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Original article

EYE MOVEMENTS AND DYNAMIC BALANCE BETWEEN EGYPTIAN HANDBALL PLAYERS AND KUWAITI HANDBALL PLAYERS

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Abstract

Aim. Vision may be the most variable and selective of all the senses. Attempting to observe fast movements that occur in sport places great demands on human vision. The eyes send information to the brain where it is integrated and interpreted as a three-dimensional (3D) phenomenon. The integration of visual information from both eyes into a 3D image called fusion. Without a conscious effort to attend to something, the eyes will continuously move throughout the visual field. When something gets our visual attention, we may focus both eyes on the object. This pause is called a fixation. The aim of this study was to determine the differences between Egyptian handball players and Kuwaiti handball players in eye movements and dynamic balance.

Methods. Eleven elite Egyptian handball players and Ten Kuwaiti handball players were participated in the study (mean age. 22.55 ± 2.34). , test results were obtained for eye movements. All participants were professional players and members in national teams. Eye movements of participants were recorded via Videonystagmograpy (VNG). In addition, star test to measure the dynamic balance.

Results. There was no significantly differences between Egyptian handball players and Kuwaiti handball players in eye movements except gaze test. In addition, relationship only between gaze behavioral and balance test forEgyptian handball players.

Conclusions. Future research should consider these results, and determines the vision tests that strong connect with handball game.

Key words: Eye Movements, Handball, V.N.G

Introduction

Team handball is a fast and furious court game. It is a rigorous sport with a high level of physical contact and lots of action. It is considered second only to pelota (Jai-Alai) as the fastest team game in the world and it is thus an ideal spectator sport. The cantaloupe-sized, stitched-leather ball, similar to a small soccer ball, is thrown at speeds of 50 M.P.H. or more by the human arm. Goalies are especially dependent upon quick reaction time. It is a simple and inexpensive game, requiring a minimum of equipment, and is played by men and women of all ages. The duration of the game depends upon the age and sex of the participants. The International Handball Federation controls rules of the game. (American Optometric Association 1998)

The field of sports vision is generally considered a very modern discipline. It is only in recent years that it has begun to gain any press attention and, more importantly,become an area that is actively sought out by coaches and athletes. However,there is still much debate regarding the role of vision in sporting performance. It was the legendary American Football coach Blanton Collier who coined the phrase`the eyes lead the body' and in the vast majority of sports it is clear that it is the visual system that provides the athlete with information about where, when,and what to perform. It is therefore the eyes, via pathways in the brain, which direct the muscles of the body to respond.

Elite athletes will spend hours every week improving the speed, strength and endurance of their muscles. but, if they are inefficient in processing visual information, is this muscular training a waste of time? If the eyes do not tell a cricketer where the ball is, will he ever hit it, no matter how much time he has spent working on his stroke. The debate around sports vision is therefore not about vision being a critical factor in sports performance, but concerns the conflicting evidence around whether successful athletes possess superior visual skills to

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novices, whether training can enhance visual performance, and whether better visual skills will translate into improved 'on pitch'performance. It is with these issues in mind that this thesis begins, with the hope that the findings may be able to contribute to making athletes more informed and, in turn, more successful.

Humans receive information from the external environment through several sensory organs. Vision is the most dominant sense, with 70% of all sensory receptors in the eye. (Yoshimitsu, Hiroshi, 2004). Vision, with components such as visual skills, contributes up to 80% of information obtained (Buys, 2004). Sports vision can be defined as the study of the visual abilities that are required in recreational and competitive sports, as well as the development of visual strategies for improvement of accuracy, stamina, consistency and hence performance of the visual system (Daune and Darlene, 1997). If the visual system is not receiving messages accurately or quickly enough, performance may suffer (Berman, 1990). It is important for visual systems to be functioning at advanced levels because athletic performance can be one of the most rigorous activities for the visual system (Hitzemen and Beckerman, 1993).

According to (Reichow and Stern, 1986) Sports vision encompasses performance orientated comprehensive vision care programs involving education, evaluation, correction, protecting, and enhancement of an athlete.

Vision is much more than seeing 20/20. Vision is composed of many interrelated skills that can be trained and refined in order to enhance athletic performance. Demands on the visual system during athletic performance are rigorous. Therefore, an athlete who has superior visual skills will have a leading edge over his opponent

Quick and accurate eye movements are essential to athletic success. handball players require eye movement in a variety of directions. Saccadic eye movements are used to direct foveal fixation towards objects of interest (Henderson and Hollingworth, 2003). Saccades depend on information from the periphery of the retina to tell the brain that there is something of interest in the field that should be recognised12

At the 1994 Olympic Games in Lillehammer, from the 342 athletes representing 46 countries and ranging in age from 16 to 41, more than 171 (50%) had never received a comprehensive visual examination (Olympic Vision Centre. 1994). This corresponds with previous results from (Garner, 1977) who concluded that a significant amount of elite athletes compete in their specific sports with uncorrected visual defects. This may be because the sports they participate in are perhaps of low visual demand, or they compensate with higher functioning of other skills (Neil, 1995) or they may be performing below their true potential.

Studies in human vision are increasingly addressing the dynamic nature of visual activity (Findlay, 1998). According to (Ballard, et al. 1997; Gilchrist, et al.2001) the Common Symptoms of Handball players that maybe related to Vision Problems are:

- Difficulty maintaining balance even in basic position
- Difficulty judging your position in space during routines
- Poor timing of movements during routines
- Difficulty maintaining concentration during a match
- Difficulty visualizing maneuvers
- Difficulty seeing well for floor or vault work

Under most situations in which vision is employed, saccadic eye movements are used to scan the visual scene actively at a rate of three or four movements each second. The task of visual search has proved to be a very productive paradigm to investigate active vision (Findlay & Gilchrist, 2001).

However, to the author's knowledge, a systematic analysis of the sports vision involved in fencing and handball games are still lacking. Hence, the aim of this study was to determine the differences fencers and handball players in saccadic adaptation.

Methods.

Participants.

Eleven elite Egyptian handball players and Ten Kuwaiti handball players were participated in the study (mean age. 22.55 ± 2.34). , test results were obtained for eye movements. All participants were professional players and members in national teams. Eye movements of participants were recorded via Videonystagmograpy (VNG). In addition, star test to measure the dynamic balance

Measurements.

Eye movements were recorded via Videonystagmograpy (VNG).

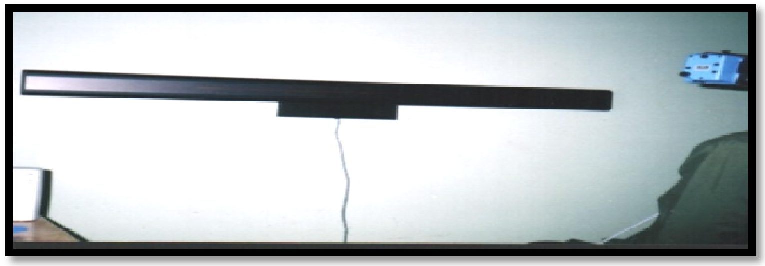
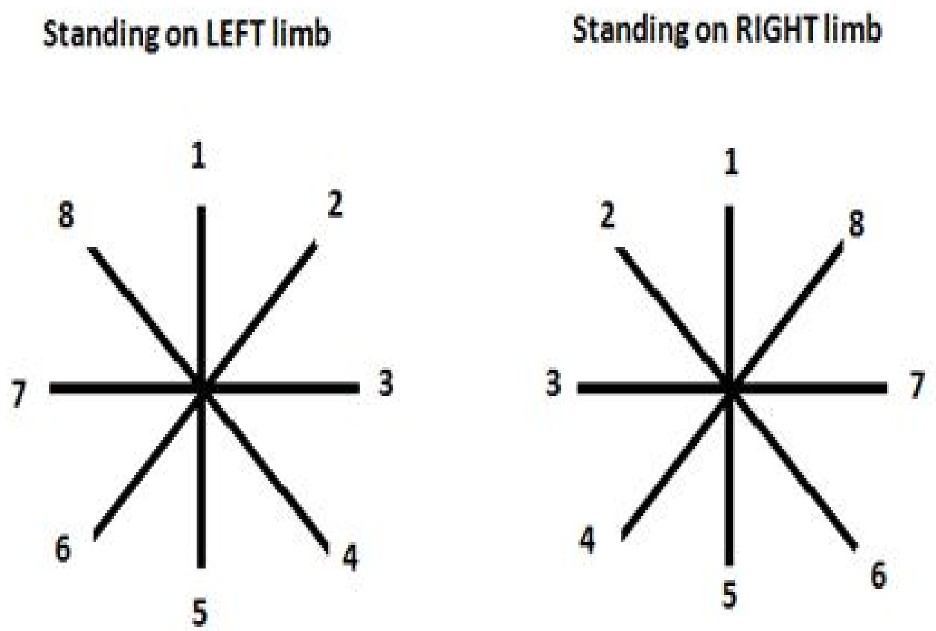


Figure 1: shows Videonystagmograpy (VNG) instrument

Star excursion balance test

The Star Excursion Balance Test (SEBT) is a dynamic test that requires strength, flexibility, and proprioception. It is a measure of dynamic balance that provides a significant challenge to athletes and people who are physically active. The test can be used to assess physical performance but can also be used to screen deficits in dynamic postural control due to musculoskeletal injuries like chronic ankle instability. It could be used to identify athletes at greater risk for lower extremity injury. It is also possible to use the test during the rehabilitation of orthopedic injuries in healthy, physically active adults.



1. Anterior
2. Anteromedial
3. Medial
4. Posteromedial
5. Posterior
6. Posterolateral
7. Lateral
8. Anterolateral

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means andstandard deviations (SD). Differences between two groups were reported as mean difference ±95% confidence intervals (meandiff ±

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95% CI).Student's t-test for independent samples was used to determine the differences in fitness parameters between the two groups. The $p<0.05$ was considered as statistically significant.

Results

Table 1 shows the age and anthropometric characteristics of the subjects. There were no significant differences observed in the anthropometric characteristics for the subjects in the two groups.

Table 1. Age, Anthropometric Characteristics and Training Experience of the Groups (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]	Training Experience
Egyptian players	11	22.74 ± 1.1	79.18 ± 3.2	182.17 ± 6.8	5.0 ± 2.1
Kuwaiti players	10	23.63 ± 0.9	76.54 ± 4.1*	188.22 ± 5.2	5.1 ± 1.3

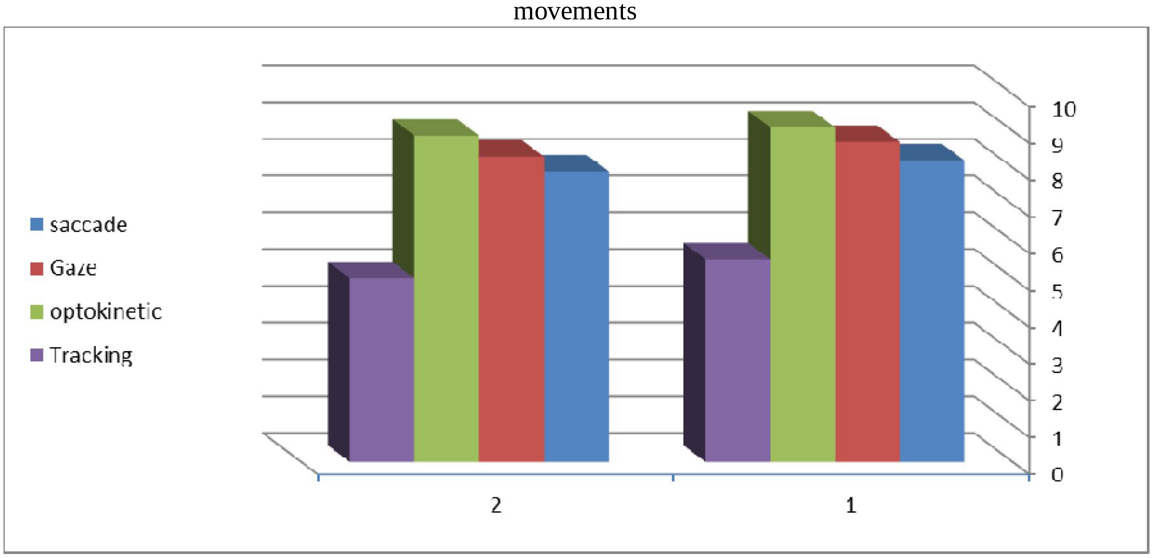
Table 2. Mean ± SD and "T" Test between the two Groups (Egyptian handball players and Kuwaiti handball players) in Dynamic balance

Variables	Egyptian players		Kuwaiti players		Sign.
	M	SD	M	SD	
Anterior	62.74	4.76	61.19	±4.55	N S
Anteromedial	79.19	±7.55	75.37	±7.73	N S
Medial	87.19	±7.19	86.53	±9.11	N S
Posteromedial	94.00	±2.36	93.71	±7.15	N S
Posterior	89.80	±8.50	90.43	±8.49	N S
Posterolateral	112.85	±5.67	111.48	±8.53	N S
Lateral	118.74	±6.42	120.63	±6.37	N S
Anterolateral	95.99	±6.23	92.96	± 5.26	N S

Table 2 shows that:

No Significant Difference between the two Groups (Egyptian handball players and Kuwaiti handball players).

Figure 2: shows the differences between Egyptian handball players and Kuwaiti handball players in eye movements



Baseline results showed that: no significantly differences between two groups (Egyptian handball players and Kuwaiti handball players) in all visual variables except gaze test.

Discussion

This study is the first report on the dynamics of saccadic adaptation in handball and to investigate whether athletes perform better with respect to saccadic adaptation in both positive and negative directions. The results clearly show that there is no change in the magnitude of saccadic adaptation between handball s players with Egyptian handball players and Kuwaiti handball players in both gain increasing and decreasing saccadic adaptation

This supports the idea that the ocular motor system does not tolerate overshooting of the target and that undershooting is common during saccade execution.

Hence. The time constant for gain reduction is much shorter in comparison to a gain increase.

Since, the results suggest that magnitude differences in saccadic adaptation between the groups is not significant, this results is consistent with earlier findings in literature. (Raiju, 2004)

Future research should consider these results, and determines the vision tests, which strong connect with handball s game.

The difference between gaze control and eye movements is that gaze control takes into account movements of the head as well as just the eyes. Often, if the handball player following an object such as a moving ball, you need to move your head so that you can accurately fixate the point at which you make contact with the ball (by foot, etc.)

In many sports, the ball moves too fast for the athlete to be able to follow it accurately without moving your head. In fact, the common exhortation to "keep your eyes on the ball" simply is not possible. In cricket, Land & McLeod (2000) found that elite batsmen actually moved their gaze ahead of the ball, so that they were "lying in wait" for the bounce of the ball on the pitch. This enabled them to make the most appropriate stroke response. Similar strategies were found in table tennis by Ripoll and Fleurance (1988).

Players need to be able to track the path of the ball early in its flight so they can predict the bounce point. In tennis, Ripoll & Fleurance found that players visually tracked the ball for on average 150 milliseconds for flat forehands, and 185ms if there was topspin as well. Similarly, in cricket, Land & McLeod found that elite batsmen tracked the ball for the first 150 - 200ms of its flight. Just because you are looking at one place, does not necessarily mean that your attention is focused on the same spot. For instance, a boxer who wants to make a body shot can do so without taking his eyes off his opponent's face. If he had to look down every time, it would give his intention away to his opponent. The fact that he does not have to suggests that the two systems - gaze control and attention - are completely separate. However, research that is more recent has suggested otherwise.

Shepard et al (1986) found that it wasn't possible for participants in their studies to change their gaze from one point to another whilst maintaining their visual attention on the initial point. Studies using brain imaging have since discovered that the same nerve pathways within the brain are involved in both moving the gaze and shifting visual attention.

A study by Kundle, et al. (2007) used eye-tracker technology to study the eye movements and search time of three full-time mammographers, one attending radiologist, two mammography fellows, and three radiology residents while they read and interpreted 20 normal and 20 abnormal mammograms. The eye-tracker data showed that by ten seconds the mammographer has covered most of the image while the resident has missed a large portion of the superior aspect. The median time for all participants to view a cancer was 1.13 seconds but this was considerably shorter for those scored as true positive (0.87 seconds) than for those scored as false negatives (2.37 seconds). The eyes of the best observers actually jumped straight to the cancer on first seeing the image. It was concluded that an initial global image analysis produces a holistic perception that enables the rapid identification of abnormalities and that the ability to utilize information in the holistic perception improves with diagnostic proficiency. Wood (1999) surmised that dedicated mammography's view thousands of mammograms every year and their expertise comes from the fact that they synthesize these images into a 'searchable matrix of diagnostic meaning and pathologic features'. It has further been noted that deliberate practice such as this enhances perceptual learning and enables observers to use more efficient holistic strategies instead of just search-to-find strategies (Charness, et al., 1996;Sowden, et al. 2000).

Therefore, athletes can be looking at one place whilst thinking about somewhere else, but moving the eyes means shifting the attention. Shepard and others that the shift of attention comes before the shift in gaze have also found it.

Conclusion

Future research should consider these results, and determines the vision tests that strong connect with handball game.

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