.48(depth perception). The observed t-values are found to be significant at 0.05 levels. From the results, it was inferred that visual skills traininghas significant impact over the changes on the abilities of balance and depth perception among the players of badminton.

Table- 2 Significance of Mean gains or losses on abilities balance (dynamic and static)of and depth perception of Traditional Training Group

Coordinative abilities	Source	Mean	S.D	SEM	MD	t-ratio	Sig.
Dynamic Balance	Pre-test	65.60	5.77	1.49	2.00	*2.02	0.55
	Post -test	63.60	6.77	1.75			
Static Balance	Pre-test	40.20	2.46	0.63	1.06	*1.52	0.15
	Post -test	41.27	1.79	0.46			
Depth Perception	Pre-test	1.53	0.87	0.22	0.11	*0.64	0.53
	Post -test	1.41	0.81	0.21			

S.D: Standard Deviation SEM: Standard Error of Mean
MD: Mean Difference * Significant at 0.05 level

Table -2 delineates the results on measuring the changes over the twelve weeks of Traditional Training on abilities of balance and depth perception. Thus, the descriptive measures such as mean and standard deviation on changes from baseline to post treatment are: for dynamic balance 65.60± 5.77 (Pre-test), 63.60± 6.77 (Post- test) [Fig.1], for static balance 40.20± 2.46 (Pre-test), 41.27± 1.79 (Post- test) [Fig.2] and for depth perception 1.53± 0.87 (Pre-test), 1.41± 0.81 (Post- test) [Fig.3]. Following this, the results of paired t-test, the obtained t-value on testing the changes from the baseline to post- test are: 2.00 for dynamic balance, 1.06 for static balance and 0.11 for depth perception. Thus, the obtained t- value on changes made from the baseline to post test on dynamic balance (2.02), for static balance (1.52) and depth perception (0.64) are found to be statistically not significant at 0.05 levels. From the results, it is inferred that the training such as visual skills can be inducted into traditional training so as to procure the visual skills among the players of badminton specifically at school level as they can effectively learned those skills.

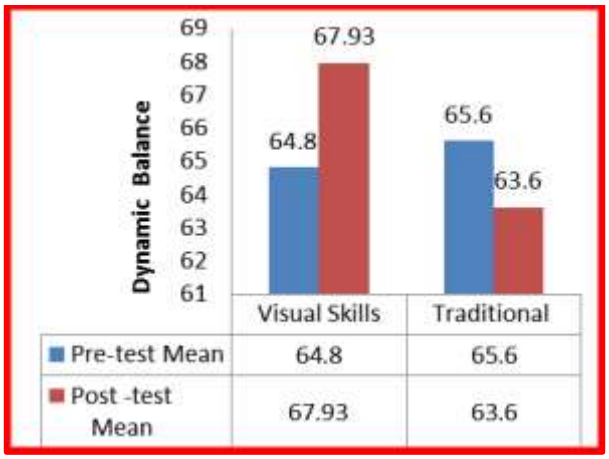

Figure -1

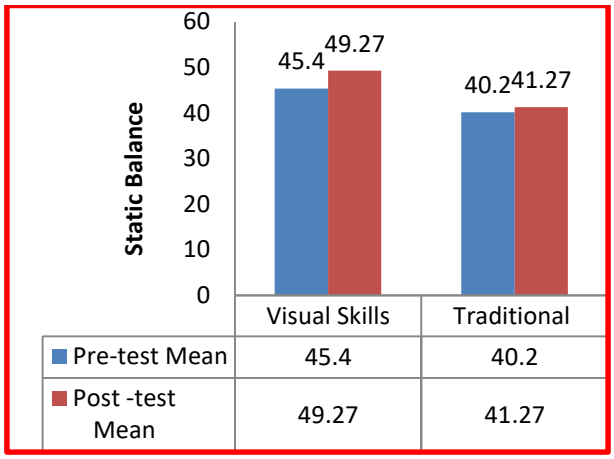

Figure -2

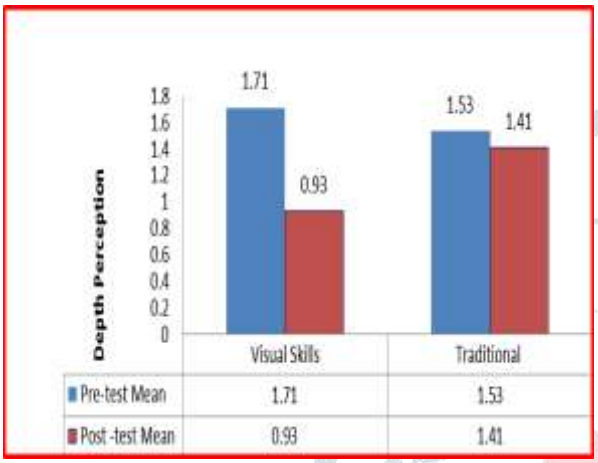

Figure-3

Following the analysis of individualize effects of visual skill training and traditional training, to validate the impact of visual skills training on the abilities of balance and depth perception which is one among the objectives of the present study, the data collected on variables from the subjects treated with visual skills training and traditional training from before and after the treatment period tested with analysis of covariance. Testing the significance of mean difference before and after the treatment period is the initial process of analysis of covariance.The results obtained are displayed in the following tables from 3 to 5.

Table- 3 Analysis of Variance on Dynamic Balance

Tests	Source	Sum of Squares	DF	Mean Squares	F-ratio	Sig.
Pre-test	Between Groups	4.800	1	4.800	0.177	0.677
	Within Groups	758.000	28	27.071		
Post – test	Between Groups	140.833	1	140.833	*4.30	0.047
	Within Groups	916.533	28	32.733		
Adjusted Post - test	Between Groups	193.846	1	193.846	*23.75	0.000
	Within Groups	220.416	27	8.164		

* Significant at 0.05 level

Table- 3 reveals that the observed F-values are: 0.177 for pre- test, 4.30 for post- test and 23.75 for adjusted post -test. In testing the significance of mean difference between the visual skill training and traditional training on dynamic balance, the obtained F- value (0.177) was found to be statistically not significant , whereas, testing the post -test mean ,the obtained F-value 4.30(post- test) was found to be significant at 0.05 level. Following this, in testing the adjusted post- test means such as 68.31 for Visual Skills Training and 63.21 for Traditional Training (Fig.4), the obtained F-value 23.75 was found to be statistically significantat 0.05 level. Thus, the results obtained confirm that the visual skills training have more impact on the development of dynamic balance, when compared to traditional training.

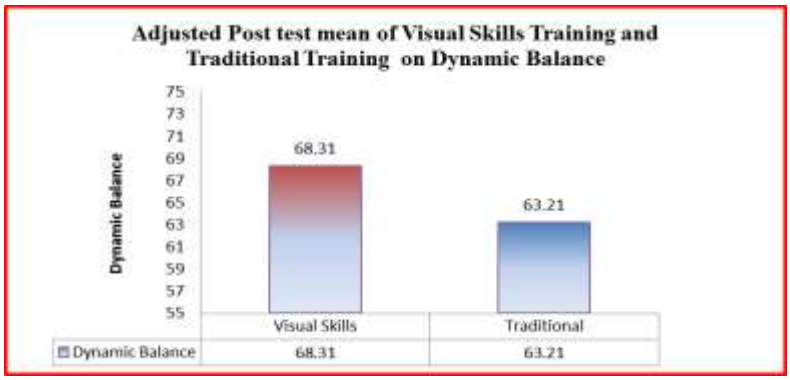

Fig.4

Table- 4 Analysis of Variance on Static Balance

Tests	Source	Sum of Squares	DF	Mean Squares	F-ratio	Sig.
Pre-test	Between Groups	202.800	1	202.800	21.18	0.000
	Within Groups	268.000	28	9.571		
Post – test	Between Groups	480.000	1	480.000	*55.11	0.000
	Within Groups	243.867	28	8.710		
Adjusted Post - test	Between Groups	82.609	1	82.609	*19.33	0.000
	Within Groups	115.332	27	4.272		

* Significant at 0.05 level

Table- 4 presents that the observed F-values are: 21.18 for pre- test, 55.11 for post -test and 19.39 for adjusted post -test. In testing the significance of mean difference between the visual skill training and traditional training on static balance, the obtained F- value (21,18) was found to be statistically not significant , whereas, testing the post -test mean ,the obtained F-value 55.11 (post -test) was found to be significant at 0.05 level. Following this, in testing the adjusted post - test means such as 47.46 for visual Skills Training) and 43.06 for Traditional Training (Fig.5), the obtained F-value 19.33 was found to be statistically significantat 0.05 level. Thus, the results obtained confirm that the visualskills training have more effect on the development of static balance, when compared to traditional training.

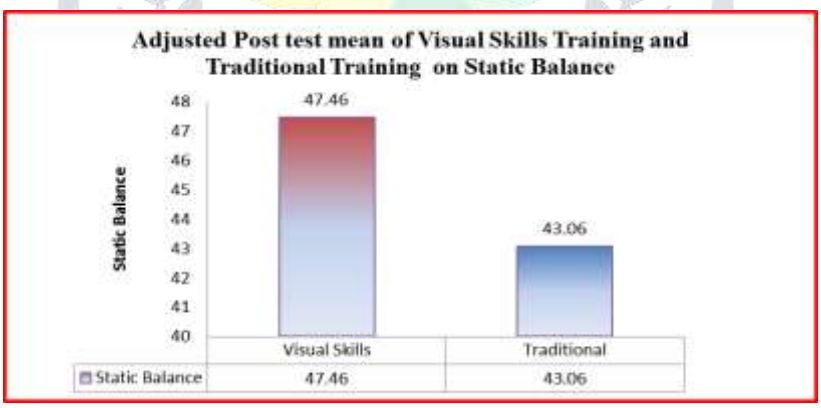

Fig.5

Table- 5 Analysis of Variance on Depth Perception

Tests	Source	Sum of Squares	DF	Mean Squares	F-ratio	Sig.
Pre-test	Between Groups	0.261	1	0.261	0.20	0.658
	Within Groups	36.547	28	1.305		
Post – test	Between Groups	1.728	1	1.728	*4.35	0.046
	Within Groups	11.111	28	0.397		
Adjusted Post - test	Between Groups	2.107	1	2.107	*6.86	0.014
	Within Groups	8.287	27	0.307		

* Significant at 0.05 level

Table- 5 shows that the observed F-values are: 0.20 for pre- test, 4.35for post- test and 6.86 for adjusted post- test. In testing the significance of mean difference between the visual skill training and traditional training on depth perception (Fig.6), the obtained F- value (0.20) was found to be statistically not significant, whereas, testing the post -test mean,the obtained F-value 4.35 was found to be significant at 0.05 level. Following this, in testing the adjusted post- test means such as 0.93 for visual Skills Training and1.43 for Traditional Training (Fig.6), the obtained F-value 6.86 was found to be statistically significantat 0.05 level. Thus, the results obtained confirm that the visualskills training has more consequence on the development of depth perception, when compared to traditional training.

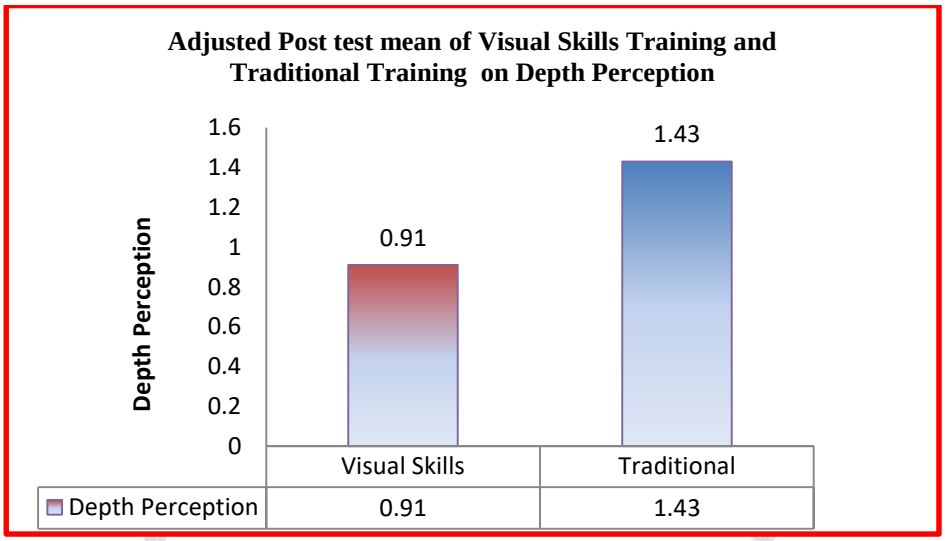

Fig.6

Discussion on Findings

In the present study, the observed results confirmed the effect of visual skill training positively over the improvement of visual skills such as depth perception and balance(static and dynamic).Like trained the physical skills, visual skills also can be trained and developed (Edward et al. 2005). The need of visual skills in sport is emphasized earlier by Blantor Collier (1979) being a football coach, as it is very essential for the sport to perform complex movements like in the games of badminton, gymnastics, volleyball, basketball and so on. To develop the visual skills (Clark et al, 2012)perceptual training programhas been employed the perceptual training program for a baseball team. From the results, they have observed that batting average was improved compared to players who are kept under control and also found favorable impact following the visual skills training. Several other research studies also reported positively over the effect of visual skills training on the performance of sports (West and Bressan, 1996, Kofsky ,2005)

In sport, a player or athlete may be similar in size, shape, and physical abilities, whereas the difference may exist in the visual skills such as dynamic visual acuity, eye focusing and teaming skills, visual spatial perception, and visual processing speed, visual reacting and response, hand-eye coordination and peripheral awareness. But opportunities are there to develop these visual skills for them (Lambert, 2005). Visual skills training can be incorporated as integral part of sport training practices since visual skills are one among the key factors of success. The influence of visual skills on perceptual abilities examined by Trachtman (1973) on ocular motility and found a coefficient of correlation of +0.40 between two pursuit directions (up/down and side to side) and batting averages at greater than 0.05 level of significance. His findings stress the functional relationship exists between the visual skills and ability of batting. The player ability over the visual acuity and ability to perceive the object in distance are the major determinants in the performance of batting. In comparing the visual skills on batting ability the findings (Falkowitz and Mendel, 1977) also confirmed the efficacy of visual skills. In their study they reported that their 11 to 13 year old Little Leaguers, who had better tracking and convergence skills than a comparable sample, were more likely to have higher batting averages; however, a statistical analysis was not reported. Superior binocular depth perception has been demonstrated to be more advantageous to athletes.In such a way, it has been observed from the earlier studies (Krüger et al., 2009) thatvisual skills training is the significant source for the players to perform well in the perceptual skills like depth perception and ability of balance.

In the present study, drills related to visual skills such as ladder drills, jump rope and shuttle helps the players indirectly strengthening their muscles and developing neuromuscular abilities.While performing these drills,a player has to concentrate over the activity with precision in movements and complete within the stipulated periodas visualabilities are significantly influencing the visualconcentration (WilliamsandDavids, 1997). It enhance the neuro sensory motor awareness over the movement which might have been the significance cause for the dominance of subjects treated with visual skills with imagery training on perceptual abilities like eye hand coordination (Rameshpandian and Rajeswaran ,2021). Thus such type of drills related visual skills enable a player to develop their coordinative abilities and ability of balance. Likewise, one among the drills administered for improving the clear in badminton is clear a height. In which the wall act altered 25 feet high used to practice clears. In this drill,the players are benefited in learning the visual skills of accommodation vengeancewhereby they can have divergence and convergence abilities. Having the divergence and convergence abilities players can judge the distance between the objects made clear successfully. The sources for such positive development over the depth perception and ability of balance substantiated with the findings of Krüger et al (2009).

In his study, he has examined the effect of visual skills on skill performance of cricket players. In their study, they found that their intervention of visual skills with skill performance program enhance the performance of players on visual fields onballhandlingskills,co-ordination, visualawareness, eyetrackingskills,accuracy,peripheral awareness,pro-action, reactionskillsandvisualconcentration which enable them to perform well in sport. During practicing the wall clear drills for particular duration, player had an opportunity to gain over stability and mobility. Karimian et al (2015) stated that visual skills in balance, precision and perception have exceptional visual prowess which were increased by visual skills training. Thus the player is benefited in developing their abilities of static and dynamic balance. Visual skills training normally helps the players in developing the skills related to eye movement, focusing in object, peripheral visual awareness and visual perceptual abilities, resulting of which a player can able to apply in the field (Wilson, &Falkel, 2004).

Conclusions

Based on the results, the following conclusion has been made. In testing the individualized effect of visual skill training on depth perception and ability of balance (static and dynamic), the observed result confirm the changes made from before treatment and after treatment on the performance of depth perception and ability of balance. Results from the individualized effect of visual skill training explained that performance on depth perception and abilities of balance have been improved from the base line. In considering the results on traditional training, the changes have been observed from the baseline was failed to reach the significant level. Based on the results of individualized effect of visual skills training and traditional form of training, it was concluded that, the need of visual skill training may be the viable source for the players in procuring the visual abilities such as depth perception and ability of balance.

In order to validate the efficiency of visual skill training on the performance of depth perception and abilities of balance, the observed result was favored to the subjects treated with visual skill training compared to the subjects of traditional training. In the present study, drills employed in the visual skills are basically concentrated over the movement of eye, in connection with multifaceted components of perceiving the information and send to brain for making decisions. Following the information, this development of visual abilities, drills employed to strengthen the muscle memory basically related to movements of fundamental skills in badminton and perceptual abilities. Such type of drills enable the subjects to enhance their visual abilities of saccades movements', eye hand co-ordination, eye foot coordination,visualawareness, eyetrackingskills,accuracy,peripheral awareness, span of apprehension, perception, visualreactionskillsandvisualconcentration. Thus, the object oriented visual skills training encompass the sources for development of visual abilities which in turn make improvement over the visual skills of depth perception. Besides, the game specific drills employed in the present study concomitantly help the subjects to enhance their ability over stability and mobility. Thus, such a scientifically designed visual skills training might have been the significant source for the improvement on depth perception and abilities of balance both in static and dynamic compared to the subjects of traditional training. Hence, it was concluded that in future, physical training, the physical education teachers, coaches, trainers and exercises designers should incorporate the visual skills training to extract the potential of the players in the game situation, based on the efficiency of visual skills.

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