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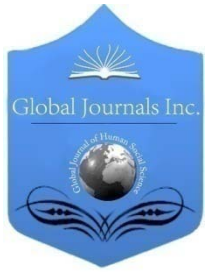

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Theoretical and Methodical Considerations Regarding the Spine Imbalances in Different Sports Disciplines

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Abstract- *Introduction:* The practice of different sports disciplines generates, in certain cases, imbalances in the spine dynamics.

Purpose: This paper aims to approach, both theoretically and methodically, the modalities through which the practice of different sports branches may induce pathologies susceptible to hinder the training progress.

Content: The study presents a classification of sports disciplines from the perspective of their influence on the spinal column. The analysis relies on the discussion of some possible imbalances, but also on some methodical recommendations for the postural education of athletes.

Conclusions: Athletes can practice their favorite sport without restrictions and with successful results, inclusively when they are confronted to spinal imbalances and back pains, if they are provided appropriate training, efficient prevention modalities and correct treatments. It is important for the athletes to be informed and become aware of the possible imbalances at their spine level, but also of some asymmetries of their body structure.

Keywords: *sports; spine; sports injuries.*

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I. Introduction

The positive effects of physical exercise on the locomotor apparatus development are known since the ancient times, but the practice of certain sports disciplines under the intensive effort conditions, therefore under competitive conditions, presents an increased health-related risk, one of the most vulnerable zones being the spine (Pfeiffer and Magnus, 2007; Uwe, 1999).

The most frequent situations are encountered in those sports disciplines which, through their specific technique, impose: very ample flexions and extensions; rotations; position holding; work under vibration conditions; exercises that develop asymmetrically the muscles. All these generate imbalances in the spinal column dynamics (Liebenson, 2002) Some sports disciplines produce aggressions at the spine level, reason for which they are not indicated to those with spinal problems. If training incorporates compensatory exercises for the muscular development equilibration, the opposite effects can be rectified.

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A particular role comes to the program constructed by the physical therapist, who has to include exercises for the spine rehabilitation, as well as vertebral manipulations meant to release the tension accumulated in case of vertebral compression (Balius et al., 1987).

II. Current Level Reflected in Literature

This paper aims to approach, both theoretically and methodically, the modalities through which the practice of different sports branches may induce pathologies susceptible to hinder the training progress. Such an issue is very topical, because the evolution of sports performances requires more and more intense efforts which, implicitly, have an effect on the spinal column functionality.

Specialty literature related to thefields of physical education, sports and physical therapydraws attention to the impact of different sports disciplines on the spine imbalances (Liebenson, 2002; Liemohn, 2005; Prentice, 2001).

III. Issue Addressed

a) Classification of sports disciplines according to their impact on the spine

Balius Juli et al. (1987) and Martin Recio (2009) made a classification of the different sports disciplines relating them to the impact ofeffort on the spinal column. The authors nominate five categories of disciplines:

Sports with a negative impact on the spine: men's and women's artistic and aerobic gymnastics, rhythmic gymnastics, judo, wrestling, shot put and javelin throw, athletic jumps, swimming (butterfly style). In these sports branches, because of the technique required, the spinal column cannot be protected. The risk factor is represented by the multiple movements of flexion, extension, rotation, etc.

Sports with a possible negative impact on the spine: weightlifting, athletics (hurdles, hammer throw and discus throw), canoe & kayak, motoring, horse riding, cycling, water and alpine skiing, waterpolo, rugby. In such sports, the spinal column can be protected, particularly during the workouts, by using an appropriate

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technique and a suitable physical training. Movements at the spine level are not as demanding as the previously mentioned ones and the correct execution of techniquedoesnot affect the spinal column.

Sports with an indifferent impact on the spine:athletic running events, football, fencing, hockey, tennis, table tennis, golf, archery, etc. In these sports disciplines, movements at the spine level are not forced, however occasional injuries are possible.

Sports with a positive impact on the spine: basketball, handball, volleyball, swimming (except for the butterfly style), gymnastics for fitness, etc. These sports branches are included in this category because they donot use unnatural movements, but stretching movements, and they donot involve continuous loads.

S*ports with a high degree of risk for the spine:* mountain climbing, speleology,parachuting, acrobatic skiing, trampoline jumps, sports gymnastics. In these sports disciplines, the prevention modalities are essential to avoid risks, that is why athletes should be protected by the most suitable safety measures and they also should be able to master a perfect technique.

b) Recommendations concerning the spine postures to be avoided in sports activity

Authors such as López Miñarro (2000), Pfeiffer and Magnus (2007) recommend the avoidance, at the spinal column level, of some postures susceptible to induce pains and harmful effects over time. They underline, for each corporal attitude, the factors that may generate imbalances or dysfunctions.

Sustained kyphotic posture – it produces an overload at the dorsal column level, with an increased incidence of disc protrusion, muscular and ligament elongation, as well as ventilatory mechanical alterations.

Cervical hyperextension– it produces the nerve root clipping, compression of the posterior vertebral part of the body, arterial clippings and an overload of the cervical muscular-ligamentous complex.

Cervical hyperflexion – it produces ligamentous injuries in the posterior vertebral region, compression at the cervical intervertebral disc level, compression of the vertebral artery, as well as the vertebral nerve root clipping.

Cervical circumduction – it produces imbalances as a result of the torsion and tension at the cervical structure level.

Trunk hyperflexion – it produces an overload in the zone corresponding to both L5 vertebra and sacrum base.

Lumbar hyperextension or hyperlordosis – it produces a dimensional reduction of the conjugation holes, with clippings at the nerve root level, an excessive compression of the intervertebral discs and the nerve root injury because of the contact between the spinous apophyses.

Maximum lateral flexion – it produces a high pressure on the vertebral discs, with a possible nerve root compression, a reduction of the intervertebral space, as well as a maximal elongation of the longitudinal ligaments, with a possibility of rupture.

Combined exercises for the spine – they represent associations of the previously mentioned effects. These exercises combine one or more contraindicated articular postures such as:

- Trunk rotation + lumbar hyperextension
- Trunk rotation + hyperflexion
- Hip flexion + trunk flexion
- Coxofemoral and lumbar hyperextension

The risk of such combined exercises is given by the fact that they may produce even more severe injuries.

c) Back pain and its negative consequences

Back pain may have negative consequences on sports activity, up to the point that it may hinder the practice of some sports or condition some professionals to put an end to their sports carrier (M. Gonzales et al., 2000). These negative consequences might be the following:

Pain chronicity. If the treatment is not appropriate and the athlete continues physical activity despite the pain felt, he/she is exposed to the same risk factors, with the possibility of pain chronicity. From a neurological perspective, the longer the pain persists, the more the recovery will be difficult.

Administration of some unsuitable treatments. There are athletes who have a tendency to make abuse of some symptomatic treatments which, although efficient and indicated over a short period of time, on a long term they may generate undesirable effects. It is the case of the administration of corticoids or other drugs.

Interruption of sports practice. In most sports, the back muscles must be strong, work correctly and be well coordinated in order to hold different postures, provide the body balance and allow some quick corporal movements. But the pain maylead the athlete to abandon the sports activity performed. Certain neurological mechanisms determine the muscles to contract or workimproperly, which renders extremely difficult the correct practice of the respective sports.

d) Modalities for the back pain prevention and the postural education of athletes

For an appropriate prevention of the back pain and a successful postural education, one can use different measures that have proved their effectiveness and are based on a series of principles (Creţu, 2003;Canto and Jimenez, 1998):

- Awareness of the corporal attitude
- Strength development in the back and abdominal muscles

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- Joint mobility and muscle flexibility (suppleness)

These three principles can be developed through some work modalities with different characteristics, for instance: respiratory reeducation, exercises in the water environment or balance exercises.

e) Awareness of the body attitude

One should know the imbalances, the adopted position asymmetries, as well as the correct position, under the static and dynamic conditions.

Learning the correct position must encompass, from the chronological point of view, different stages:

- *Awareness of the body attitude.* By using different methods of subjective assessment, the therapist searches for the asymmetries caused by the spinal column curves that exceed the physiological normality of the child's or the adolescent's body structure.
- *Modeling and awareness of the correct body attitude or posture.* When the child or the adolescent knows the asymmetries of his/her body structure, the therapist tries to correct them through a series of exercises included in the group of the conscious gymnastic technics. Among them, there can be mentioned: exercises of identification in front of the mirror; stretching exercises; retroversion and anteversion movements of pelvis in different positions: orthostatism, sit position, dorsal decubitus, ventral decubitus; breathing exercises; postural exercises in the water environment.
- *Automation of the correct posture.* To complete this stage, a laborious work is required; it consists of the neuromuscular reprogramming of the current posture to a correct posture, from the physiological point of view.

f) Strength development in the back and abdominal muscles

The tone diminishing in spinal muscles causes some postural abnormalities. The muscle groups that lack strength and, consequently, may hinder the creation of normal postural reflexes and their conservation are the following:

- *The spinal extensors*: deep muscles –erector spinae: spinalis, longissimus, iliocostalis, which inserts between the spinous and the transverse processes, its main role being to hold up the spine and ensure its stability; intermediate muscles: serratus posterior superior, serratus posterior inferior; superficial muscles: rhomboideus minor; these muscles are responsible for the movement.
- *The spinal flexors*, located in front of the spinal column, are the following: rectus abdominis, abdominal internal and external oblique muscles, iliopsoas.

Toning these muscle groups determines the trunk stability and protects the spine against some processes that generate osteoarticular deformations. The following indications must be considered:

- ✓ Exercises shouldnot stress the concavity of the column.
- ✓ Isometric exercises are recommended (the position is maintained for 7 to 10 seconds, but the interval may be increased up to 20 seconds).
- ✓ A special emphasis should be placed on the controlled therapeutic exercises (slow movements, maintaining the control maintaining while the exercise is performed).
- ✓ The head is considered an extension of the spine (it shouldnot fall).

One of the very efficient methods to strengthen the trunk muscles is Pilates method.

g) Joint mobility and muscle flexibility (suppleness)

Joint mobility in children and adolescents is determined by the bone elongation, in disproportion with the increase in muscular mass at the level of lower limbs and trunk. Thus, mobility decreases, particularly in the time interval between 10 and 14 years old.

The poor amplitude of different joints doesnot allow the achievement of a satisfactory balance. The normal balance regaining may be hindered by the amplitude limitation in the following joints: coxofemoral joint, spinal column joints (at the lumbar, dorsal and cervical levels) and glenohumeral joint, as a result of the pectoralis major retraction.

When conceiving a work program for the mobility, the following aspects should be taken into account:

- ✓ The program must have a progressive intensity and must be preceded by an appropriate warm-up.
- ✓ Mobility exercises can be combined with relaxation exercises, because these ones reduce tension at the muscle tone level.
- ✓ Static and dynamic exercises will be associated to slow and controlled movements, which lead the muscle to a tension position, then the stretching is maintained for a period of time.

Among the recommended motor activities that contribute to the development of the basic principles-mentioned above, there are: exercises for the respiratory reeducation, balance exercises and exercises in the water environment.

IV. Respiratory Reeducation

While the exercises are performed, inspiration accompanies the stretching movements and the rest phase, and expiration accompanies the effort phase of the exercises, because it forces the abdominal muscles to contract. The following indications are proposed:

- ✓ Exercises for the diaphragm mobility
- ✓ Practice of different breathing types (abdominal, thoracic and clavicular ones)

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- ✓ Work on some breathing rhythms that are necessary in different activities or sports: swimming, cycling, expression of some feelings (fury, interior peace), etc.
- ✓ Diverse breathing techniques: yoga (pranayama), tai chi, qi gong, etc.

V. Body Balance

Balance exercises are destined to the correct postural integration of the body schema. The following indications are proposed:

- ✓ Reduction of the support base. For instance: while sitting on a balloon, the subject tries to keep the trunk upright.
- ✓ Elevation of the gravity center and reduction of the support base. For instance: on the balance board, different positions are experienced, modifying the support point or bending the trunk.
- ✓ Increase of the body's perceptive level reached in the previous exercises, by suppressing the sight.

To benefit from all that the biological element gives to the individual in different growth and development stages, the special training of balance capacity is particularly recommended in the age period from 6 to 10 years (Macovei, 2006).

VI. Activities in the Water Environment

In the water environment, human body is submitted to a series of particular laws (**Archimedes force**, hydrostatic pressure, water resistance, etc.) that make it the ideal ambience for working on the postural education and reeducation.

Program for the postural education and reeducation in the water environment:

a. Learning the correct position of trunk in the water. This is achieved under the guidance of a teacher, who permanently corrects the body position by using his/her hands or some accurate verbal clues.
b. Adopting the ventral and dorsal decubitus positions (by means of the floats), the vertical floating position or the immersion position. The degree of difficulty is increased by additional movements at the level of upper and lower limbs.
c. Dynamic muscular work. Hydrodynamic resistances or the water turbulences can be used. The effort intensity is variable and follows the covered surface while the body or the limbs are moving, but also the movement execution rapidity. As swimming aids, one can use the fins, the floats and the lead belt, which offer a great resistance to the movements of upper and lower limbs, by performing thus, through these exercises, a progressive muscular work.
d. Static muscular work. It stimulates the trunk muscles (abdominal and spinal muscles, retroversor and anteversor pelvic muscles, shoulder blade fixator muscles) which work in isometry, in order to keep the trunk balance in the correct position that has been previously learned in the gym. The density diminution in different body segments by means of the floating aids, which can be used to facilitate the movement or to oppose a bigger resistance, favors the muscle strengthening.

The muscle toning in the water is globally approached, because it is not possible to work analytically with a specific muscular group without the intervention of other muscular groups. When the body or one of its segments travels in the water environment, there is a dynamic work of the muscles that perform the movement, or an isometric one, of the muscles that maintain the body position.

VII. Conclusions

- All over the day, the spinal column regions are usually submitted to an excessive tension, reason for which it must be avoided to overload themdue to sports activities, wrong postures or an excessive development of muscular strength.
- Back pain appears more and more frequently in sports activity, being one of the main causes of muscular imbalances induced by an improper training method and by the adoption of an incorrect posture when performing different sports gestures.
- Athletes can practice their favorite sport without restrictions and with successful results, inclusively when they are confronted to spinal imbalances and back pains, if they are provided appropriate training, efficient prevention modalities and correct treatments.
- It is important for the athletes to be informed and become aware of the possible imbalances at their spine level, but also of some asymmetries of their body structure.

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References Références Referencias

1. Balius Juli, R., Balius Matas, R., & Balius Matas, X.(1987).Columna vertebral y deporte. *Apunts, XXIV*, 223-229.
2. Canto, R., & Jimenez, J.(1998).*La columna vertebral en la edad escolar: La postura correcta, prevención y educación*. Madrid: Gymnos, pp. 72-78.

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3. Creţu, A.(2003).*Ghid clinic şi terapeutic fizical-kinetic în bolile reumatice*.Bucureşti:Bren, pp. 255-263.
4. Gonzales, M., Rodriguez, G., De La Puente, F., & y Diaz, G.(2000).Tratamiento de la columna vertebral en la educacion secundaria obligatoria.*Revista Internacional de Medicina y Ciencias de la Actividad Fisica y el Deporte, 1*(1), 27-48.
5. Liebenson, C.(2002).*Manual de rehabilitación de la columna vertebral*.Barcelona: Paidotribo, pp. 438-439.
6. Liemohn, W.(2005).*Prescripcion de exercicios para la espalda*. Barcelona: Paidotribo, pp. 67-89.
7. Lopez Miñarro, P. A. (2000). *Ejercicios físicos correctos y seguros para la columna vertebral y alternativas para su corrección*. Universidad de Murcia,Facultad de Educación.
8. Macovei, S.(1999). *Suplețea*. Bucureşti: ANEFS.
9. Macovei, S.(2006). L'équilibre - exigence technique et capacité motrice - de la théorie à la pratique.*Convegno Internationale Ginnastica Ritmica "Identita e Problematiche di Questo Sport".* Torino: Centro Studi Attivita Motoria,pp. 46-54.
10. Martin Recio, F. J.(2009).La postura corporal y sus patologias, prevencion y tratamiento desde la educacion fisica.*Revista Innovacion y Experiencias Educativas, 21*, 9-10.
11. Pfeiffer, R., & Magnus, B. (2007). *Las lesiones deportivas*. Barcelona: Paidotribo, pp. 158-159.
12. Prentice, W.E. (2001). *Técnicas de rehabilitación en la medicina deportiva*. Barcelona: Paidotribo, pp. 301-326.
13. Uwe, H. H. (1999). *Lesiones deportivas*. Barcelona: Hispano Europeea, pp. 182-188.
14. Weineck, J. (1994). *Entrenamiento optimo*. Barcelona: Hispano Europeea, p. 153.

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