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# EFFECT OF VISUAL SKILLS TRAINING ON SACCADIC EYE MOVEMENTS AND PERFORMANCE LEVEL OF VAULT FOR JUNIOR GYMNASTS

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**Abstract**

*Aim.* While physical sport is an ancient activity, vision is even older. The Egyptians had been taking part in sports for more than 2,000 years when the first ceremonial contests were held in Olympia in 776 BC. However, sports without vision is an unthinkable concept. The purpose of this study was to investigate the effect of visual skills training on saccadic eye movements and performance level of vault for junior gymnasts.

*Methods.* The study sample was selected from Mansoura club. The sample consisted of (10) junior gymnasts. The experimental group practices the visual training program for eight weeks, three times weekly. The researcher conducted homogeneity in age, height, weight, and training experience.

*Results.* Statistical analyses showed that:

Statistically significant differences between the pretests and posttests for the experimental group in dynamic balance, saccadic eye movements and performance level of vault for junior gymnasts.

*Conclusions.* Eight weeks from visual training exercises could affected on dynamic balance, saccadic eye movements and performance level of vault for junior gymnasts. These results have to be taken into account by instructors in order to better understand and implicated of these concepts for technical effects of training.

*Keywords:* visual training, vault handspring, gymnasts.

## Introduction

Artistic gymnastics is a sport that is practiced for competitive purposes and are generally practiced in various artistic gymnastics apparatuses and are separated by gender Balance beam, Floor, Horizontal bar, Parallel bars, Pommel horse, Rings, Springboard, Uneven bars, and Vault .

The vault is an artistic gymnastics apparatus on which gymnasts perform, as well as the skill performed using that apparatus. Vaulting is also the action of performing a vault. Both male and female gymnasts perform the vault.

The power in vault is necessary to complete all aerial acrobatics before landing on the ground. After a jump on the trampoline, the gymnasts must push up impulsively; dynamically pushing the vault to generate a greater height and distance, as doing so will have a greater degree of skill and acrobatic extension before landing on the ground stably.

While physical sport is an ancient activity, vision is even older. The Egyptians had been taking part in sports for more than 2,000 years when the first ceremonial contests were held in Olympia in 776 BC. However, sports without vision is an unthinkable concept. (Amr, 2005).

Vision is the master system of learning. If this system is missing or in conditions limiting the integral development of the individual

The development of perceptive motor skills has constituted and constitutes a fundamental axis of research and intervention in the field of Sports psychology. Skills such as manual eye coordination or dynamic visual acuity become essential in a multitude of sports as in gymnastics, basketball or tennis (Williams, et al. 1999). In these sports, with such dynamic environments, constantly changing, with moving with different and complex trajectories, the vision and the coordination play a very important role. This has made the interest in the training and development of these skills is very high and that the sports psychologists, optometrists and other related specialists have different methods to achieve this goal.

Until relatively recently, the training of these skills in athletes were using instruments

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designed for visual deficits. This type of instruments, according to (Quevedo & Solé, 2007) are valid for visual training with athletes for two reasons relative to the specificity of the population and the task with which it deal. In first, an athlete does not have any type of visual impairment and these programs are designed specifically for the clinical population; it is more, in many of the skills that will be trained, this group will be above the mean of the normal population (Williams, et al. 1999).

Second, the adaptation of the tests to the field to be worked on is It is essential to take into account the type of activity that the athlete and adapt their training (Quevedo Junyent, et al. 2002).

Visual training is defined as the "Art of improving the patient's visual conditions" with the aim of establishing new relationships, to receive, process and understand better the visual information. The visual training procedure is based in the repetition of a series of protocol exercises in frequency, intensity and complexity, which are intended improve the patient's visual capacity and thus achieve a more effective vision. It are talking about a process of learning. To understand and develop procedures that lead us to achieve the stated objectives it believe it is necessary to know the physiological bases that support the visual training. As (Plou Campo, 1997) it is important to study the molecular basis of learning and memory because what it learn determines, to a large extent, what it are." Further, and from a practical point of view, to know these bases allow us to respond safely to the next questions:

- Where are it acting? What system?
- Why can it act upon it?
- When is the right time to start avisual training?

The visual training as the art of improving the patient's visual conditions. In turn, the art, in its concept more classic, as a conscious manifestation of creativity based on the skill and ability to production of something. Therefore, within the visual training there is a creative part not negligible, which must necessarily possess the therapist in an innate way. In addition, an essential part of acquired skill through study, testing, practice and knowledge of rules that confer the category of Science.

The visual training consists of a series of batteries of protocolled exercises, in dependence of the visual alteration to be treated, in its frequency, intensity and complexity.

In order for the protocols of a visual therapy to be must necessarily fulfill certain characteristics.

In the first place, itmust be designed in relation with the optometric examination. Under no concept should it start avisual training if it have not previously performed a detailed optometric examination, and in the case of an athlete, an examination of skills visuals involved in sport. Are the results obtained from the same that will indicate us in which areas the patient has deficiencies, which it can improve and at what priority. It too indicate if there is any type of alteration that is not to be treated with visual training, in which case it should be honest and not raise false expectations to the patient. (Sillero, 2002)

Secondly,it have to be sure that the patient receives the visual information in the best possible conditions. That is, any type of refractive or transparency defect of media will be treated previously, since the stimulation of the visual pathway will be more effective if receives the best stimulus possible.

Third, the design of the program should follow chronological and evolutionary order appropriate to the capabilities of the patient. Of course, the battery of proposed exercises for a specific type of visual impairment should be initiated at a different level if it are talking about a child, an adult or an elite athlete. In addition, it must begin at their critical level of difficulty, according to be the patient's capabilities. If it rule exercises without any difficulty, in addition to are unlikely to exert any positive action, the patient will be bored, and if it which are initially well above their level will be frustrated and in both cases most likely that the patient leaves visual therapy. (Mori, et al. 2006)

All protocols should consist of exercises specific to the function you want improve, reproduce in the most faithful way possible a specific type of skill. If it want to improve saccadic movements (eyes movements) it will not get it exercising any type of motility ocular, it will only achieve it by training the saccades; It's more, if it want to train for example horizontal predictive saccades only it will improve if it propose exercises where specifically involved this type of movement ocular and not another.

Any therapy, and the visual should not be an exception, must be quick and effective. For

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that from the first moment it must have very clear what our final objectives are and goals of the patient. On them, it will design a protocol aimed at achieving small objectives proposed on the basis of those of the patient in order of priorities, which gives value to therapy and encourages to the patient; without losing sight of the ultimate goal which, distant and abstract for the patient, is not a stimulus for him. In case that, due to the type of alteration to be treated, the visual training will go away to prolong in time the patient should be warned in advance of this fact and be aware the perseverance it must have in order to achieve the desired objectives.

• All visual trainingwill be individualized, based on the optometric, in chronological order evolutionary and always bearing in mind of the patient, ie single and personal; but following a series of batteries of specific exercises of demonstrated efficacy. (Loran, 1995)

Know where, why and when it can do visual training will help us to better understand the rules that sustain the visual training and to improve our protocols of action.

This knowledge will be transferred in security that necessarily be perceived by our patients and will make our creativity, when it comes to modifying or create new exercises, be the result of serious reflection and not of simple chance. (De la Vega, et al. 2011)

If it remember that, of all the information that daily it receive, between 60 and 80% is provided by our visual system, it will understand the importance that an effective visual system can have in learning and ultimately in behavior, in sports case. (Gregg, 1987)

The exercises performed in the visual training directly effect on two systems that are part of the system visual:

The Muscular System: Extrinsic Muscles of the Eye and intrinsic eye muscles

The nervous system: Retinal-geniculate-cortical pathway and via retina-mesencephalic.

It must know the anatomy-physiological characteristics of these systems, and to have them always present the time to log training because it going to influence directly on it. (Du Poit, et al., 2011)

As (Barry 2004) those who have dissected and examined much have learned at least to doubt, while other unknowing of the anatomy and unconcerned about it do not doubt nothing".

Following Morgagni's advice, even assuming the risk that at first it only learn to doubt, it will describe then the anatomy-physiological characteristics most relevant of the visual system. Since the system muscle is best known to all, it will focus on the nervous system, specifically in the retina-geniculate-cortical way or also called retina-cortical. (Coffey & Reichow, 1990)

The goal of visual training is to learn to assimilate simultaneously, process quickly and make better decisions.(Palmi, 2007)

Based on above, this article aimed to explore theeffect of visual skills training on saccadic eye movements and performance level of vault for junior gymnasts

**Method**

The study sample was selected from Mansoura club. The sample consisted of (10) junior gymnasts. The experimental group practices the visual training program for eight weeks, three times weekly. The researcher conducted homogeneity in age, height, weight, and training experience. Table (1) shows that.

**Measurements.**

1. **Eye movements were recorded via Videonystagmograpy (VNG).**

2. **Star excursion balance test**

The Star Excursion Balance Test (SEBT) is very simple and economical, being thus an easy access tool with great diagnostic value. The SEBT consists of a star drawn on the ground (hence the name), with eight directions to study. It is usually used tape-like material to make the star. From here, the individual remains in a static position, placing his (barefoot) foot in the center of the star. During the test, the subject is asked to touch the farthest point possible with the tip of

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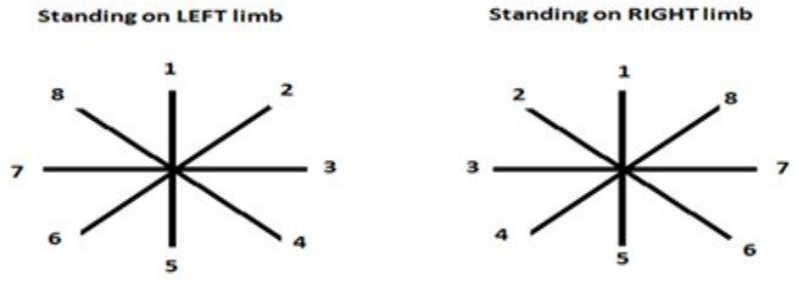
the Hallux finger. The contact of the finger must be clean, without support of the weight or imbalance of the other foot, returning each time to the initial monopodal position.At each attempt the contact point is recorded on the ground line.

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

This exercise is repeated as many times as it has been established, and in each of the directions to be studied, the final result being the average distance of all the attempts (in each of the directions).




**3. Performance level of vault handspring**

During a vault of Handspring, the gymnast runs towards the vault, jumps on the trampoline with both feet and places both hands in the vault. Once the gymnast pushes her hands, she can perform a variety of turns, tumbles and maneuvers. Sample handspring vaults include a front somersault with a one-and-a-half turn and a Raven, a front somersault with a half-turn nut in a facelift. The Rudi vault involves a front flip entry on a front flip with twists and a half.

**Statistical Analysis**

Differences in Star Excursion Balance Test (SEBT) and Performance level of vault Handspringbetween the two measurements (pretests-posttests) were compared using a paired t-test. The level of significance was set at $p < 0.05$, and all data are reported as mean ± SD.

**Results**

**Table 1. Shown the age, Anthropometric Characteristics and Training experience for the experimental Group (Mean ± SD)**

| Group | N | Age [years] | Weight [kg] | Height [cm] | Training experience |
|---|---|---|---|---|---|
| **Experimental** | 10 | 10.23 ± 1.7 | 24 ± 7.32 | 128 ± 8.79 | 6.58 ± 1.78 |

Table 1 shown the age, Anthropometric Characteristics and Training experience of the subjects. There no significant differences were observed in the characteristics for the subjects in the experimental Group.

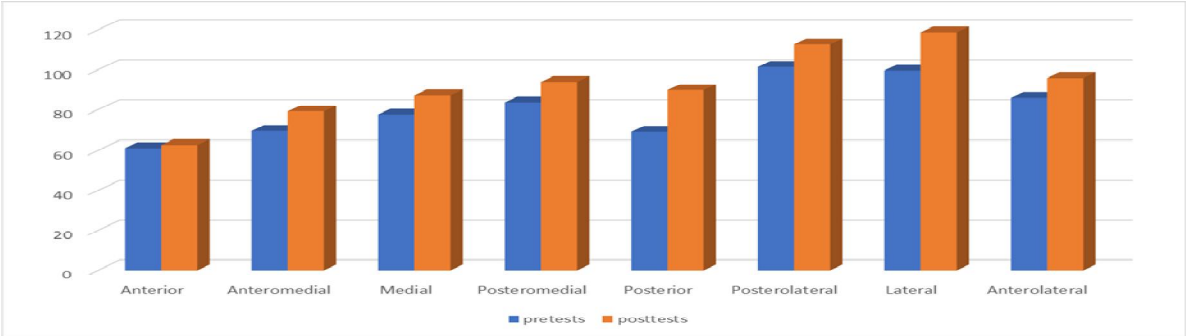



**Figure 1: shows the differences between pretests and posttests in Star Excursion Balance Test**

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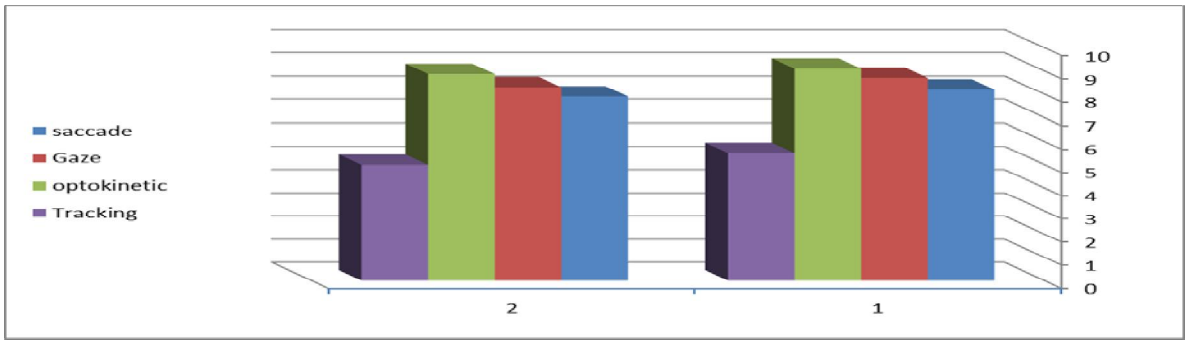


**Figure 2: shows the differences between pretests and posttests in eye movements**

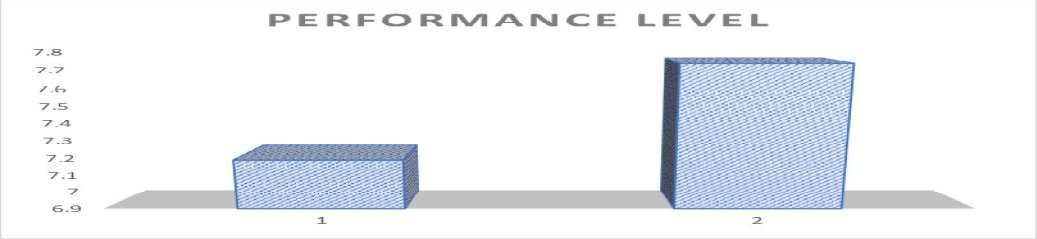


**Figure 3: shows the differences between pretests and posttests in performance level of vault handspring**

**Discussion**

Visual Training is an area of optometry that is responsible for improving the performance of the visual system thanks to activities that require precision and speed, as in sports, demanding skills of peripheral vision, focus, hand eye coordination and eye foot , tracking, static and dynamic visual acuity. This was evidenced in studies carried out with high-level athletes, where it was found that optimizing the visual capabilities improves the quality of the visual information and, therefore, the exit route is widely benefited, this is reflected in the speed, the good passes and the best aim during the game.

The use of video games, besides being a habitual practice in the adolescents and in the general population (Vivas & Hellín, 2007), has allowed an exponential expansion where the creation of programs computers for the training of motor skills in general, and visual in particular, is increasing. In 1995, (Quevedo & Solé, 2007) published, "Methodology of visual training applied to sport", proposing a methodology for specific visual training for athletes. (Vogel & Hale, 1990) propose a manual system of emission of stimuli visuals to improve the effectiveness of specific launch situations applied to players in training stages, finding an improvement in the tasks it propose. In addition, (Vivas & Hellín, 2007) carried out visual training on penalty kicks in football through a system of use of signals of anticipation to the direction of the ball, obtaining satisfactory results that would support the specificity in attentional training in soccer.

At the same time, the effects of video games have been investigated in the improvement of various perceptual and visual aspects, showing the existence of differences in certain visual abilities between people who have not played video games and yes.For example, (Martín & Nieto, 1994) in an interesting study found differences in the selective attention between subjects who did not play video games and those who did it did through an experimental design. Subsequently, these same authors studied the effect of playing different types of video games (action, role, sport, etc.) in spatial resolution and decision-making (Christenson & Winkelstein, 1988). The results of these studies manifested that people playing video games showed differences positive for the group of people who did not play regarding the detection of objects in space.

Along with the proliferation of new forms of entertainment, various leisure platforms that have aroused the interest of the community scientific basis. In the present case, the Nintendo company Nintendo DS game console, generating various scientific works of interest (Nuñez, 2002;

Shirali-Shahreza, & Shirali-Shahreza, 2009; Ghasemi, et al. 2011) that justify the need to continue deepening in its different possibilities. This company, with intends to train visual skills, has designed a video game. Flash Focus. Vision training in minutes a day ", for the training of different perceptual motor skills. The game simulates different sports scenarios related to tennis, boxing or baseball, in which it are trained through series of exercises the different skills to put into play in those sports. (Antúnez, et al., 2004)

Specifically, following the manual of the video game itself, the manual eye coordination, anticipation of movements, peripheral vision, dynamic visual acuity and selective attention.

Manual eye coordination refers to the adjustment of movements related to the hand in the direction of an object. In this process, there is not only to control the distance but also the intensity and speed with which it is does the movement (Schawartz, 2004). Motion anticipation indicates the ability to anticipate the trajectory and speed of a given projectile which moves in space (Schwart, 2004). Peripheral vision refers to the ability to locate, recognize and respond to information in the various areas of the visual field around the object on which the gaze is fixed (Loran, 1995). Dynamic visual acuity is defined as the ability to discriminate objects when it are in movement relative to the subject (Quevedo & Solé, 2007). Finally, selective attention refers to the capacity of ignore some stimuli of the environment to be able to respond to others (Szentgyorgyi, et al. 2008; Hung, et al. 2010 ; Väntinen, et al. 2010).

**Conclusions**

Eight weeks from visual training exercises could affected on dynamic balance, saccadic eye movements and performance level of vault for junior gymnasts. These results have to be taken into account by instructors in order to better understand and implicated of these concepts for technical effects of training.

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