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UNIVERSITATEA ROMÂNĂO-AMERICANĂ  
FACULTATEA DE EDUCAȚIE FIZICĂ, SPORT ȘI KINETOTERAPIE

# STRATEGIES FOR IMPLEMENTING HEALTH AND MOVEMENT EDUCATION IN SCHOOLS IN SPECIAL CONDITIONS





*International Scientific Communication Session*

**"STRATEGIES FOR IMPLEMENTING HEALTH AND MOVEMENT  
EDUCATION IN SCHOOLS IN SPECIAL CONDITIONS"**

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## **BIBLIOGRAPHY STUDY REGARDING THE LIGAMENT TEAR OF THE HANDBAL PLAYER**

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### **Abstract**

Anterior cruciate ligament injury is a common condition in both performance athletes and ordinary people. For an athlete, the injury has a major impact, it can generate in addition to physical problems, some psychological ones. In order to avoid these shortcomings, doubled by a major rest, prevention is necessary as much as possible.

The anterior cruciate ligament is of major importance, it provides stability in the knee joint. It is essential for any athlete, but especially for a handball player, who practices this sport in which the trauma of this ligament is common problem. That is why this type of trauma must be approached carefully, through an efficient and well-structured recovery protocol. Thus, with the help of physiotherapy, a good joint mobility is obtained, an optimal muscular development and last but not least an osteomuscular balance of the whole organism.

**Key words:** handball, prevention, injury.

### **Introduction**

#### **General notions in the game of handball**

Handball is a team game, which is growing rapidly in popularity and is constantly developing since the end of the 19th century in Northern Europe and Germany.

The rules of the game were established in 1917, and the first international games took place starting with 1925 for men and 1930 for women. It became an Olympic sport for men in 1972, and for women since 1976. Since then, handball has spread rapidly around the globe. This sport has developed several branches, and today we meet: beach handball, mini-handball, street handball and even wheelchair handball.

The International Handball Federation was formed in 1946 and includes 6 confederations, with 209 member federations.

#### **The degree of novelty of the theme**

The number of handball injuries in recent years is growing rapidly, as the game of handball has become much more technical, more tactical, faster and more violent at the same time.

First, knee joint injuries occur due to hard contact between players or between the player and the playing surface during matches or training, but also due to physical overload; the program is very busy with many matches and trainings throughout a season.

Secondly, injuries can also occur without contact, due to sudden changes of direction, accelerations and decelerations that occur during a match or training.



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I believe that these traumas are known, but neglected, because intoday performance sports there is looking especially that athletes to devote a lot of time for performance and results, not on injury prevention, regardless of their physical condition.

In this study, we tried to combine the classic methods of physical therapy with new elements such as electro-stimulation (Compex, Tekar), cryotherapy (Game ready), and new testing and recovery devices (Izo shift, Genu plus).

In conclusion, if a previous cruciate ligament injury occurs, the athlete enters a rest period in which he is no longer able to perform his activity. The role of the physiotherapist is crucial, helping to recover the physical condition, but also to the moral support.

The aim of this paper is to demonstrate that after an LIA-type trauma, using a well-established recovery protocol, good communication between the athlete and the physiotherapist, and with a lot of work and dedication, the athlete can exceed his limits, and can return to workouts and safe play without the risk of recurrence.

**Injury statistics**

Following the studies made by Langevoort and Holdhaus (authors of the study Handball injuries during major international tournaments) on different anatomical areas of the body, during international handball competitions (World Championship, European Championship and Olympic Games) the following injuries were recorded during 2001- 2015:

**Table 1 Injury statistics: in major competitions in men's handball**

|                                     | <b>Men</b>         |                    |                    |                    |                    |                    |                           |
|-------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------------|
| <b>Anatomical area</b>              | <b>CM<br/>2001</b> | <b>CM<br/>2003</b> | <b>JO<br/>2004</b> | <b>CE<br/>2008</b> | <b>CE<br/>2010</b> | <b>CM<br/>2015</b> | <b>Total<br/>injuries</b> |
| Head and neck                       | 11                 | 30                 | 15                 | 3                  | 11                 | 18                 | 88                        |
| Shoulder, armand elbow              | 13                 | 10                 | 6                  | 5                  | 5                  | 12                 | 51                        |
| Hand and fingers                    | 8                  | 10                 | 4                  | 11                 | 6                  | 10                 | 49                        |
| Basin                               | 16                 | 14                 | 5                  | 3                  | 2                  | 15                 | 55                        |
| Lower limb muscles                  | 13                 | 1                  | 3                  | 10                 | 14                 | 8                  | 49                        |
| Knee                                | 15                 | 15                 | 5                  | 6                  | 2                  | 15                 | 58                        |
| Foot and ankle                      | 9                  | 17                 | 6                  | 6                  | 3                  | 28                 | 69                        |
| <b>Total injurieson competition</b> | 85                 | 97                 | 44                 | 44                 | 43                 | 106                |                           |

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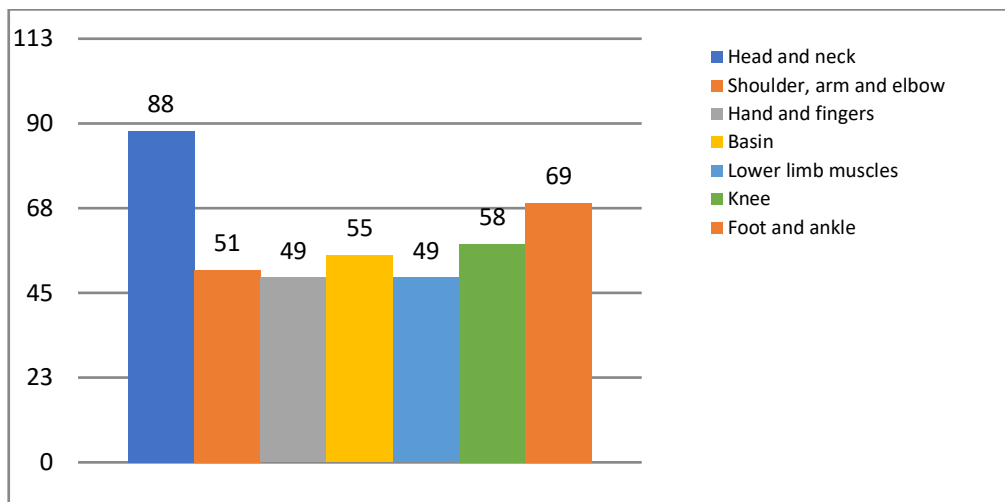


Fig. 1 Total anatomical area injuries (men's competitions)

Table 2 Injury statistics: in major competitions in women's handball

|                                     | Women     |            |           |           |           |                |
|-------------------------------------|-----------|------------|-----------|-----------|-----------|----------------|
| Anatomical area                     | CE 2002   | CM 2003    | JO 2004   | CE 2008   | CE 2010   | Total injuries |
| Head and neck                       | 15        | 30         | 23        | 13        | 19        | 100            |
| Shoulder, armand elbow              | 13        | 10         | 6         | 6         | 10        | 45             |
| Hand and fingers                    | 8         | 10         | 4         | 9         | 6         | 37             |
| Basin                               | 4         | 20         | 12        | 6         | 19        | 61             |
| Lower limb muscles                  | 3         | 3          | 3         | 11        | 15        | 35             |
| Knee                                | 5         | 12         | 10        | 4         | 6         | 37             |
| Foot and ankle                      | 7         | 15         | 5         | 4         | 10        | 41             |
| <b>Total injurieson competition</b> | <b>55</b> | <b>100</b> | <b>63</b> | <b>53</b> | <b>85</b> |                |



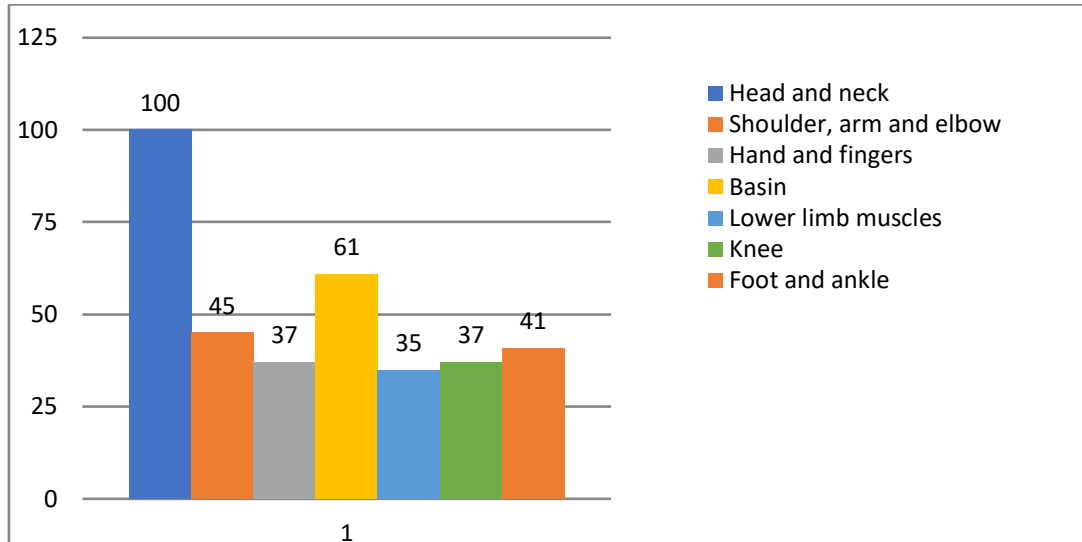


Fig. 2 Total injuries anatomical areas (women's competitions)

### **Preventing injuries in the game of handball**

Injuries can be prevented in several ways:

- Muscle stretching
- Balance and coordination exercises
- Core exercises

All these exercises increase muscle strength, improve balance and muscle coordination in situations of risky movements.

### **Knee joint**

The knee is part of the lower limb and has the role of connecting the thigh with the leg. The knee joint allows two types of movements: flexion and extension. This joint must be stable, given the support of the body weight.

The knee joint consists of: femur, menisci, four ligament bands (median and lateral collateral ligament, anterior and posterior cruciate ligament), tibial plateau, tibia, fibula, fibula, articular cartilage, joint capsule, patella (patella), synovial, synovial fluid, patellar ligament and quadriceps muscle tendon (figure below).

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Fig. 3 Knee structure

The femur is the longest bone in the body and forms the skeleton of the thigh.

The meniscus has a cushioning role between the femur and tibia and supports 40% of the mechanical loads exerted on the knee. At the same time, it ensures joint stability together with the ligaments.

The lateral collateral ligaments prevent the tibia from sliding forward, and the medial ligament does not allow it to slide backward.

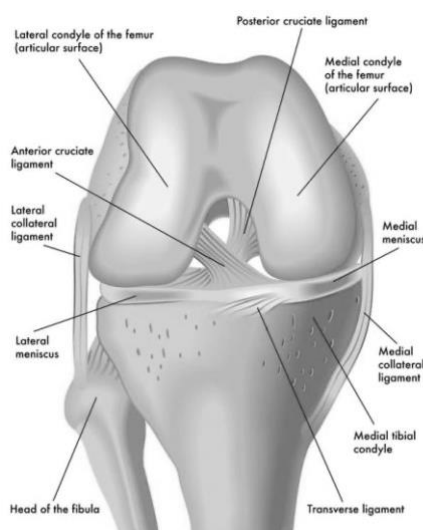


Fig. 4 Knee structure in flexion

The cruciate ligaments are a set of ligaments placed in an X-shape which have the role of stabilizing the knee joint and allow the execution of a wide set of movements. These



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ligaments are actually two round bands that extend from the intercondylar prominence of the femur to the head of the tibia.

The tibial plateau is the upper part of the tibia on which the femur rests.

The tibia is the most voluminous bone of the calf and is found in its inner part.

The fibula is a long bone, plays a minor role in the joint and is located on the outside of the leg.

The articular cartilage is the surface of friction and pressure transmission, covering the bony extremities of all mobile joints.

The patella is located at the lower extremity of the femur. It is a short, round, flattened bone anterior and posterior.

The synovial has the function of facilitating the sliding of the articular surfaces due to the synovial fluid that it secretes and covers the inside of the articular capsule.

The role of synovial fluid is to lubricate the joint, reduce friction and improve mobility.

The patellar ligament joins the lower part of the patella with the upper part of the tibia.

The quadriceps muscle tendon is located in the ventral part of the knee joint and intervenes only during the leg stretching movements.

Depending on the severity of the trauma and the age of the player, we can conclude that:

- Injuring his anterior cruciate ligament, the athlete interrupts the activity, and as an immediate effect, his physical and mental condition are about to suffer;
- After surgery, a recovery plan is established;
- For a more effective recovery, it is very important that the patient fully follows the recommendations of the physiotherapist, to perform the exercises as correctly as possible, to be punctual and even to work extra, at home, resuming what he learned in the hours face to face;
- The patient had to learn to overcome his physical and emotional barriers, to fight with himself, to self-motivate, to find the resource to get over the problem of the second month when he failed to overcome the 95 degree flexion;
- In order to obtain a fast and conclusive result - one hundred percent recovery - after the operation, the patient has to follow letter by letter, the instructions of the physiotherapist;
- Joint motility, safety of pre-operative movements, use at full capacity of the knee joint were the consequences of the given program;
- By repeating the exercises, deepening them, the patient gained not only medical advice, but also self-confidence, the barriers imposed by fear, pain or the exercise of jumping on the leg being eliminated.

There is a close link between the scientific nature of a rigorous protocol and the involvement of the physiotherapist who can become a key factor for the patient who is in physical and mental trauma needs impetus to recover.



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## **ENTRENAMIENTO DE LAS ACELERACIONES EN FÚTBOL. ACTUALIZACIÓN DE CONCEPTOS Y VARIABLES DE INDIVIDUALIZACIÓN**

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### **Resumen**

El objetivo del presente trabajo es mostrar las últimas estrategias de valoración de las aceleraciones en fútbol y su aplicación al entrenamiento en función a las publicaciones más recientes en esta materia. La valoración de las demandas físicas en fútbol, con especial atención a las acciones de alta intensidad, son de vital importancia para los entrenadores y preparadores físicos para el diseño de programas de entrenamiento específicos para sus jugadores. En este sentido, las aceleraciones están presentes en gran parte de las acciones más determinantes para el resultado de un partido, lo cual hacen que este tipo de acciones tenga un especial interés. Tradicionalmente, las aceleraciones de alta intensidad eran consideradas en base a umbrales absolutos preestablecidos. No obstante, tiene una serie de limitaciones. Recientemente ha surgido otra propuesta de valoración que permite conocer con mayor fiabilidad las características de las aceleraciones llevadas a cabo por los jugadores. Los estudios publicados a través de esta novedosa propuesta han mostrado diferencias en cuanto al número de aceleraciones de alta intensidad en cuanto a las posiciones de juego, lo cual replantea el paradigma de las aceleraciones dentro del contexto del fútbol. Esta nueva propuesta permite establecer perfiles individualizados más precisos que los anteriores, lo cual conviene considerar su aplicación por los profesionales dedicados al entrenamiento en fútbol.

**Palabras clave:** fútbol; aceleraciones; alta intensidad; entrenamiento.

### **Introducción**

El fútbol es un deporte que, dadas sus características de cooperación-oposición (Parlebás, 2001), se desenvuelve en un contexto abierto e incierto, donde el propio juego condiciona las actividades motrices que se desarrollan durante el partido. Este hecho exige a los jugadores/as una capacidad de atención permanente, donde la percepción y toma de decisiones representa un constante en la actividad y, consecuentemente, en la ejecución motriz (con balón o sin él). Siguiendo con estos argumentos, si tenemos en cuenta la gran cantidad de situaciones que pueden presentarse a lo largo de un encuentro, así como las múltiples variables que influyen en el resultado final desde un punto de vista locomotor, es más fácil entender como las respuestas serán variadas en función al jugador y a sus características.

Focalizando la atención en el aspecto físico (condicional) del juego, para un preparador físico o entrenador resulta fundamental tener un conocimiento sobre las exigencias a las que los jugadores son sometidos durante un partido, ya que este será el punto de partida para el diseño de programas de entrenamiento que tengan como objetivo preparar a los jugadores para poder realizar aquellas acciones que el juego les demanda. Dentro de la multitud de acciones que suceden durante un partido, aquellas que se realizan a máxima intensidad han copado la atención de investigadores, entrenadores y preparadores físicos, ya que es sabido que este tipo de actividades son las que tienen una mayor influencia en el resultado final del partido (esprintar en





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un desmarque, un salto en un remate, un golpeo a portería, cambios de dirección, aceleraciones, etc.) (Faude, Koch y Meter, 2012). Según varios estudios, suceden en torno a 150-250 acciones a alta intensidad (una cada 70 s de promedio), teniendo una duración promedio de 2-4 segundos y sin extenderse más de 20 m de distancia (Di Salvo et al., 2007).

Dentro de este tipo de acciones se incluyen las aceleraciones a alta intensidad. Si analizamos el perfil de las acciones que suceden durante un partido, un jugador no siempre dispone de una distancia elevada para alcanzar una alta velocidad. No obstante, aceleraciones en cortos espacios y periodos de tiempo se dan continuamente durante la competición. Tradicionalmente, las aceleraciones se habían evaluado según umbrales absolutos preestablecidos de  $1-2 \text{ m}\cdot\text{s}^{-2}$ ,  $2-3 \text{ m}\cdot\text{s}^{-2}$  y  $>3 \text{ m}\cdot\text{s}^{-2}$  (Ade, Harley y Bradley, 2014; Akenhead, Hayes, Thompson y French, 2013; Hodgson, Akenhead y Thomas, 2014; Osgnach *et al.*, 2010). Sin embargo, en los últimos años, Sonderegger, Tschopp y Taube (2016) indicaron que estos umbrales no consideran la capacidad individual de acelerar de cada jugador, lo cual no nos permite conocer el grado de esfuerzo real que representa dicha aceleración para un futbolista. Además, estos umbrales no tienen en cuenta la velocidad inicial a la que se inicia la aceleración, lo cual es determinante ya que la capacidad de acelerar disminuye a medida que la velocidad inicial de carrera aumenta.

En línea con los argumentos anteriores, si tenemos en cuenta que el fútbol es un deporte de equipo, el objetivo en la preparación de los jugadores será mejorar su habilidad/capacidad individual manteniendo las directrices tácticas para que el grupo compita en el campo de forma unida y bajo unos requisitos técnicos y tácticos establecidos por el entrenador (Castellano y Casamichana, 2016; Tamarit, 2012). En base a esta premisa, desde la parcela física, uno de los objetivos será el identificar las características individuales de cada jugador e identificar sus fortalezas y debilidades en función a las exigencias a las que se someterá en competición en función a su posición y rol táctico en el equipo.

En base a los argumentos anteriores, el objetivo del presente trabajo es mostrar las últimas estrategias de valoración de las aceleraciones en fútbol y su aplicación al entrenamiento en función a las publicaciones más recientes en esta materia.

**Estudio de las aceleraciones en fútbol: pasado, presente y futuro**

Los esfuerzos de alta intensidad en fútbol han sido tradicionalmente valorados según umbrales de velocidad, considerando un esfuerzo de alta intensidad cuando un jugador superaba una determinada velocidad, normalmente entre  $18-30 \text{ km}\cdot\text{h}^{-1}$ . No obstante, este método no considera aquellas acciones a máxima intensidad que se desarrollan en un espacio pequeño (y por tanto no alcanzan una alta velocidad de carrera). Como solución, el estudio de la magnitud del cambio de velocidad (aceleraciones) pretendía solventar esta problemática. Para ello, al igual que con los umbrales de velocidad, se establecieron una serie de umbrales absolutos en base a la aceleración.

A lo largo de la literatura científica podemos ver numerosos estudios que han incorporado la aceleración como variable de análisis de los esfuerzos de alta intensidad, considerando que una aceleración era de alta intensidad cuando superaba  $>2.78 \text{ m}\cdot\text{s}^{-2}$  (Varley y Aughey, 2013),  $>3 \text{ m}\cdot\text{s}^{-2}$  (Ade et al., 2014; Akenhead et al., 2013; Castagna et al., 2017; Hodgson et al., 2014; Osgnach et al., 2010), o incluso  $>4 \text{ m}\cdot\text{s}^{-2}$  (Bradley et al., 2010). Como podemos apreciar, existe una gran disparidad entre los autores para determinar el umbral a partir del cual se debe considerar una aceleración de alta intensidad.

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Además de esta falta de consenso entre los diferentes autores (lo cual dificulta la comparativa entre estudios), el uso de umbrales absolutos tiene dos grandes limitaciones que deben ser consideradas: 1) pueden subestimar o sobreestimar la magnitud de la aceleración, ya que no se adaptan a la capacidad de acelerar de cada jugador; 2) no consideran que la capacidad de acelerar es más elevada cuando la aceleración comienza a una velocidad baja o en estático en comparación al inicio a una alta velocidad (Bradley et al, 2010). En base a este último argumento, cuando una aceleración se inicie a una velocidad media (ej.  $10 \text{ km} \cdot \text{h}^{-1}$ ), la capacidad de acelerar será menor que si empieza desde parado, con lo cual será más difícil alcanzar dicho umbral absoluto, a pesar de que el jugador acelere a su máxima capacidad.

Como alternativa a esta forma tradicional de valoración, Sonderegger et al. (2016) propusieron un modelo de regresión lineal para valorar las aceleraciones considerando tanto la velocidad inicial como la aceleración máxima individual de cada uno. Este método se fundamenta en la evaluación individual de la capacidad de aceleración de cada jugador en función a la velocidad a la que comienza la aceleración. Para ello, estos autores propusieron evaluar dicha capacidad a través de 4 aceleraciones de 50 m partiendo de diferentes velocidades iniciales ( $0 \text{ km} \cdot \text{h}^{-1}$ ;  $6 \text{ km} \cdot \text{h}^{-1}$ ;  $10,8 \text{ km} \cdot \text{h}^{-1}$ ;  $15 \text{ km} \cdot \text{h}^{-1}$ ). A partir de estos datos, es posible establecer un algoritmo que permita saber el porcentaje de la aceleración máxima que está haciendo el futbolista en cada acción, considerando una aceleración de alta intensidad cuando ésta representa un valor  $>75\%$  de la aceleración máxima.

A través de esta propuesta solventamos las dos limitaciones del uso de umbrales absolutos, lo cual nos permite conocer con mayor precisión los esfuerzos de esta índole que realizan los futbolistas de manera individualizada. A modo de ejemplo, la figura 1 representa la capacidad de acelerar de un futbolista. En este caso, si establecemos un umbral absoluto  $>3 \text{ m} \cdot \text{s}^{-2}$ , vemos como cualquier aceleración que inicie a una velocidad por encima de los  $9 \text{ km} \cdot \text{h}^{-1}$  tendrá casi imposible superar dicho umbral, por lo que ninguna aceleración sería considerada de alta intensidad. Por tanto, la interpretación de los resultados a través de estos umbrales podría ofrecer una información equivocada de la realidad.

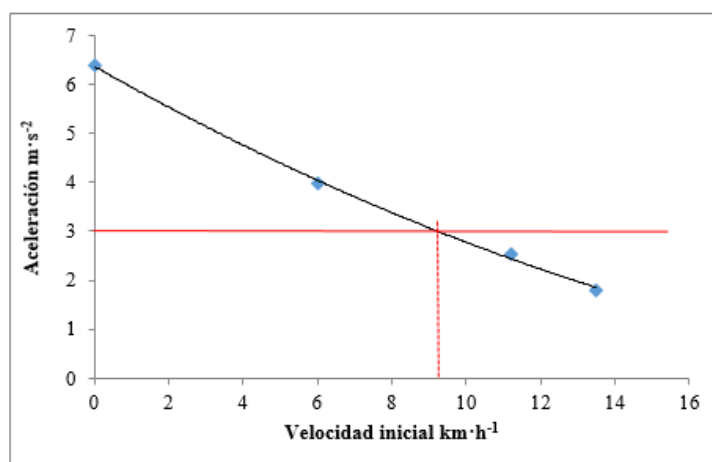


Figura 1. Ejemplo del perfil de aceleración de un jugador a diferentes velocidades iniciales.



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A raíz de la aparición de esta propuesta, varios estudios han analizado y contrastado entre la utilización de umbrales absolutos y la propuesta basada en un umbral relativo e individualizado en función a la capacidad de acelerar desde diferentes velocidades iniciales de cada jugador.

Un estudio reciente mostró como el uso de umbrales absolutos  $>3 \text{ m}\cdot\text{s}^{-2}$  podría sobreestimar los esfuerzos de aceleración a alta intensidad ( $p<0.05$ ) mientras que el uso de umbrales  $>4 \text{ m}\cdot\text{s}^{-2}$  y  $>21 \text{ km}\cdot\text{h}^{-1}$  podría subestimar los mismos (Martínez-Cabrera, Núñez-Sánchez, Muñoz-López y de Hoyo, 2020).

Por otro lado, atendiendo a las características de las aceleraciones en función a la posición de juego según Núñez-Sánchez, Toscano, Suarez-Arrones, Martínez-Cabrera y de Hoyo (2019), existen diferencias substanciales ( $>75\%$  de probabilidad) entre las diferentes posiciones de juego en función a la velocidad inicial y velocidad final alcanzada por los jugadores. Según este estudio, en las aceleraciones que inician entre 0 y  $13 \text{ km}\cdot\text{h}^{-1}$ , los centrocampistas laterales son los que más acciones de este perfil realizan en comparación con sus compañeros de equipo. Sin embargo, los defensas centrales realizan un mayor número de aceleraciones iniciadas  $>13 \text{ km}\cdot\text{h}^{-1}$  pero sin superar los  $18 \text{ km}\cdot\text{h}^{-1}$  de velocidad final. Por otro lado, los defensas laterales son los que más aceleraciones realizan  $>13 \text{ km}\cdot\text{h}^{-1}$  de velocidad inicial y superando los  $18 \text{ km}\cdot\text{h}^{-1}$  de velocidad final. Por tanto, analizando los datos de este estudio, entendemos que la demarcación de cada jugador condicionará la velocidad inicial a la que un jugador comienza a acelerar, así como la distancia o situación de juego que dispondrá para alcanzar una velocidad de carrera superior.

En vista a estas diferencias, Martínez-Cabrera, Núñez, Losada, Otero, Sánchez y de Hoyo (2018) estudiaron las características de las aceleraciones utilizando la propuesta de Sonderegger et al (2016) para conocer las características de las aceleraciones considerando la capacidad individual de cada jugador y la velocidad inicial de carrera. Sus resultados mostraron que la mayor parte de las aceleraciones se inicia de 0 a  $7 \text{ km}\cdot\text{h}^{-1}$  (72%) siendo superior substancialmente a las iniciadas entre  $7\text{-}13 \text{ km}\cdot\text{h}^{-1}$  (13%) y  $>13 \text{ km}\cdot\text{h}^{-1}$  (2,7%). Además, observaron cómo los centrocampistas fueron los que realizaron un mayor número de aceleraciones en comparación con el resto de demarcaciones, lo cual contrasta con otros estudios que usaron umbrales absolutos  $>3 \text{ m}\cdot\text{s}^{-2}$ , donde fue la posición con un menor número de aceleraciones (Vigh-Larsen et al., 2017). Como podemos observar, el hecho de considerar la capacidad individual de cada sujeto así como la velocidad inicial de cada sujeto nos puede ofrecer una perspectiva distinta a la conocida hasta ahora mediante el uso de umbrales absolutos. Por su parte, de Hoyo et al. (2018) también encontraron diferencias entre las distintas posiciones de juego cuando la velocidad inicial previa a la aceleración fue considerada.

En vistas a estos hallazgos, surge un nuevo paradigma en la posibilidad del análisis de las demandas de aceleración en el fútbol (al igual que otras modalidades deportivas similares). A raíz de los estudios analizados, los entrenadores y preparadores físicos pueden elaborar perfiles individuales a cada jugador según sus características propias y las demandas de la demarcación y rol táctico que desempeñan, lo cual resulta de gran importancia para el diseño de programas de entrenamiento específicos adaptados a las necesidades y características de cada jugador. En la figura 2, a modo de ejemplo, podemos conocer las demandas de aceleración (número) según las posiciones de juego para el equipo analizado por Martínez-Cabrera et al. (2018). Del mismo modo, es posible realizar futuros perfiles de análisis considerando tanto la aceleración como la velocidad inicial, la velocidad final, etc.

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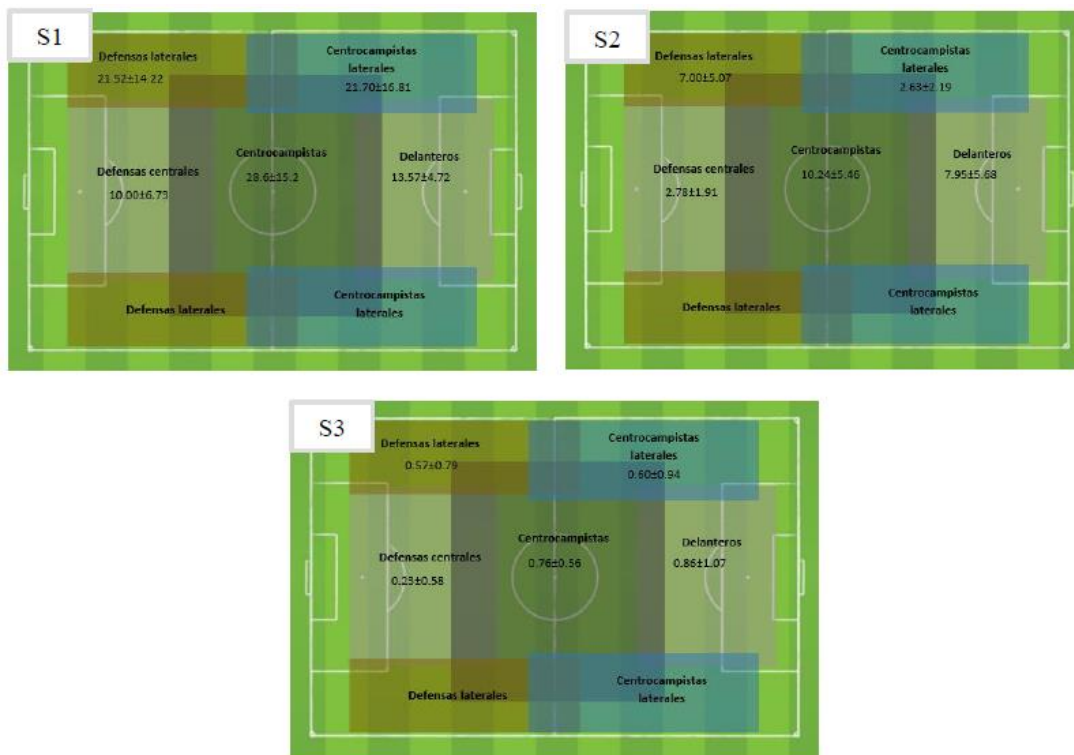


Figura 2. Perfiles de aceleración (>75% aceleración máxima) en base a umbrales individualizados a la capacidad de acelerar de cada jugador a diferentes velocidades iniciales según la propuesta de Sonderegger et al. (2016). Nota: S1= iniciadas entre 0-7 km·h<sup>-1</sup>. S2= iniciadas entre 7-13 km·h<sup>-1</sup>. S3= iniciadas >13 km·h<sup>-1</sup>.

### Conclusiones y aplicaciones prácticas

A lo largo de esta breve revisión, hemos podido analizar la importancia que tienen las aceleraciones para el rendimiento en fútbol, ya que éstas están presentes en gran parte de las acciones más determinantes para el resultado. Hasta hace unos años, estas acciones eran evaluadas a través de umbrales absolutos, establecidos normalmente  $>3 \text{ m} \cdot \text{s}^{-2}$ . Sin embargo, estos umbrales tenían una serie de limitaciones que podrían subestimar o sobreestimar las demandas reales de aceleración. En los últimos años, han aparecido en el panorama científico una serie de estudios que incluyen en análisis de las aceleraciones utilizando un umbral que considera tanto la velocidad inicial de carrera como la capacidad máxima de acelerar de cada futbolista, solventando así la problemática de los umbrales absolutos. Estos estudios nos mostraron resultados diferentes a los conocidos hasta ahora, lo cual nos hace pensar que el conocimiento de las demandas de aceleración que conocíamos hasta ahora según las posiciones de juego es posible que no fueran del todo precisos, requiriendo por tanto futuras investigaciones al respecto.

Por otro lado, el uso de estos umbrales nos permiten conocer con mayor detalle las características de las aceleraciones de los futbolistas, hecho que resulta de gran importancia para la elaboración de perfiles individuales a cada jugador en función a su capacidad individual y la posición de juego y rol táctico que realizan en el campo. Este conocimiento facilita la labor de los entrenadores y preparadores físicos para el diseño de programas de entrenamiento que permitan mejorar de una forma más eficiente el rendimiento de los



futbolistas, al mismo tiempo que reduzcan las probabilidades de lesión y faciliten la incorporación a la actividad competitiva tras un periodo de lesión.

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## **LA FORMACIÓN DEL JUGADOR DE FÚTBOL Y EL EFECTO DE LA EDAD RELATIVA**

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### **Resumen:**

Son varios los condicionantes que determinan que un deportista pueda llegar a convertirse en profesional. Entre esos condicionantes podemos encontrar el efecto de la edad relativa, el cual establece que los jugadores nacidos en el primer semestre del año tienen más posibilidades de jugar en la élite que los de segundo. El objetivo de esta investigación ha sido conocer si este efecto se produce en los jugadores que componen los equipos U23 de todos los clubes de la Liga Santander. Se analizaron las fechas de nacimiento de los jugadores ( $n=438$ ) y se procedió a conocer la distribución de meses y el valor de significación ( $p<0.05$ ) entre ambos semestres. Los resultados obtenidos muestran un valor de significancia en la presencia de RAE (64.16-35.84) de los jugadores del primer semestre con los de los jugadores semestre. Como conclusión, podemos considerar que hay presencia del RAE en los equipos U23 de la Liga Santander. Aunque deben tratarse estos datos con cautela ya que esto puede ser debido a la selección de jugadores que ofrecen rendimientos a corto plazo.

**Palabras claves:** fútbol; formación; talento; RAE

### **Introducción**

El efecto de la edad relativa (Relative age effect o RAE) puede ser definida como el retraso desde un punto de vista biológico, emocional y físico (González-Aramendi, 2007). Este efecto lleva estudiándose varias décadas en el ámbito del deporte. Algunos autores como Lesma, Pérez-González y Salinero (2011) indican que el RAE surge por la estructura competitiva que tiene el fútbol formativo, donde los jugadores nacidos en el primer tramo del año cuentan con ventaja competitiva con respecto a los que nacen en el segundo, hecho que tal y como indica Gladwell (2009) hace que también puedan tener mayores oportunidades para promocionar al fútbol profesional.

En esta investigación se plantea la hipótesis de si los jugadores que llegan al a jugar en los equipos U23 de los clubes de la Liga Santander (primera división de fútbol profesional española) están condicionados por el efecto de la edad relativa. Por tanto, el objetivo del presente estudio conocer el efecto de la edad relativa en los jugadores de los equipos U23 de la Liga Santander.

### **Método**

#### ***Muestra***

Se ha llevado a cabo un diseño de investigación empírico, empleando una estrategia descriptiva de carácter observacional (Ato, López y Benavente, 2013).



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Para llevar a cabo esta investigación se han seleccionado a los jugadores de fútbol pertenecientes a los 20 equipos de categoría U23 de los clubes de la Liga Santander de la temporada 2018-2019. La muestra está compuesta por un total de 438 jugadores de fútbol.

***Procedimiento***

En primer lugar, se llevó a cabo el proceso de recopilación de datos, utilizando diferentes fuentes, a) página web especializada en fútbol [www.transfermarkt.com](http://www.transfermarkt.com) y b) páginas web de cada club. En este proceso se registró el nombre de cada jugador de fútbol, club al que pertenecía y mes de nacimiento. Posteriormente y tal y como se muestra en otros trabajos como los González-Aramendi (2004) y Lesma et al. (2011), para establecer el efecto de la edad relativa se categorizó los meses del año en dos grupos de seis meses, estableciéndose un total de 2 semestres, donde los primeros seis meses abarcan desde enero a junio, siendo el segundo semestre compuestos por los meses de julio a diciembre.

***Análisis estadístico***

El análisis estadístico se llevó a cabo por el programa SPSS (Statistical Package for Social Sciences) en su versión 24.0. Para determinar el efecto de la edad relativa se ha utilizado la prueba Prueba z para medias de dos muestras, estableciéndose el valor de z y su valor crítico para dos colas en la hipótesis nula  $H_0$ : jugadores nacidos en primer semestre es igual a los del segundo semestre. La distribución de los equipos puede observarse en la Tabla 3.

**Tabla 1.** Distribución de los equipos U23 analizados.

| Club          | N  |
|---------------|----|
| ALAVÉS        | 22 |
| AT.MADRID     | 25 |
| BILBAO        | 23 |
| CD LEGANÉS    | 21 |
| CELTA         | 22 |
| ESPANYOL      | 23 |
| FC BARCELONA  | 23 |
| GETAFE CF     | 21 |
| GIRONA FC     | 22 |
| HUESCA        | 19 |
| LEVANTE       | 23 |
| RAYO          | 15 |
| REAL BETIS    | 22 |
| REAL MADRID   | 23 |
| REAL SOCIEDAD | 23 |
| REAL          | 22 |
| VALLADOLID    |    |



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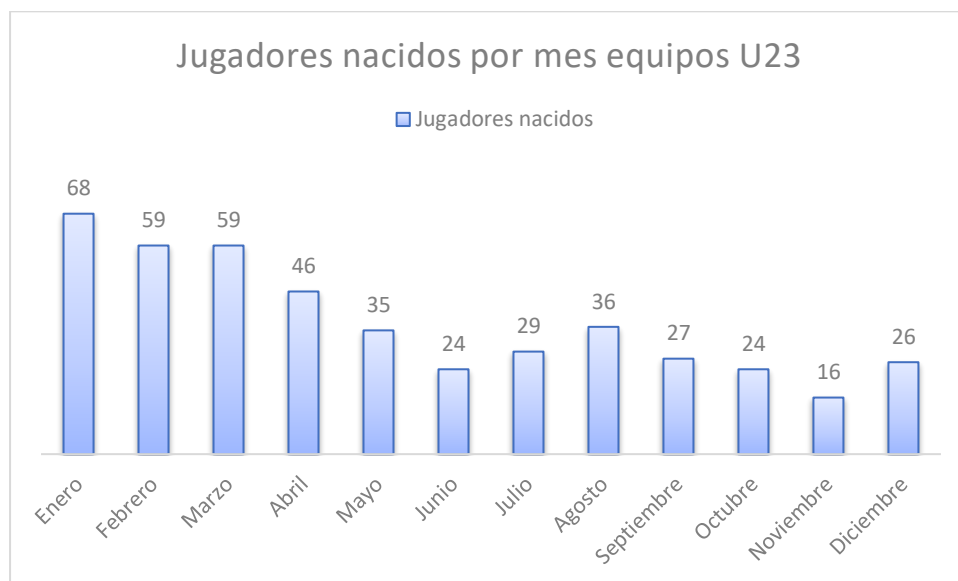
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|             |    |
|-------------|----|
| SD EIBAR    | 21 |
| SEVILLA FC  | 23 |
| VALENCIA CF | 23 |
| VILLAREAL   | 22 |

**Resultados**

***Distribución de las fechas de nacimiento***

La distribución por mes de nacimiento puede observarse en la Figura 1. Los nacimientos van decreciendo a medida que transcurren los meses, siendo la mayor frecuencia de nacimientos en el mes de enero (n=68).



**Figura 1.** Distribución por mes de nacimiento de los jugadores.

En la Tabla 4 se muestra la distribución de las fechas de nacimiento por semestre de cada uno de los equipos, siendo el Alavés el que mayor porcentaje de jugadores tiene nacidos en el primer semestre (87,5%). Por el contrario, el equipo que menos porcentaje de jugadores acumula en el primer semestre es Athletic Club de Bilbao (43,48%).



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Tabla 2. Distribución de jugadores de cada club por semestre.

| Clubs           | Ene-Jun | %     | Jul-Dic. | %     |
|-----------------|---------|-------|----------|-------|
| ALAVÉS          | 21,00   | 87,50 | 3,00     | 12,50 |
| AT. MADRID      | 20,00   | 80,00 | 5,00     | 20,00 |
| BILBAO          | 10,00   | 43,48 | 13,00    | 56,52 |
| CD LEGANÉS      | 12,00   | 57,14 | 9,00     | 42,86 |
| CELTA           | 15,00   | 68,18 | 7,00     | 31,82 |
| ESPANYOL        | 12,00   | 52,17 | 11,00    | 47,83 |
| FC BARCELONA    | 16,00   | 66,67 | 8,00     | 33,33 |
| GETAFE CF       | 10,00   | 47,62 | 11,00    | 52,38 |
| GIRONA FC       | 11,00   | 50,00 | 11,00    | 50,00 |
| HUESCA          | 11,00   | 57,89 | 8,00     | 42,11 |
| LEVANTE         | 14,00   | 56,00 | 11,00    | 44,00 |
| RAYO            | 7,00    | 53,85 | 6,00     | 46,15 |
| REAL BETIS      | 16,00   | 72,73 | 6,00     | 27,27 |
| REAL MADRID     | 17,00   | 70,83 | 7,00     | 29,17 |
| REAL SOCIEDAD   | 15,00   | 62,50 | 9,00     | 37,50 |
| REAL VALLADOLID | 15,00   | 68,18 | 7,00     | 31,82 |
| SD EIBAR        | 13,00   | 61,90 | 8,00     | 38,10 |
| SEVILLA FC      | 20,00   | 80,00 | 5,00     | 20,00 |
| VALENCIA CF     | 16,00   | 69,57 | 7,00     | 30,43 |
| VILLAREAL       | 20,00   | 76,92 | 6,00     | 23,08 |

En la Tabla 3 se muestra la comparación entre los jugadores que conforman el Grupo U23 en los equipos filiales nacidos en el primer semestre y el segundo semestre se observa un RAE de 64.16-35.84 para un valor z de 6.61 y un valor crítico de 1,96 para un nivel de  $p < 0.05$  lo cual indica que se rechaza la hipótesis nula, aceptándose que la diferencia de los jugadores del primer semestre con respecto al segundo semestre es significativa.

Tabla 3. Comparación de resultados entre jugadores de los filiales y los que posteriormente llegaron a las categorías profesionales.

|               | N Ene-Jun | N Jul-Dic | RAE         | Z    | Valor crítico de z | Sig   |
|---------------|-----------|-----------|-------------|------|--------------------|-------|
| Jugadores U23 | 291       | 158       | 64.16-35.84 | 6.61 | 1.96               | 0.000 |



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**Discusión y conclusiones**

El efecto del RAE se sigue estudiando recientemente en el fútbol profesional (Baro-Zamorano et al., 2018; Lesma et al., 2011; Salinero et al., 2014; Wiium et al., 2010) y en el fútbol base (González-Aramendi, 2004; Perea-Rodríguez, 2015; Rodríguez-Lorenzo y Martín-Acero, 2019). De hecho, los clubes muestran cierta prioridad en el proceso de desarrollo del talento con el fin de conseguir beneficios económicos y deportivos (Vaeyens et al., 2006).

La hipótesis de este trabajo planteaba si los jugadores que llegan al a jugar en los equipos U23 de los clubes de la Liga Santander están condicionados por el efecto de la edad relativa. Los resultados obtenidos muestran que los jugadores que componían los equipos filiales de los clubes de la Liga Santander de la temporada 2018-2019 si están condicionados significativamente por el efecto de la edad relativa.

En el estudio de Rodríguez-Lorenzo y Martín-Acero (2019) sobre el efecto del RAE en las categorías inferiores de un club de fútbol profesional, obtuvieron una fuerte presencia del RAE en todas las categorías, incluyendo la U23. Los resultados del presente estudio también muestran ese nivel de significancia, encontrándose un 64% de jugadores nacidos en los primeros meses del año. Estos datos también tienen un carácter similar en las investigaciones como las de Lovell et al. (2015) o la de Gómez-Piqueras (2009), dónde en todas las categorías de los clubes analizados hubo presencia significativa del RAE de los clubes analizados excepto en uno.

Por lo tanto, podemos concluir que la distribución y nivel de significancia de las fechas de nacimiento de los jugadores han mostrado una fuerte presencia del RAE en el grupo de jugadores pertenecientes a los equipos U23 de La Liga Santander de la temporada 2018-2019. Estos datos corroboran que el RAE es un condicionante presente para la promoción y selección de jugadores a categorías de élite. Por lo tanto, debemos tener cautela y considerar al RAE como un elemento a tener en cuenta en el proceso formativo de los jugadores, tratando de no discriminar a aquellos que por su edad biológica no muestren rendimiento a corto plazo. Este aspecto debe servir de reflexión sobre la importancia que tienen las estrategias que conforman el modelo formativo de un club de fútbol profesional. Por último, es importante tomar estos datos con cautela, siendo fundamental seguir investigando sobre la presencia de este efecto en el proceso de formación y promoción de jugadores de fútbol base.

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## **ANTERIOR CRUCIATE LIGAMENT INJURIES**

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### **Abstract**

The knee, although considered the largest joint and has a notable importance in statics and movements, is not a well-protected joint from an anatomical point of view. Thus, one of the reasons why traumas are often encountered in the knee is the reduced coverage of soft tissues, compared to other joints. The cruciate ligaments provide stability and limit the internal rotational movement of the tibia, hyperextension of the knee and anterior movement during flexion of the tibia on the femur.

**Key words:** knee, ligament, surgery, recovery, ligaments, pain.

### **Introduction**

Injuries to the anterior cruciate ligament were and continue to be quite common, and the best intervention turns out to be surgery. Thus, total recovery requires a complex and individualized treatment, achieved through specific and non-specific kinetic means. In the absence of proper treatment, the stability of the knee is lost and abnormal movements occur in the joint, destroying the articular cartilage by the friction of the joint surfaces. The diagnosis in this case is made through several clinical tests, being further confirmed by complementary examinations (radiographs, MRI). Another important aspect is the evaluation in medical recovery, performed by various tests and methods in order to obtain data that will be used in compiling the kinetic program.

Treatment in the anterior cruciate ligament injury seeks to restore the stability of the knee and the possibility of the patient's return to daily activities or sports as soon as possible. The therapeutic decision is influenced by factors such as: age, age of the ligament injury, field of activity, sports activity (where applicable) and the degree of instability.

For sedentary and elderly people, restoring the anterior cruciate ligament is not a mandatory option. Although it will not heal without surgery, through a qualitative recovery program, the instability of the knee becomes compensated by strengthening the adjacent anatomical structures.

The purpose of recovery is represented by the complete healing of the affected structure, aiming to achieve this goal in the shortest possible time, respecting the principles of physical therapy (individualization, painlessness, progressiveness, etc.).

### **Anatomy overview**

The knee is a biaxial mobile joint that is described as the largest and most complex joint in the body. It has an important role in biomechanics.

The knee consists of two joints: femur-tibial in which the lower epiphysis of the femur together with the upper epiphysis of the tibia and the femur-patellar joint take part, where we find the distal extremity of the femur together with the posterior face of the patella.



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The muscles that perform the knee movements are: the thigh muscles and the leg muscles. We can divide the thigh muscles according to their location into: the muscles of the anterior region, the posterior region, the lateral region and the medial region. Depending on the movements, they are divided into flexor muscles (femoral biceps, semimembranosus, semitendinosus, popliteal, tailor), extensors (femoral quadriceps), lateral rotators (femoral biceps), medial rotators (semimembranosus, semitendinosus, popliteal, tailor, gracilis).

The cruciate ligaments are two in number and are one of the important means of joining the knee joint. After their tibial insertion they were called one anterior and another posterior. The anterior cruciate ligament is a band of connective tissue, which together with the posterior cruciate ligament is one of the ways to join the knee joint. The two ligaments provide stability to the knee and limit the internal rotational movement of the tibia. It also limits knee hyperextension and anterior movement during flexion, tibia on the femur.

In the case of biomechanics, the femur-tibial joint belongs to the category of joints with a single degree of freedom, having as main movements the flexion and extension of the leg on the thigh. In addition to the main movements, we also find the secondary movements of rotation, lateral inclination and medial inclination. The movements are performed in the sagittal plane around a transverse axis that passes through the two femoral condyles.

**Anterior cruciate ligament injuries**

Injuries to the anterior cruciate ligament (ACL) cause considerable pain, and the recovery period to restore normal knee function is long. The degree of ligament injury varies between stretching, partial or complete rupture with total bone removal.

These occur when the foot is fixed to the ground, and at the knee there is a pivoting movement or in the case of more complex high-intensity trauma, which can cause multiple joint injuries (multiple ligaments, menisci, joint capsule, fractures).

Anterior cruciate ligament rupture is accompanied by a noise characteristic of the rupture, pain and inflammation of the knee occurs followed by limitation of its degree of movement. The main symptom is joint instability. There are also situations in which the pain and swelling of the knee suddenly disappear, but the problem remains present, the symptoms being felt in daily activities. Also, often the rupture of the anterior cruciate ligament is associated with the rupture of the collateral ligament or one of the menisci.

ACL rupture is often total, the diagnosis being established by the orthopedist following the anamnesis together with more detailed investigations (MRI). The anamnesis is concerned with the mechanism of injury, sudden or slow by overload, the presence of pain installed suddenly or slowly, slipping sensations in the knee, maintaining joint ability specific to the sport, the presence of inflammation, reduced range of motion, a history of others lesions at this level. It analyzes the joint inflammation, crackles and crackles when mobilizing the joint, persistent pain, knee drawer movements.

**Complex treatment in anterior cruciate ligament rupture**

Treatment in the anterior cruciate ligament injury seeks to restore the stability of the knee and the possibility of the patient's return to daily activities or sports as soon as possible. The therapeutic decision is influenced by factors such as: age, age of the ligament injury, field of activity, sports activity (where applicable) and the degree of instability. For sedentary and elderly people, restoring the anterior cruciate ligament is not mandatory. Although it will not heal without surgery, through a qualitative recovery program, the instability of the knee becomes compensated by strengthening the adjacent anatomical structures.

The general objectives of the recovery program are represented by:

- Fighting pain;



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- Minimizing the effects induced by the suspension of the activity;
- Recovery of joint mobility;
- Recovery of muscle elasticity;
- Recovery of muscle strength;
- Increased muscular endurance;
- Regaining muscle coordination;
- Improving the capacity of effort;

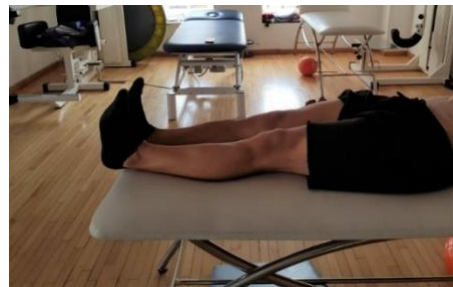
**The kinetic program**

Bellow, we present some examples of exercises for the early stages of postoperative recovery in anterior cruciate ligament injury.

EX.1- laying on the back, the quadriceps contraction is performed with holding for 5-10 seconds followed by rest, 10 repetitions of 4 sets each (10x4).

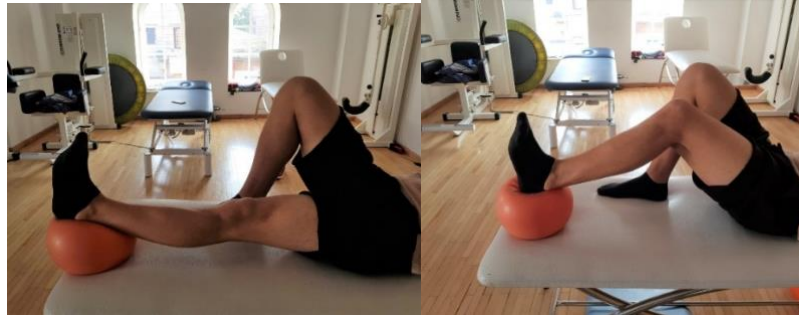


EX.2- laying on the back, the patient will perform simultaneously with both lower limbs the dorsiflexion of the legs with holding 3-5 seconds followed by returning to the initial position, 10x4.



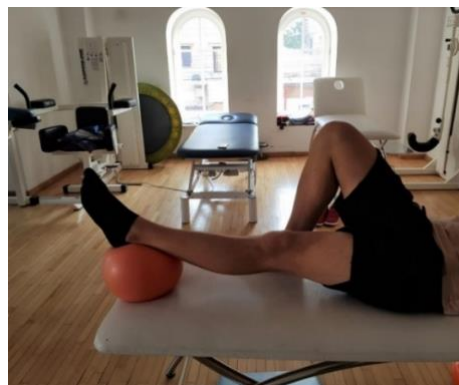
**EX.2**

EX.3 – laying on the back, the patient performs the flexion and extension of the knee by rolling a sponge ball, which is placed under the Achilles tendon, 15x3.



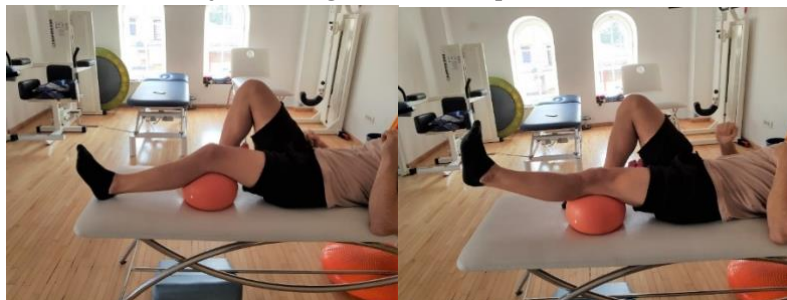
**EX.3**

EX.4 – laying on the back with a sponge ball placed under the Achilles tendon, the patient relaxes the muscles of the affected lower limb, facilitating the passive extension of the knee, maintains 2-5 minutes repeatedly 3 times a day.



**EX.4**

EX.5 – laying on the back with a sponge ball in the popliteal region, the knee is extended, maintaining the position for 2-3 seconds followed by returning to the initial position, 15x3.

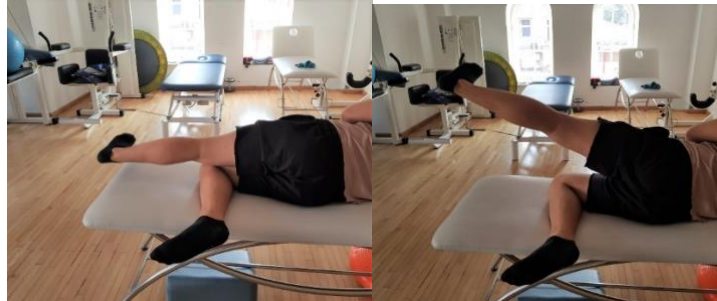


**EX.5**

EX.6 - lateral decubitus with the healthy limb flexed from the knee joint, abduction of the affected lower limb and return to the initial position, 15x3.

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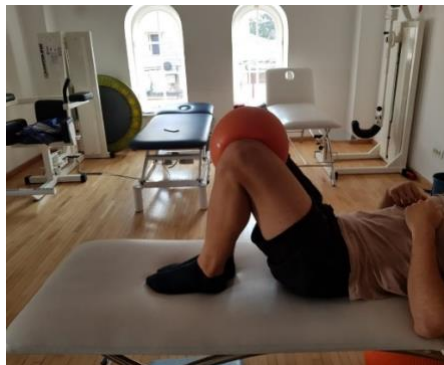
**EX.6**

EX.7 – laying on the back, the patient performs the flexion of the thigh in 3 strokes with maintenance at the maximum point 3-5 seconds, having at the level of the ankle attached weight, 10x3.



**EX.7**

EX.8 – laying on the back with both knees bent and a ball positioned between them, adduction of the thighs, for 10-12 seconds, 3x3.



**EX.8**

EX.9 – laying on the back, with the knee flexed at 90 degrees, the thigh is extended on the torso, with weight attached to the ankle, 10x3.



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**EX.9**

EX.10 - sitting with his back glued to a fitness ball and another small ball located between the knees to avoid the tendency to approach them, perform semi-knee bends, 8-10x3.



**EX.10**

EX.11 - sitting on the quadriceps chair, the patient performs the knee extension, 10-12x3.



**EX.11**

EX.12 - sitting press, the patient performs the flexion and extension of the knee, 10X3.



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**EX.12**

**Conclusions**

1. Anterior cruciate ligament injuries are currently among the most common injuries encountered in the knee, affecting the stability of the knee and thus its range of motion.
2. In general, rupture of the anterior cruciate ligament is associated with rupture of the collateral ligament and one of the menisci.
3. For best results on the postoperative recovery program, it is necessary to apply a preoperative kinetic program.
4. The psyche plays an important role in the recovery process, so the patient's desire to get through this period as quickly as possible, motivates him to become more receptive and pay more attention to how to perform the exercises.
5. Postoperative recovery aims to: regain mobility, regain muscle strength and elasticity, complete recovery of dynamic stability and postural balance, increase ligament strength, reintegration into daily activity.
6. The kinetic program must take into account the age, sex, field of activity and current condition of the patient.
7. The most common causes of limited mobility are muscle contractions, pain, joint blockage and lack of muscle tone.
8. It is recommended that the number of objectives of each recovery phase is not high, in order to avoid pathological fatigue.
9. The kinetic program must be individualized, taking into account the evolution of the patient based on the results obtained from the evaluations.
10. The most used surgery is the bone-tendon-bone procedure.
11. The hypotonia of the quadriceps creates the impossibility of achieving complete extension.
12. An amplitude of up to 90 degrees is required to allow normal walking.
13. Physical therapy plays an important role in the recovery process of the anterior cruciate ligament

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## **PHYSICAL THERAPY IN ACHILLES TENDON RUPTURE**

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### **Abstract**

Postoperative recovery is extremely important when some of the morpho-functional abnormality has been surgically resolved. As basic elements that we have in the recovery program are restoring movements in the joints affected and close to the injury, restoring muscle tone and trophicity, dynamic balancing of muscle mass to prevent or remedy any deviations or misalignments of the physiological axes and the formation of new reflexes.

**Key Words:** disease, topic, sport practitioners, tendon, synovial sheaths, tendinitis, surgical treatment.

### **Introduction**

The musculoskeletal system is exposed to orthopedic and traumatic conditions, due to various causes. We have many preventive, curative or recovery measures.

A large part of these therapeutic means aim at the partial, even total avoidance of these diseases, aiming either at the removal of the etiopathogenic factors or at the reconstitution of the structures affected by the disease and the functional recovery.

The topic is relevant in the context in which there is a high number of sport practitioners at national level, among all age groups, thus there is a risk of increased injuries.

### **Tendon - overview**

It is a resistant, inextensible organ, formed by conjunctival bundles (collagen fibers), connected to each other by a fundamental substance, like a cement. Among the collagen fibers are tendon cells (tenocytes). As with muscles, there are a series of conjunctival septa that separate the tendon bundles. These partitions form the internal peritendon and they detach from the external peritendon.

The tendon is inserted either directly into the bone or through the periosteum. In the first case it is continued with the collagen fibers of the bone. At these levels, bone tears occur when, during a trauma, the tendon does not yield. Usually, however, the tendon fibers fuse with the collagen of the periosteum and, through this, the surface on the bone becomes much larger.

Some tendons, which pass through osteofibrous canals, are wrapped with synovial sheaths formed of a visceral sheet, on the tendon, and another parietal, on the osteofibrous canal.

These synovial sheaths allow a better sliding of the tendon. In parts without a synovial sheath, there is an areolar fatty tissue around the tendon called the paratendon. The connection between the tendon and its sliding bed is made by the mesotendon - a series of conjunctival layers that contain blood vessels "in arches" for tendon nutrition (which is always deficient). The mesotendon allows a good mobilization of the tendon during contraction.

Similar to the synovial sheath of the tendon and having the same role, the serous bursa develops in areas where the tendon or muscle is threatened to be damaged by friction or intermittent pressure.



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**Tendon injuries**

TENDINITIS is a condition of the tendon that is clinically expressed by painful subjective accusations and objectively by changes in shape and consistency. It can occur suddenly, following an initial trauma or slowly following the production of local metabolic changes, by an overload of the respective segment. Most of the times, the two causes compete and favor the condition, in the sense that in a tendon with pre-existing histochemical changes, a trauma, even a minor one, produces the lesion that can reach ruptures of various degrees.

Among the favorable conditions can be listed: circulatory disorders, incorrect biomechanical habits, endocrine disorders, methodological training mistakes, fatigue and overtraining, food deficiencies. The inspection reveals a deformation of the region in the form of a swelling of different sizes. Palpation reveals an infested, hard, painful area, sometimes accompanied by crackling, specifying the location of the lesion.

The passive and especially active stretching maneuver of the respective tendon produces localized and irradiated pain. Also, the active movement in the opposite direction of the respective segment is very painful, sometimes even impossible. Ultrasound locates and specifies the size of the lesions. The treatment differs depending on the anatomoclinical form and the evolutionary study in which the athlete was caught. In general, it is recommended ice massages in the first 48 hours, segmental rest (in acute cases even immobilized plaster in position, relaxation of the region for 10-15 days) x-ray therapy, anti-inflammatory, trophostimulants, and in the recovery period dynamic currents and solux. Commonly encountered anatomoclinical forms are: abductor tendinitis with onset and complex symptomatology. The pains are accentuated by the effort, the evolution is insidious, the calm periods alternating with the periods of exacerbations determined by intense efforts. The prognosis remains reserved in the untreated or superficially treated cases, the total or partial ruptures can be numerous; tendinitis of the tendon complex "goose foot" more common in athletes, gymnasts, basketball players, footballers is a particular form of inflammation of the common distal tendon of the semitendinosus and semimembranosus at the knee; the tendency of the deltoid muscle and the supraspinatus muscle found in swimmers, produces their "painful shoulder". The symptoms and treatment are the ones mentioned above, only the segmental management is longer; patellar tendon and quadriceps tendon tendonitis more common in wrestlers, skiers, basketball players, athletes.

**TENDON RUPTURE** is a fairly common event in sports and post-sports activity, being the terminal episode of a progressive degenerative process, which evolves asymptotically, so that the rupture occurs, apparently, "suddenly". In full physical exertion, a sudden movement hears a noise immediately accompanied by violent pain and functional impotence. The local examination highlights the depression that interrupts the continuity of the tendon relief and areas with edema at both ends. Tendon rupture cannot be located in the central proximal insertion part and at the bone insertion. When the rupture is near the bone insertion it can occur with bone tearing. The treatment being surgical, it is recommended that after the athlete has been sedated to be transported immediately to the hospital. In our study, the most frequently ruptured tendons were: the Achilles tendon in which the violent pain is accompanied by the impossibility of lifting and maintaining on the toes, and at the local examination sometimes the groove at the rupture is masked by an intact tendon in the vicinity (plantar thin, plantar flexors).

The surgical treatment is followed by a first immobilization in equine for 30 days and a second in right angle, approach, also 30 days, after which an energetic kinetotherapeutic and physiotherapeutic recovery; the extensor tendon of the ring at the level of the phalanges, found in volleyball players, handball players, basketball players, football goalkeepers, who benefit from the same surgical and recovering attitude; the quadriceps tendon whose continuity between the patella and the patellar tendon is restored by surgery, followed



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by 30 days of immobilization and recovery by all means. The tendon of the long portion of the brachial biceps that after suturing immobilizes for 25-30 days, followed by its recovery through physiotherapy and physiotherapy.

**Tendon injuries - recovery**

Tendons are structures with a particularly important role due to their extensibility and the ability to "absorb" the contractile energy.

Through their flexibility they can adapt to the shapes of the bone structures and determine the final direction of action of the muscle. They consist of bundles formed of regular bands of collagen fibers. The vascular supply of the tendons is poor and therefore frequent injuries in tendons heal with calcifications. They are surrounded by synovial sheaths in the created space; the Achilles tendon has a rudimentary sheath.

Most tendon injuries in sports traumatology are caused by overload, repeated forging of friction and traction. Muscle fatigue reduces biomechanical efficiency and the ability of the tendon to "absorb" shocks, also contributing to injuries.

Most of the tendon injuries are caused by decreased muscle flexibility and endurance .

As a result of these aggressions, we have inflammation (tenosynovitis) and also an abnormal slip of it.

Inside the synovial sheaths, adhesions can occur, which are manifested by crackling. In rowers we frequently encounter De Quervain stenotic tenosynovitis, where the pain and shortening of the tendons lead to limited mobility.

The primary degenerative processes (degenerative tendinopathies) constitute a pathological entity distinct from tendon lesions by overload. In these cases, tendon ruptures most commonly occur at the site of these primary degenerative changes. Secondary, degenerative alterations in the peripheral areas of calcified primary tendinopathies are also described.

Biomechanical disorders of one or other joints in the kinetic chain may lead to tendon injury. For example, an athlete with rotator cuff injuries will change his throwing movements, which will secondarily affect the elbow tendons.

Tendon injuries are usually manifested by pain, reduced inflammation of the soft tissues, without joint effusion, reduced flexibility and impaired stability.

Tendon injuries are very common in athletes. Among the best known are: rotator cuff and elbow tendons in tennis and handball, triceps and distal biceps tendon in weightlifting, patellar tendon in cyclists and basketball, goose foot tendons, Achilles, hind leg tendon origin of hamstrings, iliotibial band and plantar fascia in runners.

**The anatomy of the Achilles tendon**

The superficial muscular plane consists of the sural triceps muscle with its three component parts. At the site of insertion of the soleus, the tendon fibers form an arch - the tendon of the soleus - through which passes the posterior neurovascular bundle of the leg (posterior tibial artery, satellite veins, tibial nerve and lymphatic vessels). The tendons of the thin plantar pass between the gastrocnemius and the solarium. All these muscles meet distally in the Achilles tendon that is inserted on the calcaneal tuberosity.

**Tendon rupture**

The Achilles tendon is the tendon of the sural triceps and is inserted on the posterior of the calcaneus; it is the most voluminous and resistant tendon of the body. The vascularization is ensured by branches of muscular and periosteal origin. The middle part of the tendon is the most improperly vascularized.

It is known that the sural triceps is plantar flexor and accessory adductor and supinator.



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The role of the sural triceps is to stabilize, along the movement, the angle formed by the tibia and foot.

Due in large part to the morphological and functional characteristics that was presented, the rupture of the Achilles tendon is the most common spontaneous rupture, being found especially in athletes.

The most common mechanism of production is the indirect one: strong muscle contraction encountering an abnormal resistance, is what occurs at the start of a race, during a fall on the legs. Such accidents are encountered in athletes (running, jumping), tennis, basketball, skiing, football, volleyball, mountaineering.

Rarely, Achilles tendon ruptures can occur through direct trauma, in hockey, through patina injury.

Tendon rupture is favored by: degenerative tendon disorders (tenosynovitis and tendonitis), repeated microtraumas, vascular disorders, metabolic disorders, corticosteroid infiltrations, some eating errors, etc.

The data from the specialized literature show that the most frequent rupture place was 3-4 cm from its insertion, the area where the tendon has a precarious vascularization and a slight narrowing.

The prophylaxis of ruptures can be done as follows:

- ensuring a progressive training for young athletes, which makes the dimensions of the tendon increase in parallel with those of the motor muscle;
- appropriate readjustment to effort after a period of interruption of training;
- good quality training and competition equipment;
- treatment of Achilles tendinitis and tenosynovitis.

The clinical diagnosis is established on the following data: the rupture results in a violent pain that lasts 2-3 minutes, accompanied by the sensation of cracks that can be heard.

After rupture, swelling of the region occurs rapidly and an intrathecal hematoma is installed.

The physical examination reveals disruption of tendon continuity ("in the blow of an ax").

Functional impotence while walking is more discreet, as the hind leg, fibula and flexors continue to provide plantar flexion. It is important to remember that the injured person is unable to stand on tiptoe on the injured side.

The clinical examination must be completed by radiographic examinations: standard radiography; radiographic examination of the soft parts and especially the ultrasound may show the deformation of the Kager triangle (the anterior contour of the Achilles tendon becomes concave forward).

The treatment of Achilles tendon ruptures in young people and athletes is surgical:

- in recent ruptures, a simple suture with U-threads, a suture with County knots or a suture with thin plantar plastic suture are preferred;
- in old or iterative ruptures, transplantation in a short lateral fibula (PEREZ-TEUFFER).

Postoperatively, the foot is immobilized for a period that differs from author to author (as well as the position of the leg).

ORFANU N. (1974) shows that atrophy of the sural triceps muscle, retraction of the Achilles tendon, osteoporosis of the calcaneus are secondary to an immobilization of the foot in the equine and recommends that no postoperative immobilization be done, the foot will be mobilized from the first day after tendon suture. In order to assess the postoperative results, JUDET and BENASSY proposed the following criteria:

- strength of the triceps (walking test on tiptoe);
- tibio-tarsal mobility and stability;
- pain;
- edema





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**Topic presentation**

Clinical diagnosis: Tendon rupture

Recommendations:

1. Surgical treatment: simple suture with "U" threads;
2. Complex recovery treatment according to the specialized clinic.
3. Kinetotherapy;
4. Yumeiho massage / therapy;
5. Physiotherapy.
6. Gradually resume training under medical supervision (with minimum intensities and volumes);
7. Periodic weekly control of recovery;
8. Prohibited competitions until re-evaluation in the clinic, depending on the evolution of the case.

The rupture of the tendon occurred on a football field, having as bitumen the playing surface, due to a sudden starting movement on the spot and at the same time the sudden passage of the body weight from the tip to the heel (on the back leg - left foot) . Following the rupture, the subject felt a sharp pain, and at the level of the tendon, on palpation, the tendon was interrupted and the patient was unable to stand on tiptoe. The swelling of the region immediately appeared and a hematoma was installed.

Presentation of recovery protocol from the physiotherapy office: kinetic exercises

*Laying on your back:*

- bending and stretching the legs (2x8 - 5x10);
- bringing the tip of the foot in and out (2x8 - 5x10);
- the same exercises with manual resistance (clantic cord) - (2x4 - 4x8);
- wide rotation of the foot in both directions (2x8 - 5x10);

*Sitting with his knees bent, his feet pressed together, on the mattress:*

- lifting the toes with support on the heel (1); return (2) (4x8-5x10);
- lifting the tip of one leg with heel support (1); return (2) (4x8 - 5x10);
- rolling the toe-toe and heel-toe soles (2x8 - 5x10);
- rolling the sole of one foot toe-toe and heel-toe (2x8 - 5x10);
- tightening a towel under the sole with your fingers, without lifting the heel off the ground;
- pedaling exercises on the exercise bike;

*Sitting with arms outstretched forward resting on a stand:*

- lifting on tiptoes (1); return (2) (2x8 - 5x10);
- lifting on the tip of one leg (1); return (2) (2x8 - 5x10);
- lifting on the heel (1); return (2) (2x8 - 5x10);
- lifting on the heel of one leg (1); return (2) (2x8 - 5x10);
- "ankle play";
- knee bends without lifting the heels off the ground (2x4 - 5x10);
- passing the weight of the body from the outer edge to the inner edge of the feet (2x4 - 4x8);
- "shoot the crow" - knees with one leg supported by the hand on the fixed ladder;



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*Standing:*

- walking on peaks (2x5m - 5x10m);
- walking on heels (2x5m - 5x10m);
- walking on the outer edge of the foot (2x5m - 5x10m);
- walking on the inner edge of the foot (2x5m - 5x10m);

**Conclusions**

Achilles tendon rupture is an important health problem, both for ordinary people and especially for athletes. It should be noted that among the latter come many patients with this diagnosis.

The importance of the condition is given by the following considerations:

- has an important share in diseases that require kinetic recovery treatment;
- affects, first of all, active people;
- can lead to major disabilities;
- requires a significant amount of medical care.

The treatment and recovery program is complex and has several characteristics, mentioned below:

- it is essential that the recovery program be extended on an outpatient basis, as the recovery period is long, as hospitalization is not enough;
- recovery treatment first relieves the painful syndrome, then mobility and muscle strength;
- correctly executed treatment and recovery program can lead to total recovery of mobility and functionality;
- the values of the studied parameters have a good evolution, the desire for recovery and the conscientious execution of the recovery program being decisive factors for shortening the recovery period;
- the final expression of the efficiency of the complex recovery program is evoked by the significantly favorable evolution of all the studied parameters (pain, swelling, hypotrophy of the leg, limitation of mobility for plantar flexion and dorsiflexion, gait disorders, ability to climb and descend stairs);
- the results of the study attest to the importance of applying the kinetic program in the rupture of the Achilles tendon, a program meant to restore the mobility and functionality of the leg that suffered such a trauma.

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## **FREQUENCY STUDY OF THE FTO AND ADRB3 GENOTYPES IN A ROMANIAN COHORT OF OBESE CHILDREN**

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### **Abstract**

The human population worldwide has showed during the past years an alarming increase the incidence of obesity in all races, sexes, social, cultural, religious or geographic environments.

Romanian population has adopted generally the Western countries' lifestyle and presently is one of the leader countries in the high incidence in obesity, especially in childhood obesity.

This study is a first approach of genotyping in a selected Romanian cohort comprising adults and children for two genes related both to energy accumulation and expenditure, respectively: FTO rs9939609 and ADRB3 rs4994. The results showed that although statistically significant in both groups, the FTO allele A was more associated with obesity in adults than in children. The FTO rs9939609 polymorphism is a common SNP in our Romanian study group, its mutant A allele showing a higher frequency than the worldwide rates. The selected ADRB3 polymorphism is a rare genetic variant in our Romanian cohort: its C allele has shown correlations, although not statistical, with obesity susceptibility, all of the heterozygous (TC) individuals belonging to obese groups, while no homozygous mutant (CC) subjects were reported. Although rare, the ADRB3 mutant frequency was higher in our Romanian groups than in the reported worldwide population. In contrast with the FTO genotype, the ADRB3 genotyping showed a higher association with the predisposition for obesity in children than in adults in our cohort.

**Keywords:** obesity, FTO, ADRB3, rs9939609, rs4994, allele frequencies, genetic predisposition.

### **Introduction**

Obesity is commonly known as the result of an unbalance between intake and expenditure, a complex multifactorial disorder involving all metabolic pathways (lipid metabolism, glucose metabolism, protein and energy metabolism, vitamin metabolism) (1, 2), in which fat mass accumulation and low energy consumption are key predisposing and etiopathogenetic factors.

Since the discovery of the Fat Mass and Obesity associated (FTO) gene in 2007 (3, 4) as the first gene ever described as being correlated with the predisposition for the common polygenic obesity, genome wide association studies (GWAS) identified a number of more than 60 chromosome regions and over 240 single nucleotide polymorphisms (SNPs) linked with the complex matrix of molecular processes involved in the pathogenesis of this complex disorder (5-9).

The common rs9939609 SNP from intron 1 of the FTO gene is the most widely correlated genetic variant with the predisposition for obesity, being involved in the fat mass accumulation process and in the hunger-satiety pathway (10-12). As a response to the FTO adiposity action, the ADRB3 gene is engaged in



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the energetic balance of the organism, its rather rare rs9449 (Trp64Arg/W64R) polymorphism being connected with low energy expenditure and the susceptibility for developing obesity (13-15). Apart from the polygenic obesity, a number of over 60 genetic monogenic and pleiotropic genetic syndromes describe obesity as their main and only or one of their main clinical features. Several genes have been identified as the mutational causal factor for monogenic obesity syndromes (leptin, proopiomelanocortin, melanocortin 4 receptor, prolactin, etc.) (16, 17), while more than 30 pleiotropic multisystemic syndromes have been reported of including obesity (Prader Willi syndrome, Alstrom syndrome, Cohen syndrome, Fragile X syndrome, etc.) (18, 19).

The Romanian population has showed during the past years an alarming increase in the incidence of obesity in all races, sexes, social, cultural, religious or geographic environments. The high rates of this disorder in children notable should inquire immediate action from the scientific and medical worlds in order to finally fully understand and try to cutback the development of this dangerous disease.

**Purpose of the study**

The current study wishes to emphasize the frequency of the FTO rs9939609 and ADRB3 rs4994 genetic variants in our Romanian (Caucasian) cohort. The research also intends to detect the correlation between these gene polymorphisms and the obesity susceptibility. These estimations would represent a first step in providing a genetic risk map for this disorder in our Romanian population.

**Materials. Methods**

**1. Cohort selection**

Our study included a total of 64 subjects separated into: 1. Adults, 33 individuals (23 obese, 10 normal/controls); 2. Children, 23 subjects (13 obese, 10 normal/controls); 3. Prader-Willi syndrome patients (8). The whole research consisted in a number of different association studies between the obesity pathogenesis and predisposition and each of the FTO rs9939609 and ADRB3 rs4994 (Trp64Arg) gene variants: adults study, children study, PWS patients study, family study, whole cohort study. The present paper addresses the frequencies study of both the FTO rs9939609 and ADRB3 rs4994 polymorphisms in our groups.

**2. Biological material**

FTO rs9939609 and ADRB3 rs4994 (Trp64Arg) DNA genotyping were performed on DNA extracted from *saliva* and *blood*. All selected subjects have given their *written informed consent* for the procedures and any further use of their biological material and data. *the study has been conducted under the supervision and with the approval from the Bioethics Committee of the National Commission of Romania for UNESCO.*

**3. DNA genotyping method**

The method used for both polymorphisms genotyping was the High Resolution Melting Quenching Probe's temperature (HRM-QP) analysis performed on an Arkray IDensy 5320 system. IsoHelix Buccal Swabs and Isolation Kits were used for collecting and isolating saliva for DNA extraction.

**4. Statistical analysis and association studies**

Data and results obtained through genotyping were analysed with the use of the *statistics SPSS software* (version 13.0) and the *Microsoft Excel Analyse-it Tool Pack 1.71*. For the present study the Descriptive (Frequencies, Ratios) and ANOVA analysis were approached.

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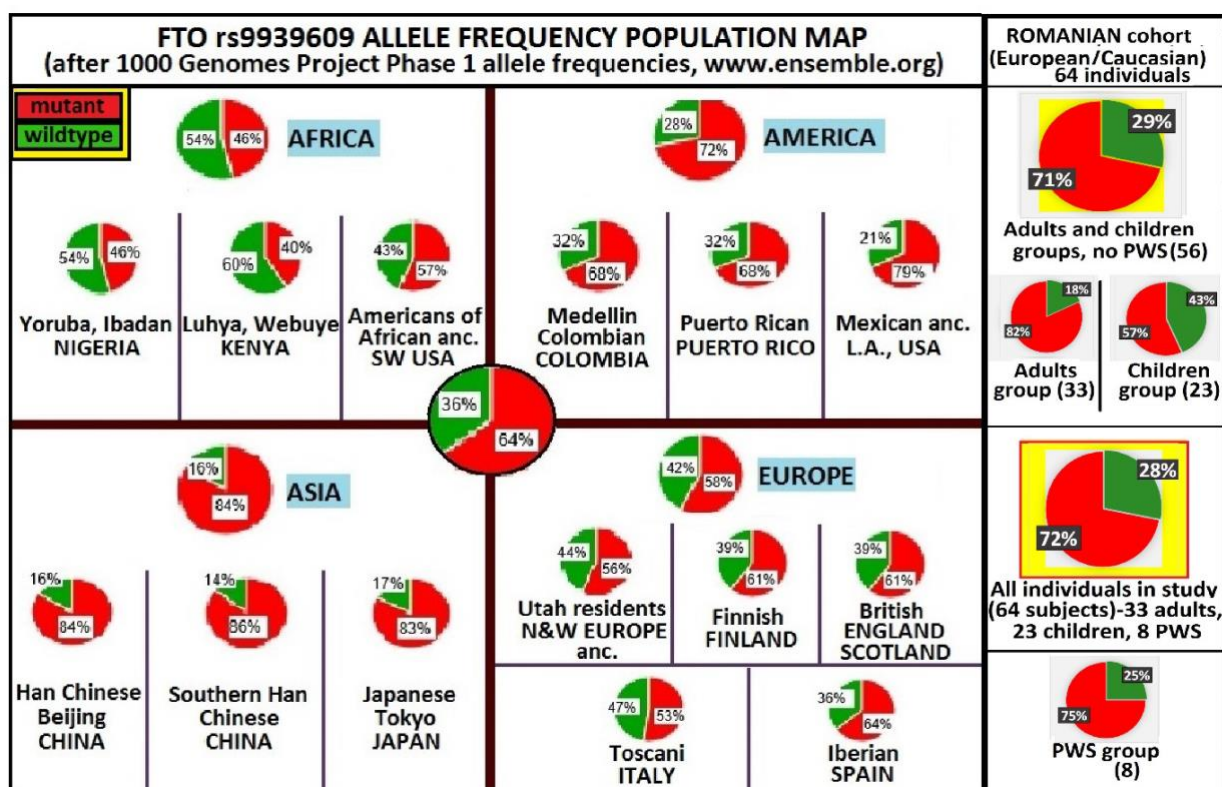
## Results

All allele frequency results for the FTO rs9939609 and ADRB3 rs4994 genotyping are listed in Figures

1, 2

## Discussions

### 1. FTO rs9939609 genotyping (figure 1).



**Figure 1.** FTO rs9939609 mutant A allele worldwide and Romanian cohort frequencies map (after 12)

#### 1.1. FTO rs9939609 genotypes and mutant A allele frequencies in all subjects

The FTO rs9939609 polymorphism is known to be a common gene variant in the Asian (84%, with an overall global high in Southern Han Chinese – 86%) and Latin American (72%) populations, while being less widely spread in African individuals (46%). In Caucasians, 58% of the Europeans carry the mutant A allele, with highest incidence in the Iberian population (64%) (10, 12).

In all the subjects from our study the frequency of the A allele was 71.9%, 7.9% higher than the overall worldwide reported frequency of the allele (64%) and 13.9% higher than the European Caucasian one (58%) (12), 46 out of the total of 64 individuals carrying at least one copy of this genetic variant. The incidence of this mutant allele in the obese subjects (adults and children) was as high as 88.9% (PWS patients not included), with almost half of the obese individuals (47.2%) carrying the homozygous mutant (AA) genotype, while in all the controls A allele was identified in just 40% (10% AA). Although the number of individuals in the present research is not big enough to make general assumptions, the high rate of the A allele in our study group may be an indicator that the rs9939609 SNP of the FTO gene is a common genetic variant in the Romanian





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(Caucasian) population, with an elevated correlation with obesity and the predisposition for developing this disease.

**1.2. FTO rs9939609 genotypes and mutant A allele frequencies in adults groups**

The adults group revealed the highest FTO rs9939609 gene variant frequencies. The overall adults frequency of the A allele was 81.8% (27 out of 33 adults), with a booming 95.7% (22/23) in obese adults and 50% (5/10) in controls. The rate of the homozygous mutant (AA) and heterozygous (TA) genotypes was considerable higher in obese than in subjects (TA – 43.5% vs. 30%; AA – 56.5% vs. 30%), while only 4.3% (1/23) of these individuals were wearing the TT FTO genotype. These proportions and the important 45.7% statistical difference between the adults groups ( $p=0.024$ , ANOVA test) may be a proof that the FTO rs9939609 gene variant is a strong indicator for obesity and the predisposition for obesity in our Romanian Caucasian cohort.

Furthermore, these numbers are much higher than the worldwide and European frequencies and tend to be similar to those in which this mutant FTO allele is a high risk predictor for obesity (Asian and Latin American), possibly indicating themselves the higher predisposition of our group for developing this disorder.

**1.3. FTO rs9939609 genotypes and mutant A allele frequencies in children groups**

13 of the 23 children in our study were shown carrying the A allele (56.5%), frequency similar with the European Caucasian one (68%) (ensembl.org [12]), although revealing an unexpected difference to the high frequencies of this gene variant in the adults group (81.8%). This 13.8% difference correlated to the hugely 95.7% A allele rate in the obese adults may point out the fact that the rs9939609 FTO SNP has been identified more in association with obesity in adults than in children in our Romanian Caucasian cohort, while both being statistically linked with this disorder however.

Nevertheless, the obese group showed an elevated percentage (76.9%, 10/13) of the A allele, while the control (normal) children group reported the most surprisingly low rate of the A allele, 30% (3/10) and a 0% incidence of the AA homozygous mutant genotype, this genotype being represented in our cohort by the obese children only. As in the adults groups, the fact that there was such a considerable statistical ( $p=0.001$ , ANOVA test) difference (49.9%, close to the one found in the adults group) regarding the mutant FTO allele frequencies between the 2 children groups (obese/normal) may indicate that the FTO rs9939609 polymorphism has the same strong association with obesity in children as in adults, being much more common in obese children than in normal weight ones.

**1.4. FTO rs9939609 genotypes and mutant A allele frequencies in PWS patients group**

The Prader Willi patients revealed a slightly higher frequency of the A allele compared to the general study cohort (75% vs 71.9%). Although the low number of PWS individuals included in our research, 8, does not allow us to extend the frequencies to an at least isolated population status, we found it specifically interesting to observe the increased rate of the homozygous AA genotype, 50% (4 out of 8 patients), higher than the one found in obese subjects from both adults and children groups (47.2%), yet lower than the obese adults one (56.5%).

Being given the ethiology of PWS however, we cannot link the obesity from this complex genetic disorder to the presence of the mutant FTO rs9939609 A allele, as it is the direct cause of a specific different kind of genetic mistake (lack of the satiety hypothalamic center due to a 15q11-13 microdeletion). It may be nevertheless intriguing to understand if obesity itself draws upon genetic mutations known to be associated to



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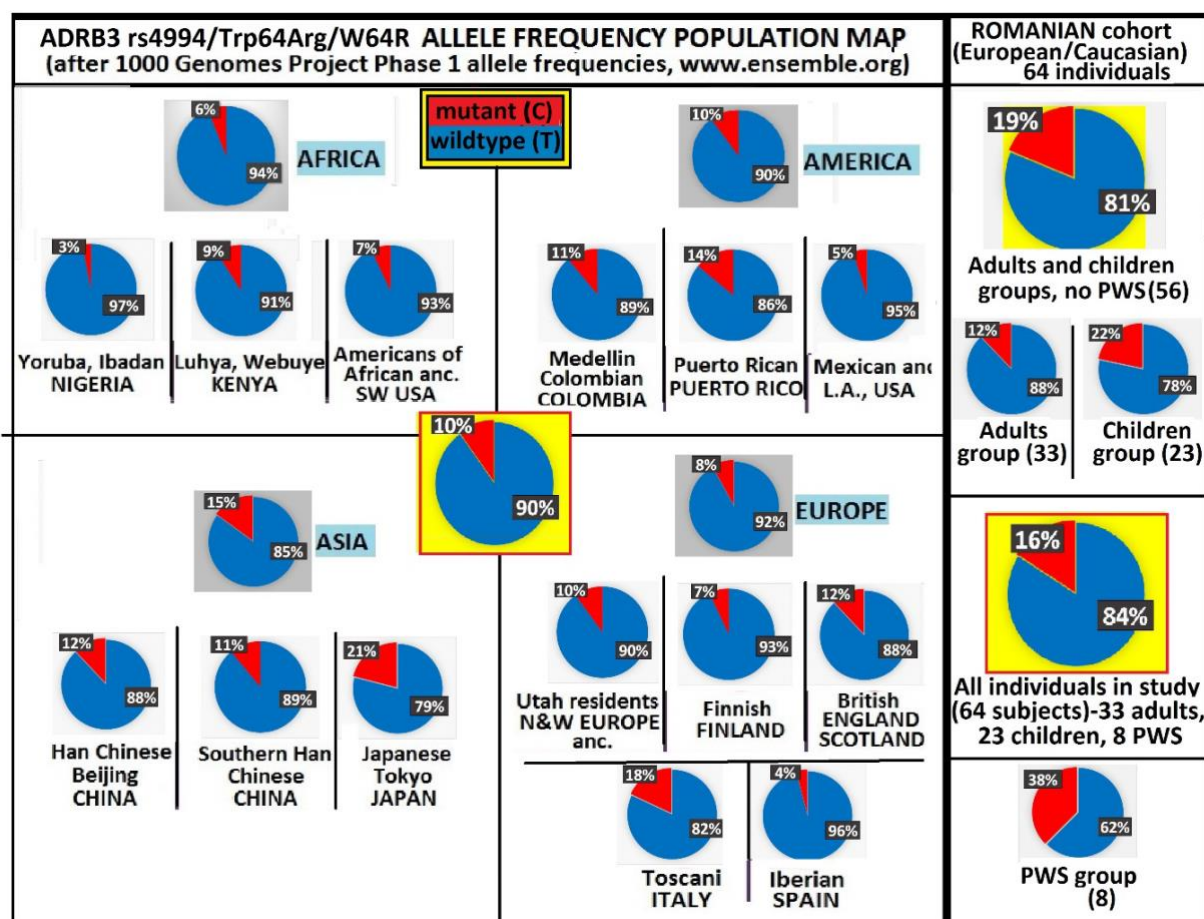
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itself, this possibly being one of the multiple mechanisms in the case of the PWS patients in which the lack of this specific satiety center in the hypothalamic nuclei produces its effects upon body weight and fat mass.

## 2. ADRB3 rs4994 (Trp64Arg) frequencies (figure 2)

### 2.1. ADRB3 rs4994 genotypes and C allele frequencies in all subjects

The ADRB3 rs4994 polymorphism is known to be a rare gene variant worldwide in all populations (10%), with a possible interference in obesity pathogenesis and association with the energy pathway alteration in this disorder. The Asians are known to be more predisposed of carrying the mutant C allele (15%), with an overall global high in the Japanese population (21%), while being extremely rarely met in Africans (6%). In Caucasians, 8% of the Europeans carry the mutant C allele, with highest rates in the Italian Toscani population (18%) (13, 15).



**Figure 2.** ADRB3 rs4994 mutant C allele worldwide and Romanian cohort frequencies map (after 15)

In all the subjects from our study the frequency of the C allele was 18.8%, 8.8% higher than the overall worldwide reported frequency of the allele (10%) and 10.8% higher (*more than double*) than the European Caucasian one (8%) (15), 12 out of the total of 64 individuals carrying at least one copy of this genetic variant.



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Although still a rare ADRB3 variant, these numbers are much higher than the worldwide and European frequencies and tend to be similar to those in which this mutant FTO allele is a high risk predictor for obesity (Japanese Asian) (15), possibly indicating themselves the higher predisposition of our group for developing this disorder.

The incidence of this mutant C allele in the obese subjects (adults and children) was 25% (PWS patients not included), while the controls revealed no C allele (0%, 0/20). It is important to state that there have been no CC homozygous mutant genotype in any of our 64 subjects, invoking the rarity of this genetic variant. The fact that the only C allele carriers were found only in the obese groups (adults and children) may point out that the ADRB3 Trp64Arg polymorphism may be correlated with obesity and the predisposition for developing this disease in our study group and possibly in the Romanian population, while yet remaining a rare SNP in our cohort.

**2.2. ADRB3 rs4994 genotypes and C allele frequencies in adults groups**

The overall adults frequency of the C allele was 12.1% (4 out of 33 adults), with a higher rate in obese (17.4%, 4/23, all heterozygous, TC) than in controls (0%, 0/10). The important, although not statistical ( $p=0.17$ , ANOVA test), 12.1% difference between the adults groups may be a proof that the ADRB3 rs4994 gene variant is one of the markers for obesity predisposition in our Romanian Caucasian cohort.

**2.3. ADRB3 rs4994 genotypes and C allele frequencies in children groups**

5 of the 23 children in our study were shown carrying the C allele (21.7%), 0.7% higher than the overall high Japanese rate and close to triple than in the European Caucasian one (8%) (15), revealing at the same time an intriguing 9.8% (almost double) difference to the adults groups frequency (12.1%).

This contrast correlated with the extremely elevated 38.5% C allele rate in the obese children and the difference between the obese and adults children groups (38.5%) may point out the fact that the rs9939609 FTO SNP has a much stronger association with obesity in children than in adults in our Romanian Caucasian cohort.

**2.4. ADRB3 rs4994 genotypes and C allele frequencies in the PWS group**

The Prader Willi patients revealed an unexpectedly higher, more than double frequency of the C allele when compared to the general study cohort (37.5% vs 18.8%), 3 of the 8 subjects carrying the ADRB3 TC heterozygous genotype. As stated before in previous paragraphs, PWS has a distinctive genetic cause which leaves little space for predisposition in the case of obesity, as this specific disorder is generated directly from the lack of the satiety brain center. Nonetheless, being given the high incidence of the mutant C allele in our 8 PWS patients, we may question whether the lack of this specific hypothalamic center generates obesity through different other genetic markers known to be involved in the hunger-satiety pathway. The study must however extend to a much greater number of subjects in order for such assumptions to be made.

**3. Obesity genetic predisposition and eating behaviour and lifestyle**

The FTO gene action on the fat mass (adipose tissue) accumulation is expressed by altering eating behaviour, control over eating and response to highly environmental hunger and hunger-like stimuli. In this respect, lack of control over eating (which seems to be directly influenced by the FTO gene variants and especially by the rs9939609 polymorphism), and also geographical, social, economical, psychological, political, religious, behavioural individuals aspects are all environmental risk factors for developing obesity (20). In this regard, early susceptibility screening for this disorder may deliver important benefits to persons carrying the genetic predisposition (represented by multiple obesity risk gene variants), as changing their eating habits and decreasing the environmental interference (mostly through sustained / lifetime diet and physical exercise) proved to deny or even cancel the genetic inheritance (21-23). At the same time, FTO expression has been illustrated of altering or interacting with other chromosome locations known to be



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involved in the brain/hypothalamic hunger – satiety pathway. Thus, studying the specific rs9939609 polymorphism of the FTO gene and the rate in which this common general population variant is found in our Romanian study should provide, through association studies, clues on the mechanism in which different responses to hunger and various lifestyles can influence this predisposition in the extent of developing into the actual disorder. Association study results showed complete concordance with reported literature regarding the role of the FTO gene in the obesity etiopathogenesis, proving that FTO rs9939609 genotyping is an effective prophylactic method of early detecting the susceptibility for this disease and setting up a healthy lifestyle for counteracting the genetic influence to gain weight (3, 24-28). Moreover, the high mutant A allele frequency and the increased rate of the AA homozygous mutant genotype in correlation with obesity not only in adults, but in children as well, should pull a high alarm signal towards studying this genetic variant.

Obesity is known to be the perfect risk terrain for the development of further severe complex disorders, such as: glucose metabolism alterations and diabetes mellitus, hypertension, heart failure, embolism, stroke, atherosclerosis, kidney failure, hepatic steatosis, dyslipidemias and other lipid metabolism disfunctions, metabolic syndrome, basal metabolic rate and energy metabolism alterations, etc. These are direct consequences and often comorbidities of obesity. Once having its debut during childhood, long term weight gain, sustained obesity and its persistence into adulthood will be a far greater predispositional factor for all the above-mentioned diseases (29). In our first ever approach of the ADRB3 rs4994 genotyping on the Romanian population, there has been shown that the mutant variants are very rare, so far for the our less than 100 individuals group. It has been elected together with FTO genotypes as being representative of the energy expenditure processes, and thus the final effect of the energy accumulation, a process controlled by FTO gene variants. The ADRB3 gene has shown to be a rare genetic variant in our Romanian population. This gene is expressed especially in the adipose tissue and is known of being associated with the regulation of lipolysis and thermogenesis, its rs4994 being highly associated with obesity predisposition in the Asian, especially Japanese population (30, 31).

There are however 2 other  $\beta$ -adrenergic receptors (ADRB1 and ADRB2), also linked with obesity risk, which may prove to be better genetic variants for future associative research in the Romanian population (several studies indicate correlations between different ADRB2 SNPs and obesity in European Caucasian populations). Further approach of more genetic variants of adrenergic receptors on a more numerous individuals may have a substantial potential to correctly correlate their role in obesogenic genetic field in our population.

The adipose tissue expression of the ADRB3 gene and its possible interference or positive co-regulation with the FTO gene's fat mass activity persuaded us upon the Asian stated genetic variant of ADRB3. Nonetheless, the fact that the mutant C allele of the rs4994 ADRB3 SNP has been scarcely identified in our cohort does not imply that this polymorphism shows no correlations with obesity. On the contrary, while not statistically significant due to the low number of C allele carriers among our study groups, the association with the obesity risk is to be surveyed as all the rs4994 heterozygotes (TC; no CC genotypes identified in our cohort) belonged to the obese groups and none of the controls were identified of wearing this allele.

Yet, recent research comes in our approval and shows similar results but with statistical associative significance in this case in a Hungarian cohort. (32).

The wider research, out of which the current study was extracted, has been the first ever evaluation of the genetic predisposition for the common obesity, both gene variants (FTO rs9939609 and ADRB3 rs4994) never having been genotyped before in association with this disorder in our country. While the ADRB3 gene



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was never described before in Romania, only one research approached the FTO gene before, yet not in correlation with obesity (33).

### **Conclusions**

The rs9939609 FTO polymorphism is a common genetic variant among the studied Romanian Caucasian cohort. The mutant FTO A allele has been described in high frequencies in the obese individuals from our study, being strongly correlating with obesity. Our research revealed high rates of the homozygous mutant (AA) genotype, especially in the obese groups. Although statistically significant in both groups, the A allele was more associated with obesity in adults than in children.

The ADRB3 rs4994 polymorphism is a rare genetic variant in our Romanian cohort. The C allele of the ADRB3 gene has shown correlations, although not statistical, with obesity susceptibility, all of the heterozygous (TC) individuals belonging to obese groups, while no homozygous mutant (CC) subjects were reported. Although rare, the ADRB3 Trp64Arg SNP's frequency was higher in our Romanian groups than in the reported worldwide population. In contrast with the FTO rs9939609 A allele, the ADRB3 rs4994 C allele has pointed out a higher association with the predisposition for obesity in children than in adults.

The frequency of the FTO A allele in Prader Willi syndrome patients was close to the general population one, with a high incidence of the AA genotype, possibly indicating a role of this genetic variant in the pathogenesis of obesity in this syndrome. The frequency of the ADRB3 C allele in PWS subjects was much higher than in the other studied groups and than in the reported worldwide rates, opening a possible debate in the respect of this SNP's implication in the development of obesity in PWS patients.

Knowing the frequencies in which a genetic variant with clinical implications is present in a specific population is of extreme importance in the full and correct understanding of the complex molecular mechanisms which lead to the development of the different disorders.

The rs9939609 FTO gene polymorphism has been proven in our cohort of being a strong, widely spread, indicator for obesity susceptibility. While seemingly rare, the rs499 ADRB3 when present is a fair predictor of the predisposition for developing obesity. Further studying of these genetic variants on broader cohorts would be of great importance in decrypting the molecular pathways involved in the etiopathogenesis of obesity.

This current frequency study and the positive associative results are of great importance for clinical practice and management of obesity, as the FTO rs9939609 gene polymorphism mainly and, at some extent, the ADRB3 rs4994 SNP as well, when present, are significant indicators for the predisposition to develop this disorder.

The present results from DNA genotyping and the statistical differences in mutant alleles frequencies between obese and normal individuals in our study groups have provided us a secure set-off point for association studies with the commonly reported clinical obesity parameters (weight, waist, body mass index, basal metabolic rate, body fat mass and excess) and with the biological markers for various obesity comorbidities (lipids, glucose, transaminases, thyroid hormones, blood pressure). These correlations are yet to be published and tend to provide precious information on the future possibility of an early obesity risk detection and management.

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**APPLICATIONS OF ACTIVE PROPHYLAXIS FOR THE PREVENTION OF  
POSTTRAUMATIC DISEASES IN JUDO PRACTICE CHILDREN**

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**Abstract**

Performance sports require a great deal of sacrifice, time, materials, seriousness and perseverance. Most parents give their children a sport to fill their child's time, due to the inability to stay with him or to have no one to leave him with during the service. This is a beneficial thing for children, practicing a sport helps a harmonious physical development, learning skills and motor qualities and the concept of success, making it feel important.

Behind these performances if a training program is not designed properly can lead to post-traumatic joint and ligament disorders. Balancing the actual training specific to the sport practiced, combined with fun games and exercises for prophylaxis, trains the child without him realizing that the game he plays has a beneficial role in preventing post-traumatic diseases in each sport, prosthetic correction of the spine and maintaining optimal health of the body.

**Key words:** prophylaxis, prevention, judo post-traumatic disease.

**Introduction**

In judo, many ailments can be found in the joints of the hands, elbows, knees and ankles, because incorrectly performed falls can directly cause injuries to these segments. In terms of ligaments, the most common condition of the knee is the rupture of the anterior cruciate ligament and meniscus. These injuries are due to a heating performed incorrectly over time in training and the stress of the body from an early age, in the work force is put on the athlete weight over the body, injuries neglected or not treated properly, after training is not observed the program of stretching and recovery of the body after exertion. Overload is the basis of every performance sport, because this is the only way to achieve maximum performance, this principle is wrong, a well-balanced workout, the necessary hours of sleep and a healthy diet can bring good performance. As you get older, many good athletes are forced to give up sports due to post-traumatic conditions that occur during practice.

Prophylaxis plays a very important role in this branch of sport, because the effects of preventing post-traumatic diseases in children practicing judo, have a very large effect, it is easy to get injured, better prevent. Each national judo sports club is equipped with a series of specialists and physiotherapists in the field, the main goal being prevention.

Kata-waza is a form of judo art where all the beauty of the execution technique is highlighted, suppleness, accuracy, by slow execution the technique can be understood in depth even by a beginner. Kata demonstrations are not only spectacular, but also have a constructive role of a defense technique against an attacker (Kano J. (1963)).

This technique includes prophylaxis by correcting small mistakes that occur during the execution of a procedure. Thus educating practitioners to perfect any dissatisfaction or physical condition in their lives.

If we were to analyze from the point of view of biological nature, in young children the development is gradual, uneven, as a result of this development we can mark the period of slow development and the period



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of rapid development (Muntean A. (2006)). Depending on the male and female sex, the development and stature differ, presenting an unevenly ascending evolution, as a result in boys aged 7-9 years the development is gradual, and in girls the development occurs earlier 6-8 years, the differential being made at the expense of the lower limbs and stature, but also of the weight. The weight is ascending, the evolution being uneven; the highest jumps are marked at the age of 9-10 years, the muscular system being slower than the development of the skeletal system (Rabolu, E., (2014)). At this age, the bones have an equal amount of cartilaginous tissue in their structure, which leads to a decrease in bone resistance to high stresses with high intensity, favoring even slight deformation if the training factors are favored in this negative sense. Especially in girls, the pelvis are incompletely welded, as a result of which it is necessary to comply with certain requirements regarding physical effort (Mârza, D. (2005)).

Other factors that disadvantage a correct posture can be sitting on the bench, poor gait but also the carrying of heavy objects, even the wrong carrying of the backpack (the weight balance being tilted more on one shoulder and not evenly), as a result of these mistakes and due to deficiencies in the deposition of calcium salts in the bones and the asymmetry of vicious positions, at this age can occur kyphosis, scoliosis, lordosis and rounded back each disease having a differential degree from one person to another (Toma Șt. (2018)).

Regarding the use of sport in children's lives, not only as a branch of fun but also for the benefit of the body, both for a harmonious physical development, but also for prophylactic purposes, which helps prevent and eliminate problems over time after practice performance sports (Toma, G., Toma, Șt., (2008)). Judo as a contact sport, in wrestling, required the children's joints at a high level, so in addition to the wrestling itself, the creator of this sport introduced a less demanding branch, namely KATA-WAZA (Rabolu, E. N., (2017)). We define this branch as the pure technique of judo, where practitioners learn completely the correctness of judo techniques, the accuracy of the procedures performed in the most efficient way. As a result, Kata-waza becomes a competitive sport where athletes from all over the world can obtain diplomas and medals through kata demonstrations, for the "best" procedures performed correctly.

The beneficial purpose of this sport in children includes the correction of vicious positions, kyphosis being the most common disease of the spine at school age, because the correction of the child's posture is neglected (Șerbescu, C.). Due to unjustified reasons with or without the parents' will, children approach an incorrect position both in front of the computer, at school and on the street. The branch of judo such as kata-waza teaches children to perform the procedures correctly but also to maintain a correct posture, the coach drawing the child's attention by explaining how to perform the procedures correctly and at the same time the posture. Complex judo training, where we have as an introduction, a first stage the basic warm-up of the body, before starting the effort is very important to be performed correctly and complex by various means fun but beneficial to the body, as a result a good warm-up will remove the risks may occur during training, namely injuries, and in a long time deformities in the spine, characterized by kyphosis, scoliosis and lordosis.

The actual training should not be difficult, so the coach will select for each age category, children with the same weight / kg with a maximum of 1-2 kg over the weight of the children's body. The repetition of the procedures will be performed in a slow and correct rhythm with a number of 10 to 12 repetitions; the working time will be established according to the possibilities of the age group. Speaking of age, we refer to the category of 3-7 years where the body is in the phase of accumulating basic skills and knowledge, this being the difficult period of posture education and coordination of segments. Between 3 and 5 years the accuracy of the procedures will have a very low yield, the training being based more on games and exercises for prophylactic purposes, to prevent and combat mild forms and conditions such as: varus and varum, front shoulders,



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kyphosis, lordosis, scoliosis, torticollis, mild forms of rickets (clogged sternum) and other (Toma G., Toma, Șt. (2013)).

**Material and method**

The prophylactic purpose of the main kata-waza techniques used in groups of beginner children requires a high technical training because the number of procedures and elements are in an increasing number of techniques, during training being changeable and varied.

The aim of the research is to follow the evolution of development, selection, introduction and adaptability of means specific to physiotherapy and physical motor skills for prophylactic purposes of novice athletes, judo practitioners, through various means and procedures belonging to the KATA-WAZA group of procedures.

**Research hypotheses**

The hypotheses of this paper show the impact that physiotherapy has on the lives of judo athletes and various branches of this sport, by preventing and treating complex forms of mild diseases of the body and introducing a work plan specific to physiotherapy.

**Hypothesis no. 1:** using specific activities of physical therapy in sports, which serve to fulfill some goals or desires of beginner practices, we will achieve the desired goals.

**Hypothesis no. 2:** by using procedures or games adapted for prophylactic purposes, we will obtain a high level of performance and satisfaction if these activities carried out in training are a priority for practitioners.

**Hypothesis no. 3:** in training we will use a centralized approach on each practitioner, the introduction of priority means for practicing children specific to physiotherapy for prophylactic purposes, then an increase in the quality of life and psycho-motor apparatus will be obtained.

**Research tasks**

1. Theoretical documentation.
2. Formulation of hypotheses.
3. Choosing research methods.
4. Interpretation of results and evaluation.
5. Formulation of conclusions.

**Research design**

A.P. and M.M. they are two boys, both 7 years old, they live with their parents.

A.P. lives in a 3-room apartment on the 5th floor of a building that benefits from all facilities (water, heat, cable, etc.), in the center of Pitesti. He lives in the house with his parents and a sister 2 years younger than him. He is a student at the gymnasium school from urban. M.M. lives at home in a rural area, a 5-room house that benefits from all the necessary utilities (water, heat, internet, etc.). He is alone with his parents; he studies at the gymnasium school from country.

Both children are sociable, smart, friendly, have high optimism, ambitious, persevering, funny and orderly. The two are big fans of war games and cars, after finishing homework they spend the rest of their time in front of the computer.

At the age of 7 they suffer from a slight form of kyphosis due to the vicious position, at first glance it does not seem serious, but over time this condition will impose limitations on movement, pain and various difficulties.

**I. Initiation:**



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The first contact with the two children was in the judo hall, where I was training with the coach. From the first interaction with the two children, I noticed the deficiencies that appeared in the column, following a dialogue with the two, I decided that I would not reveal anything from the data that they will reveal to me.

The therapist-client relationship was a very good relationship, understanding and mutual respect being at the forefront, all to their benefit.

## **II. Establishment of reference frameworks**

In physical therapy, this staffs opt for a systematic and practical approach, everything being focused on the subjects. A first framework I chose to use this systematization because after evaluating the two children I took into account the environmental factors that influence their lives. In addition to the children's physical environment, we also take into account the social environment, the people with whom they interact despite the fact that they like to spend some of their free time at the computer, the two children have a high sociability. A second framework is the practice centered on the two children, because the relationship between the physiotherapist and the patient must be a good collaboration in order to be able to realize the objectives and achieve them successfully.

The physiotherapist must ensure that he has a language well understood by the subjects through which to provide reliable information for setting and achieving the proposed objectives, if the language is not understood and the yield will be low.

## **III. Evaluation**

As a form of evaluation we used the method of observation and interview. During the evaluation, we identified how a day in the life of the two children goes about their daily routine.

As a description of the routine of the two we have: children wake up around 7 o'clock, carry out personal care activities, breakfast, at 8 o'clock they are at school until 12-13, after school they stay outside until 2 pm, they arrive at home they serve meals, go to bed or watch an animated film until 15.30, at 16.00 I am at the training room. After finishing the training at 6 pm, they go home, serve meals, personal hygiene, do their homework, and with the time left until 10 pm they play on the computer.

We can change the routine at least during training through active games but beneficial to the body. The two subjects were put to a series of exercises and play, and following their achievements they were evaluated

## **Analysis of research results**

The two athletes A.P. and M.M. before practicing this sport they had a slightly messy life, the computer being a priority for their free time, following this priority a slight kyphotic shape was installed at the level of the C7-T7 vertebrae. The children sometimes felt the need to lie down, with slight pain in the area. Sport in combination with physical prophylaxis and the development of a well-structured program of nutrition, rest and personal activities, helps to combat the recovery and prophylactic prevention of influencing factors that emphasize postural positions. Prophylaxis in judo prevents injuries to the joints and ligaments that may occur during training or competitions. The athletes were open, confident and willing to follow the program, having a very similar character to each other, both the training program and the one to improve the quality of life, was approached with amusement from the two, the feedback over day making his presence known at every workout. In terms of communication, the athletes approached a very good communication, the messages and requirements being understood from the beginning. As a first phase, the environmental influences were removed, which imposed a vicious position on the children without knowing it, so the excess hours on the computer were reduced, the wrong repetition of the procedures was perfected correctly, in collaboration with the school teacher a course was held for 1 the time when materials were presented to guide the correct position

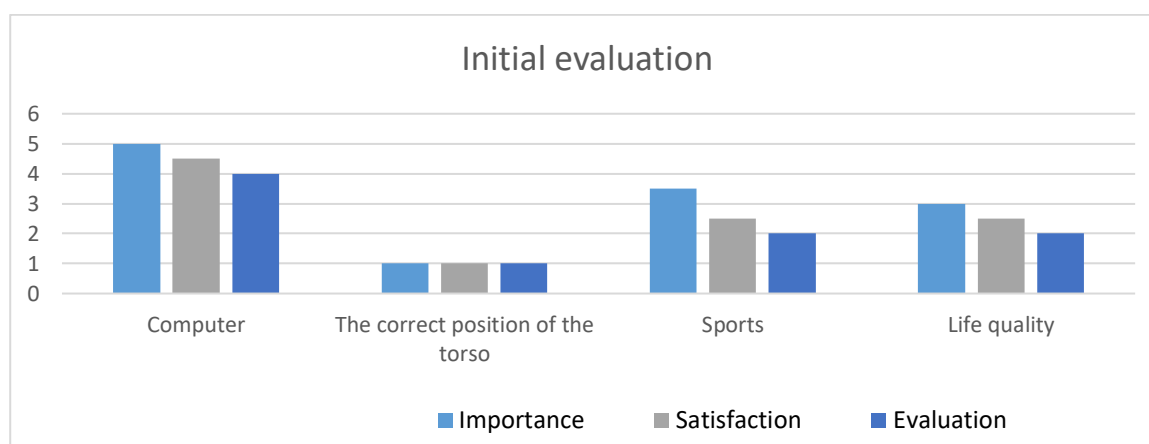


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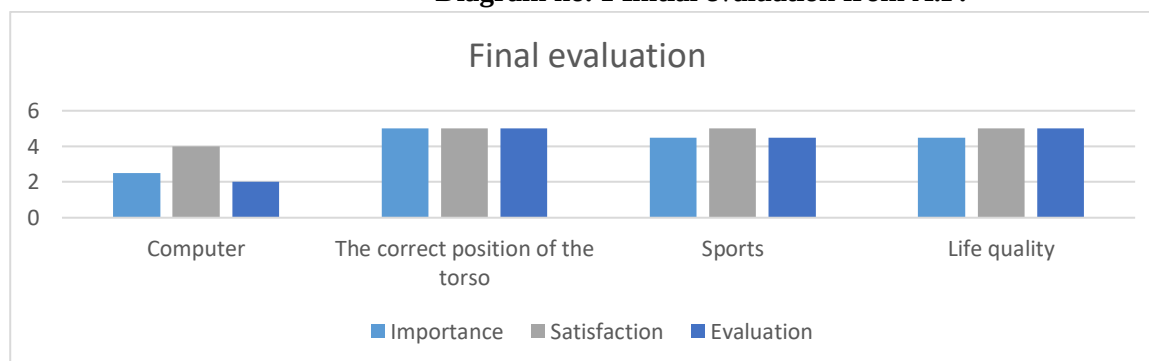
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of the body. Following all these activities and programs, A.P. and M.M. they are really satisfied, being much more able to appreciate the quality of life and the optimal health of the body.

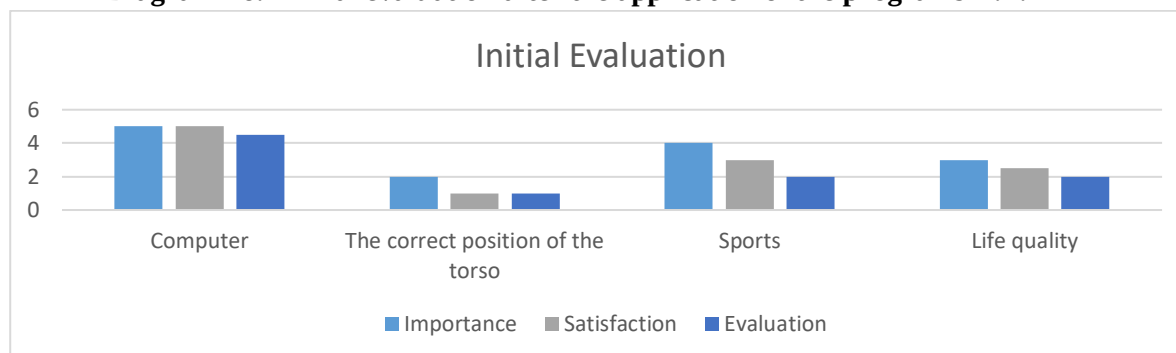
The diagrams below will show the evolution of the two athletes on a scale from 1 to 5 before and after the start of the programs made above. We adapted a series of habits that athletes used to use frequently. The three sub-points below the graph: the importance, satisfaction and performance / evolution will show the qualities of these activities that were to the liking of athletes, the aim being to reduce gestures that harm athletes and increase good facilities for prophylactic purposes.



**Diagram no. 1 Initial evaluation from A.P.**



**Diagram no. 2 Final evaluation after the application of the programs A.P.**

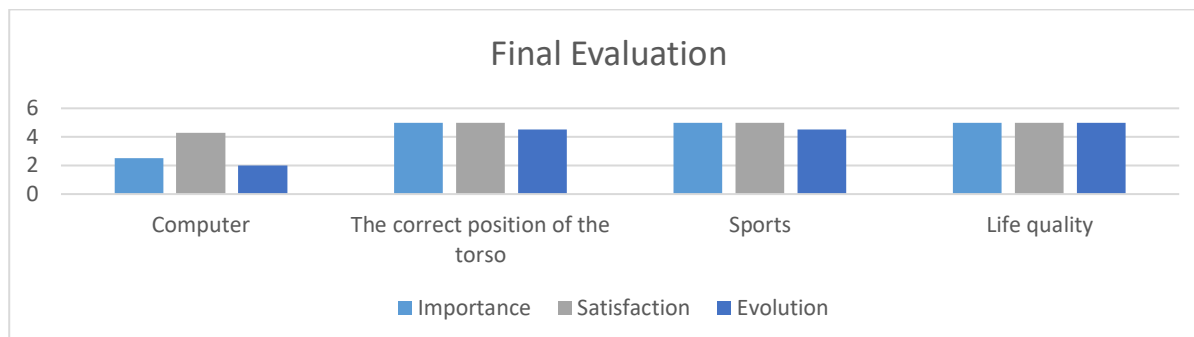


**Diagram no. 3 Initial evaluation from M.M**



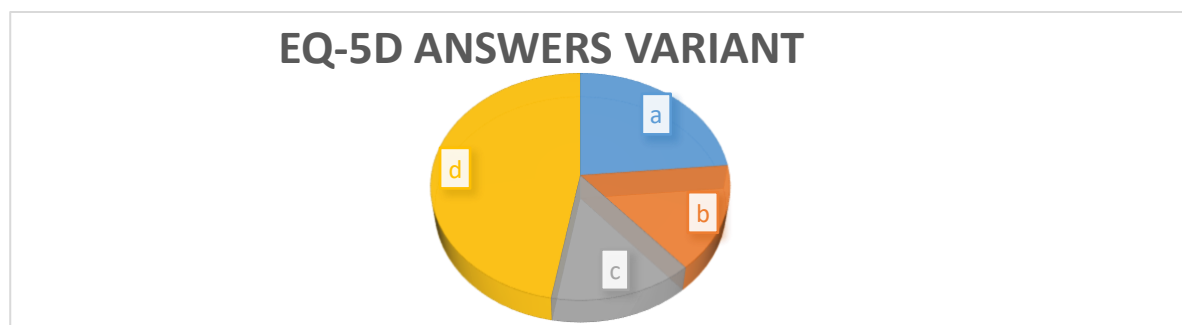
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**Diagram no. 4 Final evaluation after the application of the programs M.M.**

Like the programs, both athletes underwent a standardized test before starting work programs, EuroQol-5D, is a questionnaire that will assess the measurement of quality of life, the questionnaires contain 10 items, with 4 answer options, of which only one is considered. This questionnaire was designed to capture information directly from the individual. Its widespread use around the world, indications of a nation's health and clinical trials and others.



**Diagram no.5 the best answers**

The first diagrams represent the initial evaluation of the athletes, in which they had a careless program and lifestyle. They do not respect normal eating hours, home study hours or homework, because the computer takes up a lot of their time.

If we were to make a comparison of these values between the two athletes, they are visibly different. Despite the fact that A.P. has lower values in the first column as M.M., but in the second (vicious positions) the values change in favor of M.M., being more important than the first column. In both athletes the values are higher. As in the initial assessment, the values are visibly different from one athlete to another. Instead, the final evaluation favors the last three columns, as a result of which the goal has been achieved. EQ-5D questionnaires: this form of evaluation was applied at the beginning of the prophylaxis process, with the aim of evaluating athletes. Athletes received 10 questions with a multiple number of answer options over a period of time. Following the application of this questionnaire, it appears that the two children have in common the vicious jobs and computer games, the same type of condition.



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**Conclusions**

In conclusion, it does not take time and patience to perform tasks and achieve the desired results.

The child's body is very fragile at a young age and up to puberty, so all exercises and methods used in performance sports must have a pleasant impact on the child, over-training and over-stress must be avoided.

The effort is limited by the possibilities of the practices, the trainings being done for prophylactic purposes both at a young age and at a great age. All work with athletes will be active, in which the demands of the knees will be avoided (knee procedures are excluded), leg procedures from the Kata-waza group will be introduced. Therefore, the Kata-waza fighting technique is a demonstration technique, where the emphasis is on flexibility, accuracy and the correct execution of the procedures.

Prophylaxis is used in judo in order to prevent and eliminate post-traumatic diseases in the joints and ligaments. Warming also has a prophylactic role, as well as preparing the body for effort, stretching, performing procedures with a wide form of movement, fun games, all these aspects contribute to a workout beneficial to health and not necessarily performance.

The whole process of prophylaxis must be very well established, it requires a complex information, because each child is unique, and for each one a different work environment will be created.

Through the direct approach on the practices, we were able to obtain an increased performance in order to execute correctly the procedures, the vicious corrections of the different segments such as the limbs and the postural ones. The performance given by the two practitioners following a work schedule will help them in the future for quality of life maintenance.

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**IMPLEMENTATION OF SOME ELEMENTS OF OCCUPATIONAL THERAPY IN  
SCHOOL ACTIVITIES IN THE ATTENTION DEFICIT HYPERACTIVITY DISORDER  
CHILD**

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**Abstract**

Attention Deficit Hyperactivity Disorder is a neurodevelopmental disorder, complex and multifactorial, with extremely widespread childhood onset in society, which is characterized by inattention, hyperactivity and impulsivity, with difficulties that often continue into adulthood. Deficiencies caused by ADHD have been shown to exist in several areas, including educational and professional issues, patterns of family interaction, and social relationships. As an extremely heterogeneous disorder, ADHD manifests itself differently in individuals in terms of behaviors, etiology, developmental trajectories, the presence of comorbid diagnoses and response to interventions. Heterogeneity in ADHD produces different subtypes or presentations, namely, predominantly inattention, predominantly hyperactivity-impulsivity, and combined presentations. The terminology and diagnostic criteria for ADHD, similar to other neuropsychiatric disorders, have been improved and developed over the past 50 years in response to the evolving understanding and conceptualization of the underlying deficits of the disorder. Over the past decade, basic clinical research efforts to identify the causality of the syndrome have uncovered many behavioral and neurobiological changes associated with the condition, from genes to higher-order neural networks.

**Key words:** children, behavioral, conceptualization, hyperactivity, attention.

**Introduction**

Scientists have noticed with the help of neuroimaging studies, significant differences in brain development and activity in individuals with hyperactivity disorder and attention deficit. Barkley, Russel A., Ph. D., (1991), considers that in ADHD syndrome, the entire front striated system is affected, which proves the hypothesis that the pathophysiology of the deficiency is not limited to certain characteristic brain areas, being also involved multiple neural networks.

Numerous specialists in the field, through MRI studies, attest to the fact that in this category of children there is a decrease in cortical thickness in the brain areas involved in cognitive and attention processes (Hunt, R., 1998). Shaw, together with his collaborators, neuroimagingly investigated a group of children with disorders with hyperactivity and attention deficit, highlighting that the maturation of the pre-frontal lobe is low in them by up to 5 years compared to the control group. Current research reports that there are no differences in brain synthesis in the synthesis of dopamine and norepinephrine between neurotypical individuals and those with symptoms specific to the disorder (American Occupational Therapy Association, 2009). The effect of the neurotransmitters released by the presynaptic neuron at the synaptic cleft establishes a correlation between their concentration and their time interval. Ernst has shown in people with hyperactivity disorders and attention deficit disorders that dopamine processing abnormalities in the middle brain regions. The central problem seems to be that in children with ADHD, dopamine and norepinephrine are not released in areas of particular significance for cognitive function (Gilbert P., 2000).



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Another recent study by scientists showed that ADHD is genetically inherited, ie it is passed from one generation to another. It has been found that differences in certain brain structures predict the severity of ADHD symptoms and that one of these brain structures is the amygdala, which is associated with memory, emotion and aggression. The researchers also found weak neural connections between the amygdala and the pre-frontal cortex. The pre-frontal cortex influences planning, sequencing, and strategic behaviors (Green C., 2017). The authors speculate that this could account for problems with impulsivity, a primary symptom of ADHD. The two areas of the brain most affected by size reduction are the pre-frontal cortex and the anterior temporal areas. These smaller areas of the brain could represent more symptoms of ADHD. The pre-frontal cortex is associated with self-awareness and the ability to self-regulate emotion and behavior. These are challenging areas for many people with ADHD. Deterioration of the pre-frontal region can cause increased impulsivity, anger, and hyperactive behavior. The anterior temporal areas of the brain affect hearing and language skills. This includes the ability to interpret sounds in language and non-language and to understand verbal communication. Decreasing brain size in this region could also influence memory and learning (American Occupational Therapy Association (AOTA), 1986).

Taking into account the information presented above, the present research aims to analyze the impact that occupational therapy can have on children diagnosed with hyperactivity disorder and attention deficit in terms of reducing undesirable behaviors and increasing the degree of social interaction for the development of good school adaptability of individuals with ADHD.

The motivation is closely related to the fact that I want a more correct understanding of the concept of hyperactivity disorder and attention deficit and its manifestations in various contexts, to identify methods and strategies characteristic of the occupational therapy program in order to provide the necessary support. Of the child to enhance his participation and occupational performance in school activities and to eliminate any form of discrediting of this category (Helfrich C., Kielhofner G., Mattingly C., 1997).

The choice of research topic also resulted from the fact that I work in the field of recovery of children with special needs, including the attention deficit. We also found that there are few studies that certify the effectiveness of the rehabilitation program, specific to the branch of occupational therapy, in order to improve the capacity for functional independence of individuals with ADHD in the school context. Thus, another factor that influenced the choice of topic was the desire to design and implement a therapeutic intervention that demonstrates its effectiveness to be used as an informative model and to make a significant contribution in the chosen field of activity (Pașca D., 2016).

**Material and method**

Occupational therapy provides practical support by implementing individualized forms of prophylactic treatment, facilitating the recovery, restoration or development of skills needed to increase functional independence and individual satisfaction in all aspects of life.

The aim of current research is to deepen theoretical knowledge and identify ways in which occupational therapy can demonstrate its effectiveness through the school integration of the child diagnosed with hyperactivity and attention deficit.

The theoretical objective of the paper is to present a scientific framework on fundamental notions about the attention deficit and the basic concepts of the field of occupational therapy that lead to the development of appropriate plans to increase independence in the school context.

The application objective is based on the design and application of a personalized intervention program, designed to improve the school's capacity to adapt to the child with ADHD.

**General hypothesis**



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The application of a therapeutic treatment based on activities with a pronounced playful character, develops the capacity of the child with ADHD to successfully perform school tasks.

**Specific hypotheses**

**Hypothesis 1.** Occupational therapy intervention through play maximizes the ability to inhibit disruptive behaviors.

**Hypothesis 2.** Occupational therapy activities develop relationship skills with classmates.

**Hypothesis 3.** The implementation of a structured program specific to the branch of occupational therapy, improves the performance capacity in the school environment of the child with ADHD.

**Tasks**

In order to achieve the objectives and validate the hypotheses proposed in the approach of scientific research, we aimed to fulfill the following tasks:

- consulting the specialized literature in order to know the topicality of the topic;
- detailed information on the research carried out so far and the recently added discoveries with which the current work can make a significant contribution in the chosen field of interest;
- observation, identification and careful analysis of the child's performances and responses that prevent him from benefiting from the educational program, based on evaluations characteristic of occupational therapy;
- identification of skills training activities and use of environmental opportunities for the formation of functional and social independence;
- designing and implementing a particular program in accordance with the needs of the child, found after obtaining the results of the evaluation;
- establishing, planning and adapting the activity in order to achieve the proposed objectives and estimating the period of time necessary to achieve them in order to achieve an efficient and qualitative intervention;
- carrying out periodic reassessments and drawing up progress reports for recording the child's progress.

**Research design**

The scientific research was carried out in a period of 6 months. The current work was carried out in the office, where I work, as well as in the child's school environment with the consent of the institution's inspector education.

The Canadian Practice Process (CPPF) has been instrumental in this research for the client-centered provision of occupational therapy services (Law M., Baptiste S., McColl M., Opzoomer A., Polatajko H., Pollock N. 1995).

The reason for resorting to this model was due to the flexibility of the approach, promoting the continuous focus of attention on the individual and maintaining a dynamic relationship with the client, based throughout the therapeutic cycle.

**Analysis of research results**

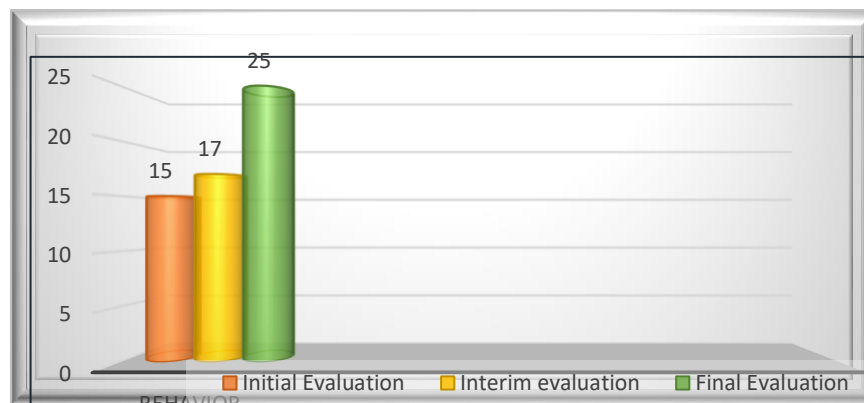
In the present research, the data analysis was performed by a diverse range of methods, in order to highlight the evolution of the subject, by comparing the results obtained at the initial evaluation, intermediate evaluation and final evaluation, the scores being recorded in tables and represented graphically, contributing thus to the global understanding of the information collected. Thus, regarding the quantification of the data collected at the behavioral grid, there are gradual changes in the subject's progress to a higher level, the child



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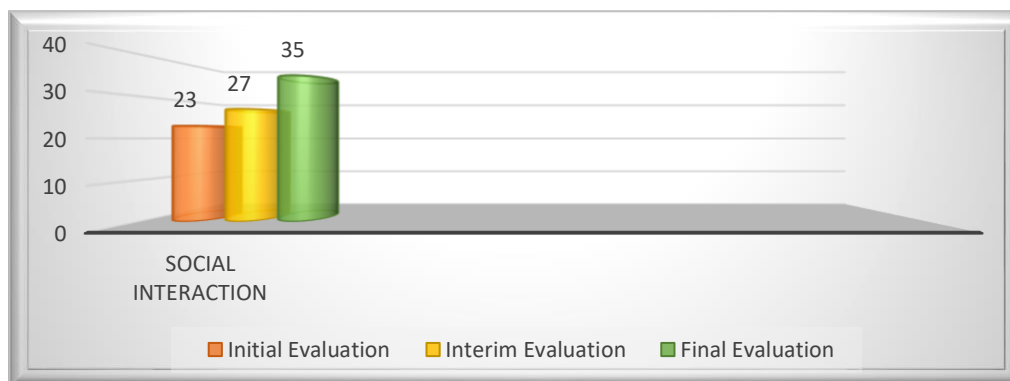
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obtaining a total score of 15 points at the initial assessment, 17 points at the intermediate assessment and 25 points at the final assessment. By carefully analyzing the results for documented conclusions, we can confirm the evolution of the subject from a medium level to a high level. The progress of the subject in relation to the degree of social interaction registers a significant increase in the development of the area of interest. Following the application of the initial evaluation, a score of 23 points was recorded, while at the intermediate evaluation a result of 27 points was obtained, and at the final evaluation the score was 35 points. This information certifies the fact that there has been a remarkable evolution in the development of the subject's relationship and communication area. Analyzing closely the results recorded in the behavioral evaluation grid, a gradual increase is found according to the graph no.1 following:



**Graph 1. Evolution of behavior**

The ADHD scale, used as a tool to identify the degree of social adaptation, indicates a constantly progressive evolution of the subject from an average index to a good index which is presented in graph no.2.

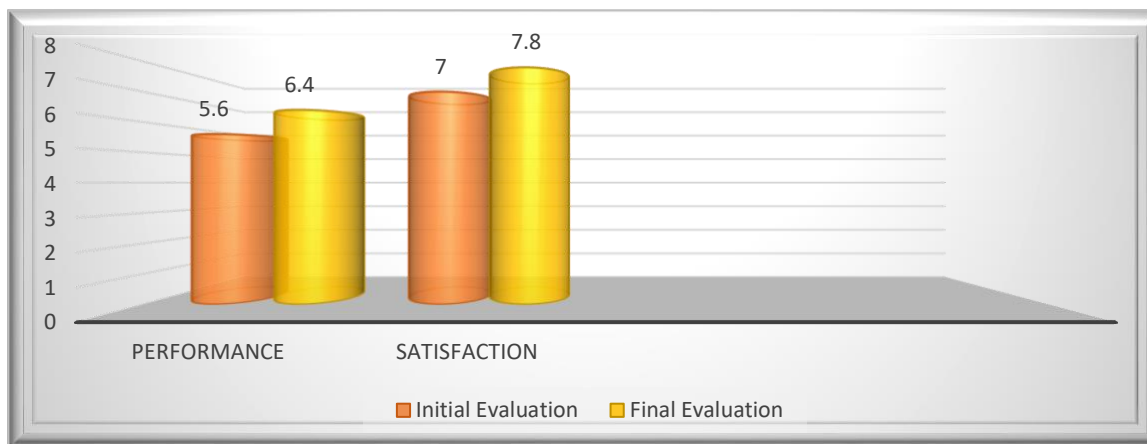


**Graph 2. Social Interaction evolution**

By comparing the results obtained after applying the COPM questionnaire, initial and final, there is an increase in the values of the index aimed at the occupational performance of the subject and the level of satisfaction of the mother, according graph no. 3, presented below:

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**Graph no.3. COMP Evaluation**

Next we will analyze in detail the research results, as well as finding the variation and evolution over time, by comparing the values of the quantities obtained according to the applied evaluations to identify the areas of the subject that need to be developed, in order to adapt it in various life contexts.

Following the application of the initial behavioral assessment, we noticed the existence of a limited capacity of the subject to persist in playful or academic activities, caused by the increased level of distractibility related to irrelevant disruptive factors.

After the implementation of the therapeutic intervention and the re-evaluation of the obtained results, the subject improved his abilities to remain in the structured tasks, without being interrupted due to the inability to focus long-term attention in the proposed activities. Therefore, the informational data prove the constant evolution of the research subject from a low level of acquisitions to a high level, which attests to the validation of hypothesis 1, according to which the occupational therapy intervention through play, maximizes the ability to inhibit disruptive behaviors.

At the initial evaluation, based on the "Barkley and DuPaul" social interaction scale, the results obtained by the subject indicated an extremely low sociometrist status, manifested by undesirable behaviors correlated with non-compliance with social norms.

The child's involvement in playful activities, specific to the field of occupational therapy, carried out in collaboration with classmates had as a direct effect the development of communication and relationship skills with peers and its integration into the school context. Thus, hypothesis 2 is validated, which states that play activities with a therapeutic role improve the subject's social interaction skills with classmates.

Through the initial application of the COPM questionnaire, used as a tool to measure the level of occupational performance of the child in the tasks they perform and to analyze the mother's satisfaction, a poor result was found for both components, the subject having a limited ability to participate, active in the tasks of daily life.

Analyzing the data obtained from the reapplication of the COPM questionnaire, a gradual increase of the child's occupational performance in the work activity and implicitly of the mother's satisfaction level was observed, which confirms hypothesis 3, which assumes that the application of a structured program specific to the occupational therapy, improves the ability to perform in school in children with ADHD.

In conclusion, this approach materialized through an analysis of global results, whose purpose was to highlight the evolution of the subject on behavioral manifestations and social participation, following the



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implementation of an intervention plan based on methods and techniques characteristic of occupational therapy, to lead to a good integration in the mass education of the child diagnosed with hyperactivity disorder and attention deficit.

**Conclusions**

The disorder with hyperactivity and attention deficit is a neuropsychiatric syndrome with a complex symptomatology, and the basic symptoms are hyperactivity, inattention and impulsivity, as well as functional deficiencies, persist frequently in adulthood.

The global prevalence of ADHD in children and adolescents is about 7%, which is a substantial increase from a decade ago.

Conventional treatment most often includes pharmacotherapy with central nerve stimuli, but the number of non-responders and side effects require treatment alternatives.

Comorbidities associated with the disorder with hyperactivity and attention deficit, lead to increased risk of emotional and behavioral problems. The most pronounced difficulties encountered by hyperactive individuals are highlighted in the process of integration in school work and in interpersonal relationships with others.

Attention deficit is an important mental health problem with heterogeneous symptoms, manifested by low tolerance for frustration, exacerbated emotional reactivity, poor sustained attention and a limited ability to inhibit the immediate response; these are one of the main factors that predispose the hyperactive child to various forms of labeling.

Although there are multiple therapeutic treatment options for children with ADHD, there is little research to certify the effectiveness of occupational therapy in developing poor skills in hyperactive individuals.

Hyperactivity disorder and attention deficit disorder are a disruptive disorder characterized by a set of chronic patterns of behavior.

Occupational therapy aims to reduce disruptive behaviors through its specific techniques and methods, using occupation as the main tool, in order to develop the ability of the hyperactive child to adapt to his living environment.

The interdisciplinary approach is fundamental for the child with ADHD in occupational therapy, due to the complexity of the needs of the individual, family and the resources needed to meet them.

The hyperactive child is always approached in a family context, and the therapeutic intervention is performed through the cooperation of all the specialists involved.

Knowledge of the characteristic occupational context and its impact on the fulfillment of the role and participation of the student with ADHD in curricular activities is a central point for the occupational therapist in the school environment.

Occupational therapy facilitates the integration of the hyperactive child in different life contexts, by building a customized intervention plan.

An important goal of therapeutic programs is to address ADHD-related deficiencies, which lead to a decrease in the quality of life of the individual with attention deficit.

Early inclusion of the child in a recovery program during preschool minimizes the negative effect of ADHD on the social, emotional, cognitive and academic development of the individual.



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## **STRENGTH AND CONDITIONING IN INJURIES PREVENTION AND REHABILITATION**

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### **Abstract**

Injuries occur as a consequence of fatigue, previous trauma, lack of physical preparation and occasionally, bad luck. The strength and conditioning coach not only has the knowledge and insight to physically prepare athletes for competition, but also has the unique position within an interdisciplinary team to characterize the stress of training and an athlete's response to it.

The strength coach is a vital member of the multidisciplinary team for both reducing risk of injury and rehabilitating an athlete to return to training and competition. Through the identification of an injury risk model, strength and conditioning coaches can apply the principles of training to target interventions which will both reduce the stress placed through the musculoskeletal system or increase its capacity to tolerate stress. Finally, rehabilitation provides the strength and conditioning coach with an exciting opportunity to help athletes make gains that are not possible throughout the rest of the competition calendar.

**Key words:** *Strength and conditioning, rehabilitation, injury, training, musculoskeletal system*

### **Introduction**

Injuries cannot be totally prevented, but the risk of injuries occurring can certainly be reduced. Musculoskeletal trauma occurs as a consequence of tissue being placed under greater stress than it can tolerate. Subsequently, the purpose of injury prevention is to:

1. Find methods of reducing the acute or chronic stress placed through a tissue;
2. Increase the stress a tissue can tolerate prior to failure.

It is clear that certain tissues are more plastic in nature than others and can adapt to stress placed through them. For example ligaments are far less plastic than muscle tissue. To reduce the risk of injury to a ligament, one must reduce the stress placed through it. Equally, to reduce the risk of injury to a muscle, we should seek to increase the stress it could tolerate by increasing its cross sectional area and force production/absorption qualities.

### **Reducing biomechanical stress on non-plastic structures**

There are two methods of reducing the stress placed through the musculoskeletal system. The first is to ensure that the movement patterns that the athlete is undertaking do not place excessive force through structures that cannot tolerate it or are not particularly plastic in nature. In order to achieve this, the strength and conditioning specialist must have a thorough understanding of both functional anatomy and clinical biomechanics. Whilst these two topics are not typical of the education of an coach, they can certainly seek this knowledge from the medical team supporting the athlete. For example, anterior cruciate ligament (ACL) injuries occur as a consequence of excessive or rapid knee valgus. In order to reduce the risk of ACL injuries, the S&C coach must prioritize exercises that reduce frontal or transverse plane forces through the knee joint. Examples include stiff-leg kettle bell swings and single-leg landing drills with no frontal or transverse plane motion of the pelvis, knee or foot.

### **Fatigue management**

The second method of reducing stress in the musculoskeletal system is to manage the fatigue an athlete is experiencing. Fatigue can reduce a muscle's capacity to generate large, rapid forces and reduce reaction times, concentration and joint proprioception. All of these factors can reduce an athlete's capacity to tolerate stress through specific structures in the musculoskeletal system. Subsequently, managing fatigue is a vital





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component of reducing injury risk. As the S&C coach has the knowledge, insight and position within an IDT to modulate and prescribe training volume and intensity, they are the best placed person to undertake this vital role.

Planned variation of training load on a daily, weekly and monthly basis reduces the monotony of training, which reduces the risk of injury and illness in athletes. Probably more important is to monitor each athlete's psychological and physical response to training in order to make sure that they are not competing in a fatigued state, and if they are training in a fatigued state, they have appropriate periods of recovery to adapt to the overall training stress.

Fatigue is an important part of the training process, but it also increases the risk of injury. The S&C coach must characterize the response to and load of training in order to determine how fatigued an athlete is, the importance of this to the training process and what training has taken place to achieve this state. Fatigue management will certainly reduce the stress placed through the body and reduce injury risk.

**Increasing tolerance**

Whilst reducing stress going through the MSK system is one approach to injury risk reduction, it is important to realize that too great a reduction will result in insufficient adaptive stress and decreased opportunity for technical improvement. As a consequence, we should look to couple this approach with strategies to increase tissue tolerance. Tissue failure occurs when the stress/strain placed through the structure exceeds its plastic region (exceeds its capacity to adapt).

It is possible to alter the amount of stress/strain a structure can tolerate by changing the length of the tissue or its capacity to generate force. The nature of the change required is determined by the most likely mechanism of injury. For example increasing stress tolerance by increasing hamstring length may reduce hamstring injury risk in gymnasts who are required to operate through large ranges of hip flexion with an extended knee. By the same token, increasing strain tolerance by increasing hamstring strength may reduce hamstring injury risk in sprinters who are not required to operate through extreme ranges of motion but do have to take high levels of force through their hamstrings. As such, the interventions required that reduce the risk of hamstring injury would differ between a sprinter and a gymnast, as they have different stress/strain requirements of the hamstring and the likely mechanisms of injury are unique.

There are several ways the S&C coach can reduce the risk of athletes getting injured. Through movement-based training, the biomechanical load going through structures which cannot tolerate them can be reduced. Fatigue can also be managed to reduce the biomechanical stress going through the MSK system. Finally, the amount of stress the MSK system can tolerate can be increased with appropriate training.

**Identifying risk factors**

In order to reduce the risk of injury to athletes, it is possible to establish injury risk models and identify the interventions the S&C coach can put in place as part of a regular training programmer. The process is one of establishing the most common and severe injuries in the athlete's sport, identify the risk factors, determine appropriate measurement tools to represent the risk, identify criteria for athletes to meet and put interventions in place which are representative of reducing the risk that each particular athlete faces.

In order to identify risk factors, the mechanisms of injury must be fully understood. ACL sprains occur as a consequence of the magnitude and rate of knee valgus whilst landing or turning. Posterior shoulder impingements occur as a consequence of a decreased capacity to decelerate the internal rotation of the humeral head whilst throwing or pushing. Lateral ankle sprains occur due to the magnitude and rate of inversion during landing and turning. To understand the risk of injury, the S&C coach must understand the mechanism. Once the mechanism is understood, the risk can be identified. To reduce knee valgus during landing or cutting activities, the medial hamstrings are required to rapidly and forcefully contract. To decelerate the internal rotation of the humeral head whilst throwing, the external rotators of the shoulder must rapidly and forcefully contract. To prevent the ankle inverting whilst landing or turning, the ankle eventers must rapidly and forcefully contract at the appropriate time

**Establishing assessments**



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Assessments should directly reflect the physical characteristics which underpin the risk of injury. Assessments must be used to determine which interventions each athlete requires. One injury may have several risk factors, of which only one may be relevant to an athlete. For example isokinetic assessment of eccentric external rotation could be used to determine whether an athlete has the strength to decelerate the internal rotation of the homers.

**Identify criteria**

Criteria should be developed based on either published data or sound reasoning. Foster 3 identified that >6,000 AU of training and a monotony of >2.0 increases risk of injury and illness. However, some athletes may regularly exceed the training volume. As such, in order to manage fatigue to reduce injury risk, S&C coaches could ensure that training monotony does not exceed 2.0 on a weekly basis. Equally, there is strong evidence to suggest that an eccentric hamstring to concentric quadriceps ratio (during isokinetic knee flexion and extension) of less than 0.9 places an athlete at a high risk of ACL injury. 1 As such, one may choose to use this criterion to determine whether an athlete requires greater eccentric hamstring strength. Ultimately, athlete-, sport- and injury-specific criteria must be identified in order to appropriately determine who needs what.

**Training interventions**

Once the needs of an athlete have been established, the role of the S&C coach is to use their knowledge of functional anatomy, the principles of training and their coaching skills to coach training programmers which reduce an athlete's risk of injury. As with any training programmer, after a sufficient period of time, the assessments should be re-taken to determine the success of the training interventions.

***Case study 1: Reducing risk of lower back pain in an elite female hockey team as part of a strength and conditioning performance program***

Due to prolonged periods in spinal flexion, large rotational forces through the spine, a high running demand and a dense competition schedule (7 international matches in 11 days), female hockey players are at risk of developing lower back pain. To improve physical performance in hockey, activities should focus on absorbing and generating power through the lower body, developing a large aerobic capacity and improving context-specific change of direction and sprint performance. The challenge is to include activities to reduce risk of lower back pain without reducing the volume of activities to improve hockey performance.

Lack of extension capacity, anti-lateral flexion capacity and rotation control were considered as risk factors, and assessments and criteria were established to measure these risk factors within the athlete group (Table 2).

For the capacity assessments, athletes were timed in the testing positions until technical failure. During the control assessment, a qualitative assessment was employed. The athlete was instructed to maintain a neutral posture and raise one arm above her head. If a technical error was observed (e.g. thoracic flexion or a weight shift), a score was given to the athlete. A score of zero represented no technical errors.

None of the squad reached the criteria, so a 10-station (circuit of trunk exercise) to reduce the risk factors were employed. The circuit was employed twice per week at the end of a gym session, and the numbers of sets and time per exercise were manipulated on a daily basis to increase the total work duration over a four-week period (Figure 1).

| <b>Risk Factor</b>             | <b>Assessment Criteria</b>  | <b>Criteria</b>                    |
|--------------------------------|-----------------------------|------------------------------------|
| <i>Anti-extension capacity</i> | <i>Flexion hold</i>         | <i>Greater than 2.5min</i>         |
| <i>Anti-lateral flexion</i>    | <i>Side hold</i>            | <i>Side hold Greater than 2min</i> |
| <i>Rotation control</i>        | <i>Plank with arm raise</i> | <i>Qualitative score of 0</i>      |

*Table 1. The risk factors, assessments and criteria utilized to determine whether an athlete was at risk of lower back pain*

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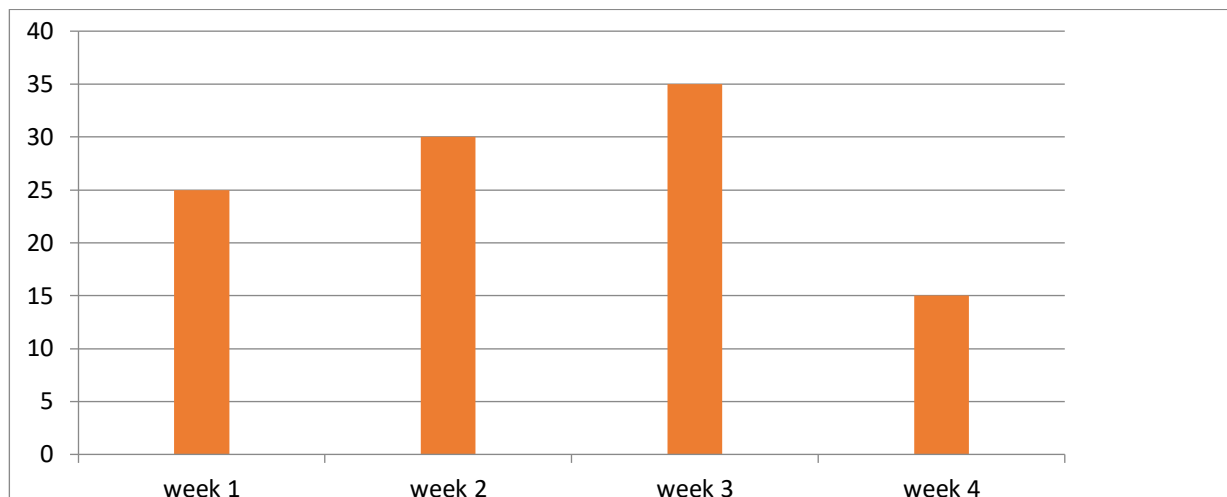


Figure 1. The weekly duration of trunk conditioning during the intervention period

| Assessment                               | Pre (n=20) | Post (n=20) | Effect size |
|------------------------------------------|------------|-------------|-------------|
| Flexion hold (s)                         | 130        | 140         | 0.22        |
| Side hold (average of left and right)(s) | 85         | 113         | 0.95        |
| Plank with arm raise (compensations)     | 1.4        | 0.4         | 1.2         |

Table 2. The results of the assessments pre- and post-training intervention. An effect size of greater than 1.2 represents a large change

This took no longer than 12 minutes to deliver. To improve motor control, exercises were utilized which required a knowledge of result with an external focus of attention 7 (e.g. in a forward crawling plank with a foam roller across the back, if the foam roller fell off, it indicated to the athlete that she had lost rotational control).

Table 2 clearly demonstrates that the short training intervention resulted in a large improvement in rotation control and moderate improvement in capacity to resist lateral flexion. The advantage of this training approach was that an intervention which reduced risk of lower back pain was able to be utilized without encroaching on any other time to be committed to improving physical performance.

### Rehabilitation

When an athlete gets injured, the S&C coach has an essential role to play. Not only does the S&C coach have the skill sets to change physical characteristics that reduce injury risk, but they can also prepare an athlete for the increasing task demands of subsequent phases of rehabilitation and use the time as an opportunity to make gains in physical performance in other areas.

As with any other period of training, rehabilitation should begin with the end in mind. What physical demands will be placed on the athlete when they return to training and competition and what physical qualities do they need to display in order to tolerate those demands? With these questions in mind, it is possible to put in place a bespoke rehabilitation strategy that is driven by increasing task demands. The progression of activities through rehabilitation should be determined by achievement of clear clinical or functional criteria. As discussed earlier, the criteria should be driven by the risk factors of the specific injury. A criteria-driven approach to rehabilitation has been shown to produce favorable outcomes and provide a framework for the S&C coach to operate within during rehabilitation.



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Having a clear understanding of both the biomechanical and physiological demands of the sport the athlete is returning to, and the mechanism of injury provides an end point for a rehabilitation programmer. In order for an athlete to return to competition or training they must be able to tolerate the biomechanical and physiological stress placed through the system. As detailed above, this can be achieved by both increasing the capacity of structures to tolerate stress or reducing the stress placed through a structure. Thus, the role of the S&C coach during rehabilitation is to train an athlete to improve their ability to tolerate the physical demands of training and competition.

As detailed in the section on reducing injury risk, a sport-specific activity which has previously caused trauma will have several different risks associated with it. In a rehabilitation paradigm, these risks can be described as fundamental competencies for an athlete to achieve. Each fundamental competency is determined by key physical characteristics. For example inability to decelerate the internal rotation of the humerus whilst throwing may be a risk factor for shoulder injuries. Subsequently, this is a fundamental competency for an athlete to achieve prior to returning to throwing. The physical characteristics that underpin this competence include eccentric strength of the external rotators, rate of force development of the external rotators, maintenance of scapula-thoracic position and timing of external rotation eccentric contraction. These characteristics can be independently assessed in order to determine which training interventions are required to rehabilitate an injured athlete's shoulder.

A hierarchy of needs exists based on the biomechanical stress of the training interventions on the injured structure. For example it would be inappropriate to start placing high forces through a shoulder joint in order to improve strength if the athlete had inappropriate control of their scapula. This would place greater stress through injured structures than it could tolerate and be detrimental to rehabilitation process. Thus, the stages of rehabilitation are determined by increasing biomechanical demand and specificity and the healing of the injured structure. It is important that assessments are put in place that represents the underpinning physical characteristics required to support a fundamental competence. Also, clear criteria should be established within the assessments to determine whether the athlete has achieved the competence to reduce that aspect of injury risk.

A hierarchical, criterion-driven approach to rehabilitation ensures that athletes can achieve fundamental competencies which allow them to undertake activities of increasing biomechanical demand and specificity. This approach is particularly appealing, as it provides goals for athletes to strive for and ensures that athletes are capable of tolerating the biomechanical demand placed through their injured structure prior to returning to training and competition. This also provides the S&C coach with a framework to apply their knowledge of functional anatomy and the principles of training to put in place bespoke training interventions, which will increase an athlete's ability to tolerate the increased biomechanical demand of returning to sport-specific activities and accelerate their rehabilitation.

***Case study 2: Increasing hamstring capacity, strength and rate of force development during the rehabilitation of an ACL injury***

A male handball player ruptured his hamstring 18 weeks prior to a major competition. To increase the chance of him competing, he decided to adopt a conservative strategy instead of reconstructive surgery. As co-activation of the medial hamstrings reduces the ACL stress by providing a posterior drawer on the tibia, it was decided that this muscle function would be one of the targets of his rehabilitation. In order to determine which exercises and loading regimes he required, a hierarchical assessment strategy was utilized (*Table 3*). To determine whether he had the capacity to tolerate high forces through this muscle group, a single leg hamstring bridge (knee flexed to 20°) was used. To determine whether he was capable of tolerating large eccentric forces through this muscle to protect the knee, an isokinetic assessment was undertaken. Finally, to determine whether he had the pre-activation strategy and rate of force development to protect his knee, the activation of his medial hamstring was recorded (using EMG) 20ms pre contact, on ground contact and at peak force during an unpredicted land and cut onto a force plate. The assessments were hierarchical and he was not allowed to undertake each assessment until he had passed the first one.



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He initially held the hamstring bridge for only 35s. A continuous muscle conditioning circuit (Table 4) was utilized for three weeks, and the volume of work was manipulated by changing the number of sets used per session (Figure 2). By week four he was capable of holding the bridge for over two minutes.

| Risk Factor               | Assessment                  | Criteria                                           |
|---------------------------|-----------------------------|----------------------------------------------------|
| Load tolerance            | Single-leg hamstring bridge | 2min                                               |
| Eccentric strength        | Isokinetic                  | Eccentric peak torque 30% > concentric peak torque |
| Rate of force development | EMG functional analysis     | Early activation of medial hamstrings              |

Table 3. The risk factors, assessments and criteria utilized to determine which type of activities the athlete should use to help him rehabilitate his ACL injury

| Exercise                                         | Time    |
|--------------------------------------------------|---------|
| 30s Single-leg bridge hold (long) (left) (right) | 30 Sec. |
| 30s Single-leg bridge hold (short) (right)       | 30 Sec. |
| Single-leg bridge hold (short) (left)            | 30 Sec. |
| Single-leg bridge hold (long)                    | 30 Sec. |
| Bridge walkouts                                  | 30 Sec. |
| Swiss ball hamstring curl (left)                 | 30 Sec. |
| Swiss ball hamstring curl (right)                | 30 Sec. |

Table 4. The hamstring conditioning circuit

The isokinetic assessment was then undertaken and revealed that he was not capable of producing enough torque eccentrically to protect his knee (Figure 3). Subsequently, heavy strength training was utilized to induce muscle hypertrophy and reduce the post-synaptic inhibition which had resulted in the eccentric strength deficit. Sumo stance deadlifts, stiff-leg kettlebell swings and single-leg prone hamstring curls were all utilized to target the deficit. In order to ensure full motor unit recruitment to stimulate the adaptive process, 6 heavy loads and lower reps were utilized with the deadlifts and moderate loads to failure were used for the swings and single-leg curls. The athlete utilized this strength regime three times per week for three weeks. The sets and reps were manipulated within the week to facilitate training variety and to allow the athlete to express maximal intent during each session. A week's training is detailed in Table 5.

After three weeks of training, the athlete had reduced their strength deficit and the functional assessment of rate of force development was undertaken. The graph in Figure 3 demonstrates that the athlete was not capable of recruiting his medial hamstring on his injured side early enough or to the same magnitude as the non-injured side. In order to reduce this deficiency, work had to be done to increase the medial hamstrings' rate force development and early activation. Small amplitude multidirectional hopping was utilized to develop pre-activity. A hamstring bridge with foot on a box (*knee flexed to 20°*) with rapid swinging of the opposite leg was utilized to develop the rate of force development of the medial hamstrings. Although the volume of work appeared greater, due to the speed of activity, the muscles were under tension for shorter periods of time but had to produce more force more rapidly (Table 6). Only two weeks of training was required to increase the magnitude of muscle activity 20ms pre-impact during an unanticipated cut see Figure 4.





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| Day | Exercise         | Notes      | Sets | Reps | Recovery |
|-----|------------------|------------|------|------|----------|
| 1   | Sumo Deadlift    | Maximal    | 4    | 5    | 30 sec   |
|     | Kettlebell Swing | Submaximal | 5    | 15   | 3 min    |
|     | Prone Hammy Curl | Submaximal | 4    | 10   | 30 sec   |
| 2   | Sumo Deadlift    | Maximal    | 3    | 5    | 30 sec   |
|     | Kettlebell Swing | Submaximal | 5    | 15   | 3 min    |
|     | Prone Hammy Curl | Submaximal | 4    | 10   | 30 sec   |
| 3   | Sumo Deadlift    | Maximal    | 3    | 5    | 30 sec   |
|     | Kettlebell Curl  | Submaximal | 3    | 10   | 3 min    |
|     | Prone Hammy Curl | Submaximal | 3    | 10   | 30 sec   |

**Conclusion**

When an athlete gets injured, the strength and conditioning coach must have performance in mind. It is imperative that athletes maintain whatever sport-specific training they can physically perform, and other training modalities can be used to maintain physical qualities. Tools such as session RPE to monitor training load can be utilized to ensure that athletes maintain total training load and there is a stepwise progression back to sport-specific training to ensure they are not over-reaching. Due to busy competition schedules and conflicting demands and pressures of training, sometimes athletes never have an opportunity to truly develop physical qualities that limit their performance.

The strength and conditioning coach can contribute to rehabilitation by working with the rest of the support team to establish clear criteria for progression based on the biomechanical demand of the activities the athlete needs to return to. They can then work with the team to put in appropriate training interventions to ensure that the athlete meets these criteria. Rehabilitation is also an excellent opportunity for the strength and conditioning coach to coach an athlete to improve their physical performance.

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## **THE EFFECTS OF KAYAKING ON STRENGTHENING MOTOR SKILLS IN SCHOOL- AGE CHILDREN**

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### **Abstract**

As children grow, motor performance develops. Motor performance skills allow children to process information in the effective management of specific tasks. Although children develop motor skills in a variety of physical activities, it may still be easy to achieve when engaging in voluntary activities according to their interests and pleasures. In this sense, the nautical activity, based on the navigation with the Kayaking on smooth waters, offers the possibility to the children to relax and to play in the same measure in safe conditions, without rules of constraint and limitation of the capacity of expression and initiative.

**Keywords:** kayak, water sports activities, fine and coarse motor skills.

### **Introduction. The beneficial effects of practicing kayaking - motor skills.**

#### **Motor skills:**

- the main motor skills such as coordination and control of the main muscle groups.
- the body's ability to coordinate to move and perform tasks.
- coarse motor skills involving large muscles - such as arms and legs in various types of movement (running, walking, balance, floating, rowing, etc.)
- fine skills related to the movements of small muscles, such as fingers for grasping, gripping, throwing, holding, etc.
- some landmarks for motor skills that also involve eye-hand coordination, such as throwing or catching a ball.

#### **Beneficial effects:**

- develops a strong bone and muscle structure
- ensures harmonious growth and development
- improves balance
- maintain and develop flexibility
- supports an adequate weight
- helps to relax
- improves self-esteem
- helps socialize

The physical development of the child implies the gradual increase of the motor capacities that he needs in the daily activity. If the parents notice that, at a certain age, the child does not yet have the specific skills for the age in question, acquired through the natural development of the body and social activity, it can impel and guide the child in a series of activities that develops these motor functions, activities based on the practice of physical and sports activities. The child should be encouraged and supported to do more and more physical exercise both in the school program and in extracurricular activities for the permanent improvement of the skills.



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**The idea** that we've started from refers to the fact that through the physical and specific nautical activity represented by the practice of kayaking by mastering the simple technical elements and the technical process of rowing on water and all the feelings represented by the nautical adventure, can stimulate the ability to develop motor skills essential for life represented by the ability to act with sharpness and dexterity. For school-age children who want to improve the development of motor skills, it is useful to do a form of sport to promote this type of development for psychomotor ability. This should be enough if you hope to learn and to enjoy challenging sports such as kayaking.

**The goal** is that over time I noticed in school-students that I knew most of them, there is an insufficient development of gross skills, attributed to insufficient psycho-motor training well below the level considered optimal for the target-age group and which may be a consequence of physical inactivity.

**Hypotheses**

**1st Hypothesis** . There is an association between the frequency of practicing nautical sports-paddle-kayaking and strengthening the gross motor skills and psycho-motor capacity for school-age children (8-12 years).

**2nd Hypothesis**. Practice of nautical-paddle-kayaking physical sports activities has as a consequence the improvement of the state of gross motor skills and of the psycho-motor capacity for school-age children (8-12 years old).

**The experiment studied - Method and material**

**First stage - recommendations:**

At school age, is indicated to development at least 60 minutes of nautical-paddle-kayaking physical activity, of moderate intensity ( $Fc = 125-130b / min$ ), per week. For a higher intensity, it is proposed to perform 45 minutes ( $Fc = 130-140b / min$ ), if the activity is performed at a higher intensity, it is vigorous-beneficial-efficient, during a week, in stages of at least 15 minutes for each paddling activity.

**Step 1 R5. RESISTANCE aerobes**

- 25-30% of maximum value of the athlete who is determined- paddle
- pulse 125-13 b / min, 25-30 stroc lov / min
- blood lactate 2 mM/L milk - 20min - water 2-3km - running, water, skiing
- parameters constant turnover, long endurance

**Second stage - recommendations:**

In order to increase the benefits that an active lifestyle has on the health of school-age children, it is recommended to increase the physical activity of water paddling, at a duration of about 90 minutes if the intensity is moderate ( $Fc = 130-140b / min$ ), respectively 75 minutes of vigorous-beneficial-efficient physical activity ( $Fc = 145-150b / min$ ).

**Step 2 R5 Aerobes RESISTANCE - O2 stable**

- 35-40% of maximum value of the athlete who is determined- paddle
- pulse 130-140 b / min, 30-40 stroc lov / min
- blood lactate 4-6 mM/L milk - 30min - water 4-6km - running, water, skiing
- parameters constant turnover, long endurance
- **initiation program** in water sports-kayaking, standardized, oriented on the way of spending free time of school-age children (8-12 years).
- **the general structure** of the sample included in the nautical-paddle-kayaking activity refers to all school-age children (8-12 years old) and does not take into account any selection criteria (S.T.Sport for All), the condition



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set, the medical opinion taken into consideration: CLINICALLY HEALTHY- SUITABLE FOR PHYSICAL EFFORT.

The incorporation of physical-sports activity for toning the general muscles, through paddle-nautical-kayaking, is scheduled in 3 days / week (Monday-Wednesday-Friday) and is ideal to strengthen gross motor skills and increase psycho-motor capacity with maximum efficiency for school-age children (8-12 years). The proposed program of initiation in physical-sports-nautical-paddle-kayaking activities(mesocycle, stage = 6 microcycles X 2).

*Description of the resources and model of training  
(are special boats for initiation)*

|      | Monday | Tuesday | Wednesday | Thursady | Friday | Saturday  | Sunday    |
|------|--------|---------|-----------|----------|--------|-----------|-----------|
| A.M. |        |         |           |          |        | Free time | Free time |
| P.M. | A      | L       | A         | L        | A      | Free time |           |

**Tb.1** – Microcycles with three trainings/week.

Specific paddling activities will lasts 20 minutes.

There will be three activities/week.

The paddling sport activity will have the following structure:

**Grouped exercises:**

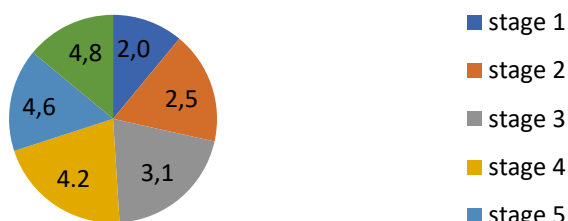
- A. A.Adjustment exercises withc specific materials for kayaking training;
- B. A. Learning and establishing prizes on the paddle;
- C. B. Set the fixed position on the paddle handle;
- D. B. Kayaking boat entry and exit exercises;
- E. C. Boat adjustment exercises-establishing the center of gravity kayaking;
- F. C. Exercises for learning the correct position in kayaking boat;
- G. D. Blade immersion exercises in water;
- H. D. Exercises for learning to attack;
- I. Balance exercises;
- J. E. Hit water on attack;
- K. F. Paddling exercises;
- L. G. Disabled rowing exercises (the boat is standing still; the boat it's moving backwards; the boat is shaken, moved, balanced etc.)



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Description of the means specific to the training model



**Kayak** = a sports boat with one or more paddling stations, sharpened at both ends, with a smooth sliding surface and which is driven by a type of non-fixed paddle, from a sitting position.

**Objectives :**

- Strengthening motor skills for school-age children (8-12 years).

**A1. Main motor skills**

- coordination and control of the main muscle groups
- the body's ability to coordinate to move and perform tasks.

**A2. Gross motor skills**

- which involves the use of large muscle groups - such as arms and legs in various types of movement (running, walking, balance, floating, rowing, etc.)

**A3. Fine motor skills**

- which involves the use of small muscles, such as the fingers for grasping, gripping, throwing, holding, etc.
- some cues for motor skills that also involve eye-hand coordination, such as throwing or catching a ball.

**B. Increasing psycho-motor capacity:**

B1. Improving muscle toning - toning is the result of developing muscle mass and decreasing the percentage of fat mass.

B1a.-toning the upper train (muscles of the upper limbs; chest, pelvis and back)

B1b.-toning the lower train (thigh muscles, lower limbs)

**• Evaluation methods**

**C.1. Specific**

- paddling-rowing moderate moderate cadence 15min  $F_c = 130b / \text{min} = \text{km} ???$
- paddling - rowing cadence increased 10min  $F_c = 140b / \text{min} = \text{km} ???$
- pulmonary capacity  $VO_2$
- cardiovascular capacity  $F_c - T_a$
- effort capacity - Ruffier test uses the formula:  $P_1 + P_2 + P_3 - 200$

**C2. Nonspecific**

**C2.a. Anthropometric measurements**

- height
- weight
- sole length
- bust height
- waist circumference
- arm span

**C2.b. Biomotor measurements**

- mobility



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- Long jump
- lift trunks
- speed running
- endurance running

**C3.The coefficient of physical-sports activity**

The coefficient of physical activity can take different values - moderate-intense physical activities, kayaking paddling, which are done with a caloric intake of 3.5-7 calories / minute.

**Conclusions**

It is good to consider participating in this type of activity, in order to fully enjoy the effects of practicing Kayaking on strengthening the motor skills of school-age children.

But the reality shows that the interest in physical activities is very low, there are few who practice physical activities on a regular basis. The other school-age children have sporadic participation or not at all, many of them being engaged in static activities such as the game on devices (mobile internet device).

The discussions revealed that they don't have time to be physically active, captured by technology, by the lack of information and by the involvement of their parents in achieving this type of physical activity for their children.

Regarding the work of awareness of the influence that physical-sports activities have on health, this must be done through well-structured programs both at the level of educational institutions and at the level of local authorities through the Sport for All program.

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## **COMPUTER-ASSISTED TRAINING IN PERFORMANCE SPORTS**

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### **Abstract**

Informatics allows sports activity to be approached from a new perspective by providing new tools for performance analysis in sports, allowing the imposition of new methods and creating conditions for technological and methodological advances in the area of motor activities.

The coach must have a minimum knowledge of using the computer that helps him and that will provide him with useful information in the instructive-educational process that he / she carries out / will carry out.

The means of information and communication technology represent indisputable resources for the sports field, to which the specialists must identify the correct, useful, efficient place in the training process. Considered to be the most important technological innovation, computer-assisted training (IAC) contributes to the efficiency of training, being a result of the gradual introduction of computerization in training.

**Key words:** technology, computer, training, coach

### **Introduction**

Through the evolution of information and communication technology (ICT), the last decades have led to the widespread promotion of the educational process at different levels. The field of informatics has created new possibilities for performing complex calculations and processing large amounts of stored information that can be used later. Most of the information is transmitted by automatic electronic means and by using special applications.

Pedagogical modernization through the means of technology and communication involves: the existence of hardware equipment (computer), programs (software) and the ability of teachers to capitalize on them in the instructional environment.

The computer assists the coach in the work of storage, sorting, processing (training design - annual, semester planning, lesson plans, etc.), teaching knowledge, analysis, preparation of teaching materials - drawings, cinematographs, sketches, drawings, diagrams, evaluation of athletes ( tests and control tests) and, especially, in the integration of multidisciplinary information, in order to make an optimal decision in directing the training and preparation of the sports competition.

It also allows him (the coach) to improve himself by preparing written materials for inspections, methodological commissions, conferences, sessions.

But computer science in sports is not limited to this aspect. It helps the coach to record the obtained performances and the statistical data processing, to the biomechanical analysis of the motor executions; to schedule and plan the training process, to compile databases and their classification, to perform evaluation, control tests, to access sites for obtaining specialized information and especially to the use of complex and complete measuring equipment.



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Regarding the programming of sports training, this represents the activity of elaborating the objectives of the training process, of the training tasks and of the forms of organization, taking into account the concrete conditions in which the activity is to take place.<sup>1</sup>

In the training scheduling process, the competitive calendar plays a very important role and therefore the most important competitions will be taken into account.

Regarding the evaluation, by using information and communication technology (ICT) the following can be evaluated in the process specific to performance sports:

- balance - with the help of static and dynamic posturography;
- posturography - through the SYNAPSYS posturographic system (Alexe D.I., 2009);
- evaluation of sensory organization (Sensory organization test) - through Bessou mobile platform;
- dexterimetry and visual motor coordination - through the visual motor coordination test indicator of the functional organization,  $\rightarrow$  neurofunctional, in terms of the dynamic coordination function;
- motor reaction evaluation - through the modern form of testing and evaluation of motor reaction (RM), is the  $\rightarrow$  computerized;
- simulators - are practical models that allow directed experimentation and at the same time repeated performance of specific actions that they copy analogically;
- biomechanical analysis - way to evaluate the technical sports potential.

In the field of sports education we face the measurement of numerous physical and motor parameters, necessary for the design of training / intervention, and for this we can use the means listed above. The use of the computer in this context increases the objectivity of the measurements and increases the confidence in the respective investigations. (Stanescu M. Stoicescu S., 2014)



Fig. 1<sup>2</sup>

<sup>1</sup> Dragnea, A., (coordonator), Educație fizică și sport – teorie și didactică, Editura Fest, București, 2006

<sup>2</sup><https://www.fysiomed.cz/zdravotnicka-technika/diagnostika/stabilometrie/stabilometricka-plosina-alfa/>

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Fig. 2<sup>3</sup>

Other directions for using the computer in sports:

- computerized recording of results either when a plate is pressed or when an infrared plane is opened;
- the possibility to access and complete the registration forms directly on the website of the federation / organization that organizes the respective competition.

M. Epuran (2005) presents the following directions of computer use in the field of physical education and sports:

- scientific research in the field with numerous aspects that can be investigated: statistical processing of collected data, determinations of motor, physiological, biomechanical, electrophysiological capacity and their transformation into digital data;
- psycho-pedagogical activity of the teacher and coach: information processing and their interpretation, technical-tactical analysis, training assistance.

In these directions, P.C. Szabo-Alexi (2010) completes with the point of view of D. Mârza (2006) who is of the opinion that "information is the third and most important direction of application in performance sports games, through the possibility of acquisition and access with the help of specific observation systems, databases containing information of interest in the field".

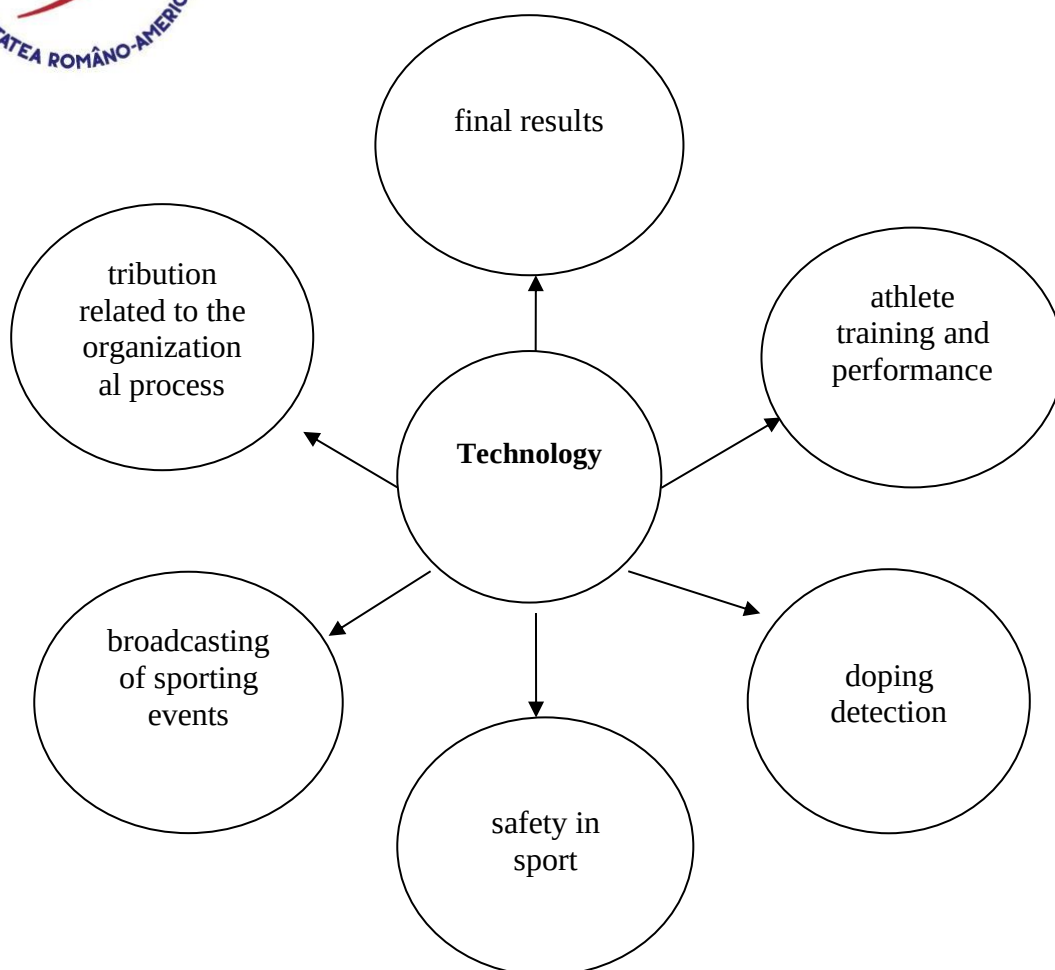
Lately, in the context of the pandemic, technology has become more than a necessity. The coaches used the computer not only for data collection, and biomechanical analysis but also for the training of the athletes that took place online. Even though it was a difficult period and they could not train for the sport they practice, they were able to carry out their physical training in conditions that were somewhat effective. So, we can say that: the permanent use of virtual training is as a complement to the traditional activity.

We present the scheme of C. Ringuet-Riot and D. James (2013) who summarized the directions of use of new technologies in sports.

<sup>3</sup><https://soulpageit.com/when-data-and-analytics-meet-sports/?fbclid=IwAR3v6XYPOVEpOXMbOIwIFnlhttp4HlujRET-VyPPGzIFfq43R1urdkH6RI4>

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### Conclusions

In conclusion, knowledge of how to use an IT tool leads to superior training both qualitatively and quantitatively, representing a professional asset that makes it possible to anticipate the evolution of subjects. Computer-assisted training facilitates and improves the learning-consolidation-improvement process of athletes.

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## **THE COACH-SWIMMER RELATIONSHIP IN PERFORMANCE SPORT**

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### **Abstract**

Improving the swimmer's style is conditioned by the coach's ability to discover the characteristics of each athlete and to use them correctly in order to obtain high results. In terms of tactical training, in the fight of equal opponents in strength, wins the one who has mastered the subtleties of tactical mastery, who has learned to quickly navigate complex situations of competitions, the one who knows how to capitalize on his training, physical and technical compared to that of the opponent. During the lessons dedicated to the tactical training of the swimmer, first of all, the athlete's ability to advantageously dose his forces is formed, ie to cover the distance uniformly, accelerated or in an alternating tempo. Secondly, his skill is formed to use and adopt his technical knowledge to solve concrete tasks during competitions using sprints along the distance, after start or return, bilateral breathing in the swimming pool to observe the actions of the opponent and others. . Thirdly, the team spirit is developed through joint actions with the teammate, especially in the relay tests. Fourthly, the skill of moving quickly during competitions is formed, from one tactical variant to another. In the theoretical training, the active character of the athlete is formed. He is determined by his degree of knowledge, by the ability to understand correctly and to appreciate correctly his own actions, each task given by the coach. The training of educating the swimmer's will is an essential educational process, without which it is inconceivable to solve the correct task of any sport training.

**Key words:** training, improving, coach.

### **Introduction**

In the process of training swimmers, the tasks of multilateral physical development of strengthening the athlete's health, harmonious improvement of all motor skills, learning the rational technique of swimming and improving style, education of moral and willful qualities, mastering the tactical mastery of a skill are solved. and practical skills. That is why in sports training it is customary to distinguish the following forms of training in a conventional way: physical, technical, tactical, theoretical training. The physical training of the athlete consists of two parts, namely - general physical training and specific physical training. The general physical training aims at the harmonious development of the swimmer, the strengthening of his health condition. These tasks can be successfully accomplished only by the widespread use of auxiliary exercises on land and the use of various means of general swimming training, water movement games, etc.

Achieving superior sports results is determined by the multilateral development of his motor skills, as well as the systematic expansion of the swimmer's skills and abilities.

The technical training of the swimmer must solve the problem of mastering the most effective swimming technique. Reaching the heights of the sports master in swimming depends to a large extent on the correct training and uninterrupted improvement of the technique of the basic procedure. The swimming technique is characterized by a series of rules that had the same meaning for the training of any athlete. Objective study and their application in practice must be the basis of the process of improving the technique



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of movements. We must not forget the importance of the style of every athlete who learns a certain swimming procedure as we can not forget his way of swimming swim, arm, butterfly or back.

In the process of sports practice, every coach with the help of the team and through the team must educate his athlete, to stimulate him in his preparation for work, to improve physical hardening, to determine him to train perseveringly to reach the heights of modern sportsmanship.

**Material**

Achieving high results in swimming cannot be conceived without overcoming a whole series of difficulties that mobilizing the athlete contribute to the development of perseverance, determination, courage and other qualities of will. The need for physical development in the process of sports improvement of the swimmer stems from the teaching about the unity and integrity of the body. The development of a physical quality of the athlete does not take place in isolation, because it leads to the improvement of all other qualities even if it is done to a lesser extent. The interaction between the different physical qualities of man in the process of development can be characterized as follows - the largest increase in the level of development of a certain physical quality involves an increase in the level of development of all others. This has been confirmed in modern practice. For example, achieving the highest level of endurance in speed regime, if the other conditions are identical, is always more successful after the general physical training lessons, which contribute to the development of all the other qualities of the swimmer. In the process of training the athlete, there are cases when the improvement of one quality begins to reflect negatively on the development of another. This is related to non-compliance with a certain proportion in the relationship between the means used to develop each quality. For example, excessive and long-term long-distance swimming increases the endurance of the athlete, but has a negative effect on the development of speed and strength. A positive interaction of qualities is possible only when the proportion of relationships between them is not violated in the development process. The physical development of the swimmer must be directed towards the acquisition of various motor skills. Using the wide range of physical exercises in training the athlete, each coach aims to train and perfect the many skills needed by the athlete both during lessons on land and in the water. Practice shows that the higher the level of motor skills of the athlete, the higher the level of coordination development, the better the improvement of the basic procedure technique. But at the same time there are certain difficulties. On the one hand, the athlete must fight for the greatest possible stability in the movement technique, on the other hand, he is obliged to improve it. In the training process, the development of the athlete's physical qualities invariably creates new and new conditions for improving the technique. Therefore, in parallel with the principle of stability of the sports technique, the training raises the requirement of its mobility. The basis for resolving this contradiction is to broaden the scope of motor skills. That is why in the process of improving the swimmer's style, in parallel with finding and consolidating the optimal technique, experienced coaches use exercises, which differ in terms of shape, character and coordination of movements. The simultaneous formation and improvement of different skills is not always characterized by a positive interaction. For example, learning the foot movements in the freestyle is an excellent preparatory exercise for the athlete to learn the movement of the feet in back swimming. In this case, a positive transfer of skills is observed. But there are also contradictory examples, in the case of concomitant learning of leg movements in arm and butterfly procedures, the athlete encounters difficulties where the negative transfer of skills speaks for itself. But the negative interaction at the beginning of learning skills in the future can become positive. The same swimmer in the arm procedure is very useful to practice butterfly swimming with his feet. As a result of these exercises the athlete will swim much better in the bras procedure.





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The development of the athlete's motor skills with the help of acquiring a surplus of skills is the basis of a correct technical training. The more and more varied the exercises learned on land and on water, the more thorough the basic training of the athlete is, which contributes to the development of specific motor activity. At the same time, the possibilities to notice the athlete's skills in a certain swimming procedure, to ensure the correct formation of his style are favored. In children, the inclinations towards a certain technical swimming procedure are manifested from an early age. It must therefore be borne in mind that seeking to obtain from the athlete the equally correct execution of all exercises in the water means to transpose these inclinations to some extent. For a "born" arm swimmer, for example, it will be just as difficult to learn to swim properly with the legs as a "born" arm swimmer. In the first years of training and improvement, the coach must know how to reduce the action of negative transfers of skills by establishing the optimal proportion between the various exercises through their structure, in the general system of applied means.

The young swimmer expands over time the scope of specific motor activity: swimming, back, butterfly, diving, etc. But all this must be subordinated to the improvement of that procedure which will later become for the young athlete the basic procedure.

The higher the level of swimming performance, the deeper and longer the specialization process, the process of mobilizing all the mental and physical resources of the athlete to obtain the best possible result in the test in which he specializes.

The main means of training the swimmer is exercise. They are conventionally divided into three groups: general development exercises; special exercises on land for the development of the physical and willpower qualities necessary for the swimmer; special exercises in water. The main method of training the swimmer is that of exercise, in other words, the method of repeated execution of various movements or actions. It is widely used to learn and improve the technique of swimming in the process of developing physical qualities, to educate the will and to acquire tactical mastery.

Learning and perfecting the technique involves the use of demonstration and explanation, execution tests, learning by elements and integral, repetition of exercises, analysis of movements and actions performed.

For the development of physical qualities are used the methods of alternative repetition with intervals, uniform, competition and others.

The methods of perfecting the swimmer's tactics of his moral education, as well as of his psychological training are characteristic.

The success of the entire training system of the next is determined not only by the application of the methods and means listed. It depends on the correct planning and organization of the entire training, on the attention that must be paid to the medical control in which the leading role is played by the pedagogical coach.

The athlete's training consists of two closely intertwined sides. It is primarily a pedagogical process with its special procedures, methods, exercises, aimed at increasing sports results. Secondly, training must be seen as a process that causes a whole series of changes in the athlete's body. Increasing the working capacity of certain organs and systems, as well as the body as a whole, promotes performance.

In this way, the coach distributing in a certain sequence different exercises, aims to increase the working sports capacity of the athletes' body, the physiologist will determine what changes occur in body functions and how they are related to the requirements of increasing effort, its total volume, of intensity, of alternating work with rest.

For competitions of great importance the swimmer must be in sports form. This state of the athlete's body, which requires a high work capacity, is characterized by the following features: the technique of performing movements must reach automation, the development of physical qualities must be at a level that





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allows him to manifest his maximum possibilities in the activity that is characteristic; a high functional state of the central nervous system and internal organs and apparatus, cardiovascular, respiratory, excretory, which ensures the capacity for maximum neuromuscular tension. This superior functional state of the body is not obtained at once, but through the long and gradual change of its functions in the process of systematic training carried out over a period of several years. The vegetative functions of the body become more economical as the training process, which is reflected by their changes at rest. For example, it is known that heart and respiratory rate decrease, blood pressure decreases, relative basal metabolism decreases.

Somatic functions are characterized by high functional mobility. It is also noticeable the increase of the capacity of economical execution of the muscular work in a standard effort, ie both the reactions to dosed effort of the vegetative system and of the somatic system are reduced more and more. The concordance of the general volume and of the intensity of the effort with the physiological state of the organism, specific to a certain stage of training, is realized.

Failure to achieve this concordance can lead to the wrong application of too much training effort, which in the future will harm the body or on the contrary too small for the already increased functional state and which will not cause the training to rise.

The work of the coach, doctor and physiologist must be carried out in close and permanent contact. In order to appreciate the increase of the training degree, the physiological and medical observations must be performed as follows: at rest; during or immediately after the execution of a standard effort appropriate to the respective sport, on the occasion of the execution of the maximum efforts in competitions. These three situations will be used during all periods of the annual training cycle.

If at the end of the paddling the muscles relax quickly and as fully as possible, a good rest is ensured in the interval between the paddling movements, which contributes to maintaining the correct technique during the medium and long distances tests. The ability to relax is more pronounced in trained athletes. In the process of sports training as the degree of training increases, the size of the maximum tension increases between one measure or another, the level of muscle tone in a state of relaxation decreases, the amplitude between tension and relaxation increases. Resting muscle tone indices usually decrease.

After training lessons that cause considerable fatigue, the strength of the muscles during voluntary tension decreases and their ability to relax decreases.

Due to the increase in the degree of training, there are considerable changes in the function of the central nervous system and in the analyzers related to it.

Pre-start heating is divided into two forms: general and specific. The general warm-up aims to increase the excitability of the central and muscular nervous system, the intensification of blood circulation and respiration. The means of general warm-up are usually gymnastics, running, jumping.

The special heating aims to increase the excitability and functional mobility of the nerve centers and muscles that are required during swimming. temporary in the training process. It follows that for the swimmer the means of this warm-up consists of various exercises in the water.

The nature of the heating differs depending on the specifics of the sample: resistance or speed. The increase in heating intensity must be proportionate in the competitive period to that of the efforts. The correct structuring of the heating can be assessed on the basis of heart rate. After warm-up at the beginning of the competition period, the heart rate must be lower than after the warm-up at the end of the competition period. The state before the start is a conditioned reflex to the effort that follows. A lively state is a necessary and natural companion of the athlete's training degree. Raising the functional capacity of the body before the start creates conditions for a rapid engagement in work, ie for the rapid increase of functions up to the physiological



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limit of the respective training degree. In case of exaggerated increase of the body's functions in the state before the start and at the start it is necessary to reduce the degree of excitability by means of a heating with an appropriate content.

The sports form means a state characterized by high sports results and their stability over a long period of time with frequent participation in competitions.

In order to determine this condition in athletes, it must be taken into account that there is a qualitative difference between the high degree of training and the sports form.

From the very beginning of the sports training, quantitative changes take place both in terms of morphology and function. At some point these quantitative changes reach a level where a new special qualitative state is manifested. The coach must know that depending on the level of physical and functional training of the body is characterized by a certain state of sportsmanship. Continuing the training process, physical and functional training increases again and at this new level, sportsmanship is characterized through many sports and higher results.

Achieving a high level of development of the body's functional capabilities, mastering a superior technique and tactics, educating the will and other qualities that characterize high sportsmanship requires a well-organized training process, carried out over many years. The level of functional capacity development achieved in one sports season needs to be consolidated and developed in the next season. Attempts to replace the training for several years with a short-term forced training have never yielded good results, harming the athlete's health. One of the most important conditions for improving the mastery of swimmers is the correct planning of training. Within it we distinguish perspective planning for several years, current planning for one year, operational planning for a month, a week.

Perspective planning of training for several years is a very important condition for increasing the skill of swimmers. The development of training perspective plans promotes a considerable increase in the effectiveness of preparation for major competitions, contributes to the rational use of existing training methods and means and the introduction of new ones, while improving the orientation and finality of the training process. The perspective plan represents the program for increasing the mastery of athletes, structured in a certain sequence, indicating its terms of transposition into life.

Perspective plans can be drawn up individually, for a particular athlete or for a group. In the first case an individual perspective plan is elaborated and in the second case in a general perspective plan, by the group. The general group plan contains data and indications that refer to all team athletes regardless of their individual characteristics. In the individual perspective plan, the indices of the general plan are concretized according to the particularities of each swimmer.

It is good to take into account the staggering of the most important domestic and international competitions, the general perspective plan of training for elite swimmers to be drawn up over a period of 4 years for example from one edition of the Olympic Games to the next. The individual perspective plan can be calculated on different terms, depending on the age of the athlete and the degree of training. It is necessary that the elaboration of the plans be preceded by the elaboration of a perspective calendar of the competitions, in which the swimmers will participate within this period of 4 years. Proper perspective planning depends in many respects on the right determination of the age at which swimmers can achieve the best results, the most favorable age for achieving performance of international value.

Of course, every athlete will expect to get the best results in the years of full flowering of all his skills.

In men the best results are obtained in most cases at the age of 17-23 years and in women between 16-22 years.



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When developing the perspective plan, it must take into account the experience of the best coaches and valuable athletes, the data of scientific research, the continuous trend of introducing new training methods. Before moving on to the perspective plan, it is recommended to analyze the initial training stage of the team or swimmer. One of the most important conditions for carrying out the planned training efforts is the systematic increase of the number of training lessons from one year to another. Therefore, the perspective plan must indicate the possible number of training lessons and competitions in different years of training. When planning training and competition efforts it is especially important to take into account the individual characteristics of swimmers. For example, as the skill increases, the number of training lessons and competitions must increase from year to year. In athletes of higher categories, the number of lessons and competitions, especially the main ones, can be set at a high level from the beginning, and during a series of years to change insignificantly, which must be represented in the perspective plan of training of this category of swimmers. In the perspective plan, the gradual increase from one year to another of the volume and intensity of the training efforts is foreseen differently for different groups of athletes. Changes in training efforts are determined by the classification of the athlete and must correspond to his prior training, his stage and individual characteristics, the conditions of training, etc. For young swimmers in training is characterized by the gradual increase in the overall volume of training effort. In well-trained swimmers, the volume of effort can stabilize at a certain level in a few years, but their character must be changed, increasing the intensity considerably, increasing the number of speed exercises, etc. Knowing the level of training and individual characteristics of his athlete, the coach will be able to correctly determine the meaning of changing training efforts over a period of years. Sometimes a lot of attention must be paid to increasing the overall volume of the training effort, and other times to increasing its intensity. In the process of training for several years, the complex of training means used by the athlete also undergoes great changes. That is why the training of the swimmer, the level of development of strength, speed, endurance, qualities of will, the degree of mastery of technique and tactics have an essential significance. In the training of the young swimmer, the complex of means used over several years changes to a much greater extent than in a well-known swimmer.

Therefore, in front of the coach is the task to distribute in such a way the complex of different exercises over the years of training, so as to obtain a general and specific superior physical and technical training.

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## **ROLE OF AQUATICS COMPONENTS ON THE EVOLUTION OF THIS ACTIVITY**

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### **Abstract**

Aqua aerobics is a combination of movements in the fluid, made especially upright while the body is partially submerged. Appeared in the last decade two major aquatic aerobics: low water aerobics and deep water aerobics.

Aqua aerobics can take many forms, depending not only on the characteristics of the pool, but also the type of equipment used, and especially of the objectives of program.

In compiling of a program it must know all the aerobic aquatic environment, training methods, and many other issues related to individual peculiarities.

In connection with the items that must be known for the development of a water program we have focused on the following:

- general principles of training (by reaching compliance efficient execution of exercises),
- special considerations for aquatic aerobics (including stability muscle groups, body alignment and strengthening the abdomen, in addition to water temperature or music and ensuring safety methods),
- fitness components (strength cardio-respiratory, muscular strength and endurance, mobility and body composition have the same importance for fitness, they must be in balance),
- muscles and movements (to start an exercise program it must be known location of muscles and how they work),
- neurological components (aspects involved in aerobic aquatic and on which depends the proper conduct of their activity are: balance, agility, focus, combining motor skills, differentiation time - space, differentiating dynamic motor anticipation, creative movement).

**Key words:** fitness, aerobic aquatic program.

**Introduction** According to the European Network of Association of Fitness (ENFA), „Fitness is a state of dynamic physical, psychological and social health, supported by activity adapted to the individual skills and needs / preferences of people responsible for their operation.” Movement is vital to maintaining a state of health throughout life. The more active a person is, the more capable in life. Moreover, muscle activity is one of the fundamental human needs. It:

- provides physical and mental sensations agreeable;
- improves motor behavior (gesture quality, accuracy, strength etc.);
- provides improvement of the great functions and adaptation to effort of organs and systems of the body;
- prevents some inadequacy, trauma;
- ensures balance and consistency in motive or psycho-motor manifestations.

Aqua aerobics is a combination of movements in the fluid, made especially in upright position while the body is partially submerged. They appeared in the last decade two major aquatic aerobics:

- exercises performed in standing, with the water level between the ribs and shoulders, called low water aerobics;



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- deep water aerobics performed, as the name indicates, in water over the head, while the body is supported by a flotation device, a float; those who master good technique can practice swimming vertically without floating.

**Content**

Aqua aerobics can take many forms, depending not only on the characteristics of the pool, but also the type of equipment used, especially program objectives (Koury, JM, 1996). Thus there: Aqua-Gym - use appropriate structures from the gym classes; Woga - puts particular emphasis on correct and development of the breathing process, taking from yoga structures; Aqua-Fin - is based on the idea of the increasing resistance in execution of movement practiced by use of special equipment - diving fins, palm, etc.; Aqua-Kickboxing - includes kick-boxing movements, Aqua-Spinning – brings in water cycle elements, Aqua-Dance – is dance in water; Aqua-Wellness - the newest form that lends itself particularly in early aquatic therapy programs.

General principles of preparation in creating a fitness program is important because through the „compliance of it they reach the efficient in execution of exercises” (Adams, MR, 2002). Rehabilitation program should use in facilitator purpose or in strain, the mechanical features (physical) and thermal water. Thus, movements are performed with maximum amplitude discharge conditions and minimum muscle requests. Training principles are part of a well-designed exercise program. They take account of:

a) adaptation of water. Vilbe (1990) mean accommodation with water: walking, running, jumping and games in the water. „One must first become friends with different water conditions and to free themselves from prejudices formed on land”. Different conditions of water link to:

- slow movements - are the result of increased density of water compared to air, now there are not possible rapid movements;
- breathing with difficulty - water pressure can exert some kind of pressure that is felt especially in the chest;
- loss of balance – through buoyancy the body can lose balance according to depth. Even with water up to the hips level is difficult to maintain vertical position;
- sore eyes - by spraying or dipping the body, water enters the eye and due to disinfectants such as chlorine, eye protection mucosa is affected;
- lower spatial orientation ability - caused by the closing of the eyes or swimming back;
- feeling cold;

b) duration of program and execution rate. Rehabilitation program will respect the principle of progressivity, as strain and duration. Thus, within 5 minutes it will take to accommodate aquatic immersion, then the program will run itself, which originally has 10-12 minutes a day and gradually increase to 30 minutes and can be repeated even 2 times per day. Aquatic meeting achieved by therapeutic swimming can take about 45 minutes - 1 hour to obtain stable results; an activity with widely recognized of induced benefits as swimming must continue throughout life.

Iteration of swimming sessions, succession or alternation of categories of means will take into account the tasks of the program. Aquatic exercise is optimal pace of 20-25 per minute. Exhalation is on the movement and inspiration during the short rest between two movements.

The program will be given in form and shall contain the following information:

- the duration of the immersion;
- the duration of the exercise (the actual re-education);
- axes of motion;





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- rhythm;
- difficulty of elements (accessibility);
- times of increasing difficulty;

c) *load*. Implementing load is a fundamental concept for improvements in various body systems. Therefore, applications must be higher than usual. This load must be increased gradually after a period of time produces various body systems changes, such as increasing capacity, increasing the strength or functionality. *Progressive load* refers to a gradual and systematic rise in pressure or request the system to produce a physiological adaptation without the risk of chronic fatigue or injury;

d) *specificity* - the principle which states that adaptation occurs only in that part of the body that is stimulated or overloaded. This concept of specificity has direct implications in developing adapted aquatic program. The type of exercises used will affect the kinds of improvements that can be achieved. Aerobic exercise develops aerobic systems of the body, while exercises of force developing muscular strength;

e) *primary response*. This principle states that those with initial possibilities weaker have the best chance to improve their condition. The more you win, the more you can win and, on the contrary, the more you has to lose, the more you lose;

f) *the intensity* is a measure of demand or requirement on the physiological systems during training activities;

g) *reversing*. The body can gradually return to the state that was the beginning of the training program if they stop training. Emphasizes the need for regular exercise, continue;

h) *variability*. The principle underlying the cross-training, says that to get a better muscular balance and a complete fitness, it is necessary to vary the intensity, duration and mode of practice. In other words, we need to practice in different ways to stimulate a change in various aspects of the body.

Aquatic exercises should be carefully selected, depending on the ultimate goal of each participant. General principles of preparation, when applied to the aquatic environment will enhance the final result.

**Special considerations for aquatic aerobic** include the stability of muscle groups, body alignment and strengthening abdomen. Also, the water temperature has an influence. Music can be useful, although exercising in water leads to fewer accidents than aerobic activity on land, accident prevention is a safety reason.

*Stability of muscle groups*. For most people the head is tilted forward, shoulders are curved too much as the spine. Gravity and repetitive movements takes out the body from alignment by strengthening certain muscles and stretching others. Typically, the muscles in the front of the body are stronger and back muscles are weaker. For most people the abdominal muscles, back muscles and back of the thigh should be strengthened, while the pectoral muscles, hamstrings (back of thigh) and iliopsoas (hip flexors) should be extended.

*Abdominal body alignment and stabilization*. Correct body alignment is essential in maintaining a upright position of the back during daily activities. Appropriate alignment of the body also helps prevent injuries. Appropriate alignment of the body: chin in slightly and press your shoulders down and back. Abdominal muscles shrink and rotate hips for that the basin to be put under the body. Feet should be shoulder-width apart and knees slightly bent and soft (not locked). Spine is in neutral and aligned.

In the sitting position, once exercised, is easy to maintain. During the activity, however, the arms and legs move, correct alignment becomes more difficult. When practicing arms and legs, trunk must become a stable base that supports the movement. A trunk too relaxed allows excessive twisting and hyperextension of the spine, which can result in injury. To maintain a safe practice position, the abdominal muscles must contract





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to keep the trunk in, with hips below it in the correct alignment. This is abdominal stabilization. The back is very extended when the abdominal muscles are relaxed.

„On land gravity acting on the body and actually help stabilize due weight” (J. Katz, 2003). In water, the effect of gravity is reduced, the body weighs less and limb movement can easily pull the body out of alignment. To practice abdominal stabilization in aquatic environment you have to maintain posture while driving through water. As is learned new aquatic exercises we indicated to create a custom to stabilize body before adding movement.

**Fitness components.** A well-designed fitness program will find the following components: resistance cardio-respiratory, muscular strength and endurance, mobility and body composition.

*Aerobic capacity*, otherwise described as cardio-respiratory fitness, aerobic capacity refers to the ability of the cardiovascular and respiratory systems to deliver oxygen to working muscles for energy during prolonged periods. To increase or maintain aerobic capacity must be made at least 20 minutes a day, three days a week at least one type of physical activity that uses large muscle groups in a rhythmic and continuous way, in a full range of motion. There are required more energy and oxygen, the heart becomes stronger, more efficient circulatory system, increases cardiac resistance - getting the opportunity to practice more for longer without fatigue.

*Muscle strength* refers to the maximum force that can be created by a muscle or group of muscles against a resistance. It is an important part of fitness, but achieving the maximum muscle force requires the use of weights or working with large loads at the gym. It is difficult to obtain comparable results without such equipment in water, but can improve muscle strength through training levels in water.

*Muscle and cardiovascular strength* are in close relationship and it is important to increase both proportionally because without aerobic resistance can not increase muscle strength and vice versa. By increasing muscle strength and muscle strength increases indirectly since last longer as the muscles, the stronger they will be. To maintain muscle mass, it is recommended at least 2-3 working sessions per week, including at least one set of 8-12 repetitions for each muscle contractions of major muscle groups of the body.

*Joint mobility.* Muscle mobility is the ability of muscle to stretch safely at full capacity. Joint mobility is the ability to move body parts around the joint in full range of motion. This is probably the least considered part of fitness, although the strength and mobility are closely related, and an imbalance can result in injury. It recommends greater extent each muscle group in terms of static and dynamic at least three times a week.

*Body composition* - the ratio between the body fat and low. Weak tissue (or non-fat composition) includes muscles, organs, bones and connective tissue. Essential body fat should weigh approximately 5% of total body weight to 15% in women. Training is done in order to change body composition. Working on muscle strength and endurance will increase tissue of the weak mass, while working on aerobic capacity will increase fat utilization, resulting in an optimal proportion between skinny and fat tissue. Ideal fat percentage is between 12-17% in males and females between 18-22%. While these figures provide an objective assessment, significant aspect is the state of health - the body's comfort level in moving the body's energy level and ability to meet more resistance activities.

**Muscles and movements.** When starting an exercise program to be known location and how working muscles (Kisner C., Colby L.A., 2007). An important fact about muscle: the more they are trained, the better tone is. Interruption causes loss of attitude.

*Muscle contractions.* When starting a movement a message is sent from the brain through the nervous system each muscle cell, that must be encouraged. „Muscles contract in different ways but in aquatic fitness are treated mainly two types of contraction - isometric and isotonic” (MR Champion, 2000).



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*In an isometric contraction* muscle tension is developed, although there is no movement. For example, isometric contractions are used to keep a tray before the body. Arm biceps are contracted but not moving. Muscle tension is constant.

*Isotonic contraction* is of great importance in practice. Shorten or lengthen the muscle, causing movement of two bones that is caught. A isotonic concentric contraction (or positive) muscle shortens. Because of resistance, all water movements resulting in concentric contractions.

*In a isotonic contraction eccentric* muscle stretches to support the resistance, but is defeated by it. For example, if a weight is held with outstretched arm to the side, eventually will overcome capacity of weight arm to keep it. To prevent injury, to control lowering arm, taking weight against the force of gravity. This is an isotonic eccentric contraction. In water this contraction occurs only if used floating equipment. For this reason, exercising in water rarely causes pain the next day, which is usually caused by eccentric contractions execution.

Relationship of the muscles - muscles usually work in pairs, both muscles going over the same joint but on different parts. Examples include biceps and triceps in the upper body, abdominal muscles and erector spinae in the center, quadriceps and hamstrings in the lower part of the body. The exercises will be presented using opposing muscle groups.

**Neurological components.** Motor skills is an area managed by the neurological system of the body and especially the coordination capabilities that enable individuals to learn, organize, control and transform motion. Issues involved in aerobic aquatic and on which dependent proper conduct of their activity are: balance, agility, focus, combining motor skills, differentiation time - space, differentiating dynamic prediction motor (muscle, nerve), creative movement.

### **Conclusions**

The biggest advantage of any regular fitness schedule is a better quality of life. Aqua aerobics programs involves many aspects, apart pool characteristics, type of equipment used, and especially program objectives.

All components presents the same importance for fitness, they must be in balance.

### **Proposals**

To avoid creating imbalances in strength and mobility that can cause injury and pain, strengthening and mobility exercises should be designed in order to counteract these problems. An appropriate balanced aquatic exercises should use the principle of specificity and guide the strengthening weak muscles and mobility exercises for the muscles that are tight.

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**RUGBY'S RELATIONSHIP WITH THE WORM-UP AND EFFORT'S  
CHARACTERISTICS FOR PLAYERS**

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**Abstract**

The "worm-up" notion is relatively new in sportive physiology; first publication only appeared in 1930. The worm-up was used first time in USA, in Europe being first time used, from sportsmen from Olympic Games from Berlin in 1936.

In Romania, the notion of "worm-up" was poor used in rugby, for a lot of years. With participation at the World Cup, the coaches and managers understood the importance of warming-up and brought a new approach. In rugby it is very important for the player to realize the importance of the worm-up and to work itself the parts that require a worm-up more considerate. The insufficiency of worm-up will facilitate the appearance of injuries, more or less dangerous. In the rugby game, the beginning and the end of warming-up must be calculated with precision, so that the player will start the game at the most higher efficiency.

In its evolution on world-wide plan, in the battle through requirements accomplishment, in actual stage, at the higher level performance, rugby has as common characteristics in all advanced schools more sustained efforts, all training time, the concern for collective game development and a good knowledge of warming-up's importance, in sportsmen training and competitions.

**Key-words:** rugby, effort, worm-up, heart frequency.

**Introduction:** Rugby represents a sportive game, which is characterized by a great performance, determined by a big variety of technical procedures and the speed of phases of attack, defense and counter-attack.

From this point of view, the effort from a game is situated, someplace between big and medium values.

On the game's course, we meet frequently moments of maximal tension, determined by starting of attacks or counter-attacks, and also moments of small and medium efforts, or even rest, determined by game and regulations.

Medium heart frequency, in a game is 170-175 / min, these values knowing important variations during the rugby game. This way, because of repeated starts, in can reach 198 / min, or can even be more then 200/ min, because in breaks, to decrease until 140-150 / min. Knowing this aspects of game development, we can appreciate from effort's view, that this is of mixed nature, anaerobium -aerobe.

**Content:** The importance of warming-up in sportsmen training, especially before games, is well known. The necessity of warming-up is explained from physiologic point of view like this: body's organs and systems have certain inertia and cannot work proper to a certain level all of a sudden, they need time. For example, blood's volume, lungs ventilation and oxygen consummation reach maximum level after 3-4 minutes since the beginning of work. Because of muscle's activity during warming-up, the metabolism increase gradually, increases the reactions of oxidation-recovery, there are changes in blood's composition and



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functional state of cardio-vascular and respiratory system. Resulting of worm-up, decreases the time of motrical reaction, the movement is executed better from technical point of view, with stronger force and speed.

The observations made in important competition, show that many sportsmen from different branches, are worming-up before training 45-60 minutes. When establishing the time of worm-up, there mustn't start only from intensity of coming exercises, even at a shorter as time exercise, there is necessary a serious, substantial worm-up. To obtain the best effect of rugby training, this must be executed based on a good function of central nervous system. For execution of a good worming-up, there is necessary of a certain training grade (number of repetition, intensity of repetition) and especially of a general resistance.

The worm-up doesn't influence visible training's efficacy if sportsmen are poor prepared and feel tired right after making that. For the beginners, a shorter and easier worm-up in more suitable.

In rugby game, during moments of maximal contractions, the main energy supplier is adenosine triphosphoric acid (ATP), product mainly be energy offered by creatinephosphate (CP). In moments of medium or small intensity and in moments of games interruptions, the resistance of phosphagenes is made with energy from ATP, came from the Oxygen consummation.

One part of synthesized of ATP, is locate directly in the muscles, and another quantity is used right away for synthesis of CP, which is passed in the muscles itself. When phosphagene consummation is bigger, the intensity of attacks is bigger and lasts more seconds. This bio-chemical processes, allow taking again of new attacks of large intensity, after rest moments. After moments of big intensity, in first 30 seconds, 70 % from ATP is recovered. Because alternation between moments of maximal efforts, medium efforts, small efforts or rest, glucose reserves, after a game doesn't speed glycogen's synthesis. This is syntesised in two hours from the end of the game, 40% from its body's own resources.

During a rugby game, main energy source is phosphagene and glycogen. Because of the interruption and breaks during rugby game, the supplies if glycogen won't be exhausted, so it would forced to pass to the energy obtained from fats.

In these conditions, oxygen necessity grows, gas exchange is more difficult, which makes after the stop of the effort, to take place of acceleration of heart frequency and breathe frequency, for oxygen necessity recovery.

Each rugby player from first division, starts about 15-25 attacks each game. If we estimate 3-7 second for each attack, we will observe that these maximal intensity efforts represents about 20% of total time of the game, this is aerobe effort, which has as energetic source - phosphagenes.

For an adjustment to this kind of effort, in training lessons and in competition, has to be made sessions of maximal efforts, which are attacks, ball sprints that last 20-30 seconds, until 1 minute, each time.

In rugby, most important are the volume and the intensity of effort. That is why; the worm-ups must be adequate.

Increasing of complexity of effort, takes to increase o intensity of effort, this is done by increasing of difficulty grade, of technical-tactical methods that are learned. Is necessary the explanation of specific effort from this area. In rugby, there are manifestations of physical capacities and development of motrical practices, combined by speed- force - dexterousness –resistance.

From physiologic point of view, the effort in rugby, is mostly maximal and shows interruptions:

- a) For execution and finalization of technical actions of attack, the effort has a dominant character of speed and dexterousness, with a high complexity grade, reaction speed, repetition and execution.
- b) The tiredness has a nervous character, because of an intense concentration, which is present during all time game.



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Rugby requires from players to have a harmonious development of loco motor system and big functions (circulator, breathing, nervous, etc), courage, determination and creativity through technical, tactical and most physic (specific and general) preparation, through education of moral qualities and will.

For children and juniors, there are enough 20-30 minutes of worm-up, and for seniors, 15-25 minutes of worm-up, according to each person's particularities. The player that injuries during training sessions, needs a bigger worm-up, special for the affected area.

First worm-up minutes must pass with easy exercises of decreased intensity, for mobilization of big functions. Next, the exercises must increase, working the muscles and the articulations. For this, the intensity must increase progressive, until the according values of effort from lesson or game.

May be used exercises more complex and bigger grades of difficulty. Last part of worming-up is addressed to the muscles group and articulations, which are about to be worked most of all during the game.

After collective worming-up, the players must have a couple minute for individual worm-up.

A break is also necessary, between worm-up and the game, but this break must be only 5-10 minutes. Only those exercises which create a pleasant mood for players must be chosen, exercises which mobilize them for the game. Each coach must form a schedule of exercises, which uses accordingly to appeared problems. The exercises must be chosen also accordingly weather, preparation grade and preparation time.

The containing of these types of worm-ups will be determined in steps, according with efficiency in practical. The worm-up has a vital importance, so is must be conducted from experienced coaches, especially with inferior categories players, or before official games.

If the coach is not enough experienced, the worm-up can be not enough, or too hard, having a negative impact of the results in the game.

Not enough worm-up, will facility to the appearance of injuries, then the players will suffer the consequences.

The players from higher grade of preparation and age must be thought how to perform their own worm-up, because they know their problems.

Is recommended that worm-up, especially the general part to have place in group, and after that, must be made an individual worming-up, with followed purposes of each individual, but in coach's participation. The beginning and the end of worm-up for game must be calculated with special precision.

In the case of a first half, where is short used, the player must maintain the worm-up, or the beginning of worm-up. Is necessary, choosing of most rational exercises and exercises alternation with relaxation moves and deep breathes, to avoid fatigueless and maintain a functional mood for efforts continuation.

Considering these presented facts, the worm-up is indispensable at the beginning of the lessons and before rugby games.

**Conclusions:**

It is accepted as optimal time frame between the end of worming-up and the beginning of competition as 5-10 minutes. In fact, after this interval, muscles fever didn't drop yet and therefore, whole effect of worming-up is maintained towards performance capacity. The worming-up effect, remains at a relative raised level, another 20-30 minutes, and cannot be perceptible after just 45 minutes: the muscles fever came back to its initial condition.

The purpose of worm-up represents improvement of sportive performance capacity and trauma's prevention. The optimization of psychological-physical parameters of performance are obtained after a general and specifically worm-up. Different forms of worming-up or combining of them proven their efficacy,





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according to each sport type and individual characteristics. A change in warming-up practices must be done progressively. The shape, intensity and the volume of the most favorable warming-up for a certain person can only be determined through personal experience.

The fact that in numerous papers, the kind and the efficacy of warming-up have been appreciated differently, depends on the fact that groups of different persons, young and elders, trained or not trained, have been confronted with this problem and plus, often in low number, in different conditions and inadequate warming-up programs.

The practice from all kind of sports, shows that warming-up, makes part of preparation for a higher level of sportive performance, because promotes to a functional redistribution, of physiological normal values, in the meaning of that performance optimization.

During warming-up there are accomplished:

- Respiration and circulation stimulation, this way creating the possibility of effective utilization of all systems.
- Blood's circulation is activated, therefore the oxygen quantity transported through the muscles is larger and contributes to improving of functionality of those, the contraction and the relaxation can switch more rapidly.
- The increasing of muscle's temperature. The more elastic muscle can make a bigger effort with the same energy consumption.
- Improving of articular mobility.
- Preparation of nervous system for effort.
- Decreasing of injury danger.

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## **THE GAME OF MOVEMENT - METHOD AND MEANS OF TRAINING IN PHYSICAL EDUCATION**

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### **Abstract**

The activity of school physical education is carried out based on the regulations and provisions, provided in the documents elaborated by the Ministry of Education and Research.

The issue of motor skills in primary school children is represented by a series of physical and mental transformations, which are characterized by an acute need for movement, but also by a tendency to learn / develop / train.

From the point of view of motor skills, it is possible to act on the skills of speed, aerobic endurance and coordination, through exercises with a partner, in a group, at different signals and with precise tasks.

**Key words:** physical education, movement game, methodology.

### **Introduction**

However, learning is hampered by the ability to process, reproduce and fix data (Rață, Gl., Constantinescu, E., 2004, p. 80-8).

In this context, we intend to design the content of the physical education lesson with a thematic content of specific action systems for optimizing the psychomotor capacity of primary school students.

We propose that this aspect of the design and application of the game of movement, to contribute effectively to the improvement of these vulnerable points of the age of children in the primary cycle (ability to concentrate, attention, exercises with a longer duration) and to stimulate them regarding active and conscious participation.

BJ Logsdon quoted by Dragnea, A., Bota, A., Stănescu, M., Teodorescu, S., Șerbănoiu, S., Tudor, V., (2006), considers that "physical education is a part of the education of the movement that was conceived as an educational program within the school curriculum ". The supporters of this conception formulate specific objectives, which illustrate the fields of psychomotor, affective and cognitive learning.

Rata G.; Constantinescu E., in (2004), defines physical education as "a component of general education, which through physical exercise, carried out voluntarily, in an organized or independent way produces the change of human behavior in motor, cognitive, social, moral, affective plan and aesthetics ".

The interdependence of the components of education according to Im., Kant, quoted by Bocoș, M., in (2002), has the following characteristic notes and features: The French pedagogue (Rene Hubert, quoted by Chiș, V., (2005), Contemporary Pedagogy, Pedagogy for Competences), distinguishes in this way: intellectual education, moral education, vocational education, aesthetic education and physical education. But these components of education can be joined, through the major influence of contemporary society, profound political, economic, social and other changes: religious education, civic education, new educated, environmental education, education for democracy, education for peace, education for human rights, etc



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Movement play has an "essential contribution to achieving the goals of school physical education." Unlike the other groups of activities used in the physical training of students, "the instructive-educational influences through play represent the following particularities", according to (Balint, Gh., - 2007, pp. 57-62):

- allow diverse manifestation and stimulate the simultaneous growth of basic or specific motor skills, motor qualities, as well as moral-volitional skills and abilities;
- the movement game offers the possibility to apply in always variable conditions the basic motor qualities and skills.

**The purpose of the paper**

The aim of the paper is to explain how movement play contributes effectively to the content of physical education and sports, for the education and development of motor skills, motor skills and abilities and motor skills.

It should be noted that in the physical education lesson one can act through the movement game to educate those mentioned within the proposed goal, during several links, not only in the thematic or specific to the education of psychomotor qualities, which precedes the thematic one, but even in the preparation for effort or selective influence of the musculoskeletal system.

Considering the research, the paper aims to follow a series of tasks, necessary for the development of our study.

**Objectives of the paper:**

1. Discovering and structuring bibliographic materials that study the issues addressed in our research.
2. Highlighting the specific means of movement play in order to develop general and specific motor skills in primary school students.
3. The necessary weight for the development of general and specific motor capacity in the physical education lesson, through movement games.

**The hypothesis of the paper**

Following the teachers' questioning, we believe that if we apply in physical education lessons means specific to the movement game, then we will be able to improve in them the general motor skills, and the specific motor skills.

**Research methods**

As research methods involved in our research we can emphasize that some methods, in relation to others, receive certain priorities. Many of these methods are found in other sciences, but this does not mean that they have not been adapted by the content and theme of their use, to the specifics of physical education and sports.

**Bibliographic study method**

In our paper, too, the bibliography represented the important scientific-methodical source with the help of which the basis and the theoretical substantiation of the investigated issues were ensured.



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**Questionnaire method**

For an overview of how to approach the improvement of children's motor skills, by the people involved in this issue, we considered it necessary in our research to develop a questionnaire. I used a type of questionnaire that I applied to physical education and sports teachers in Arges County (20 teachers).

Each question had a precise objective, with the ultimate goal of obtaining truthful data about how the child's daily schedule. The questionnaire of physical education teachers consists of 9 questions, having an open character, so that we can establish the weight of the importance of the aspects regarding the motor capacity of the child during the physical activities using the movement game within the content.

**Research organization**

In order to achieve the proposed goal in relation to the approached topic, we have set up a plan that captures the stages of realization of the concrete operational approach. The materialization of this staging is presented through the sequence below, for what was proposed and of course for what was achieved, as a constituent part of the content of the topic addressed, but also of the temporal structure.

In order to carry out our study as efficiently as possible, the stages that were covered in our documentation were established from the very beginning:

- **April 2019:** Choosing the topic and formulating the title of the paper.
- **May June 2019:** Establishing the goal, assumptions and achievable tasks.
- **June 2019:** Statement of the premises that generate the purpose and hypotheses of the paper.
- **June December 2019:** Bibliographic documentation regarding the theoretical substantiation of the paper.
- **January February 2020:** Application of the questionnaire.
- **March April 2020:** Processing and interpretation of results.
- **May 2020:** Formulation of conclusions and recommendations.

**The investigated group**

The working sample consisted of 20 teachers of physical education and sports, classes (10 3rd grade and 10th 4th grade) of teachers from General Schools no. 10, 11, 13, 19 and 20 from Pitești and the General Schools no. 2, 3 and 4 from Curtea de Argeș.

Thus, out of the total of the 20 investigated teachers, we finally determined:

**6 teachers - have a completed teaching degree;**

**6 teachers - have the didactic degree II;**

**8 teachers - have the first teaching degree;**

The questionnaire was applied during January-February 2020, the analysis of the results being performed in March-April 2020. The questionnaire of physical education teachers consists of 9 questions, having an open character, so that we can establish the weight of the importance of the aspects regarding the motor capacity of the child during the physical activities.

| Question                                                                                                           | Affirmative | Negative |
|--------------------------------------------------------------------------------------------------------------------|-------------|----------|
| Do you think that the 2 hours / week allocated to physical education for primary school students are enough?       | 4           | 16       |
| Carrying out other sports activities outside the physical education and sports classes, together with the teacher? | 6           | 14       |
| Is passing the control tests a problem for children?                                                               | 13          | 7        |



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|                                                                                                                                         |    |    |
|-----------------------------------------------------------------------------------------------------------------------------------------|----|----|
| the share of practicing a branch of sport within an organized club.                                                                     | 4  | 16 |
| have you tried to develop the child's pleasure in moving using the play of movement?                                                    | 12 | 8  |
| Do children frequently get medical relief from physical exertion?                                                                       | 8  | 12 |
| Do you think that if they worked in homogeneous groups, using the movement game, the children would give a better performance?          | 15 | 5  |
| "Do you consider it appropriate to run a 10-15 minute / hour program for children that contains movement games adapted to their needs?" | 16 | 4  |
| "During physical education class, do you consider that you have the time to work with pleasure using the game or other means?"          | 8  | 12 |

At the end of the questionnaire-based survey we can notice mainly that we have achieved the purpose for which this questionnaire was built and we can notice from the dynamics of the answers offered by specialists in the field, the definite trend of evolution of the instructional-educational process. physics and sports, through the need to introduce attractive and motivating means for the school child at this age.

To the first question of the questionnaire that wants to know if the 2 hours / week allocated to physical education for the students from the primary cycle are enough, the analysis of the teachers' answers shows us the following order: Affirmative - 4 answers; Negative - 16 answers. (Figure 3.1), which proves again that the allotted hours are considered very few and most want this to be changed.

( Is the time spent on physical education enough? percentage of answers)

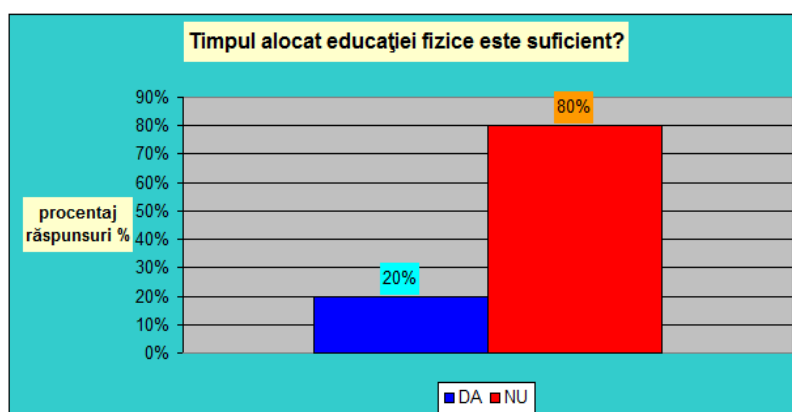


Figure 1 - The share of time allocated to the physical education lesson

Question 5 to teachers "Do children frequently get medical relief from physical exertion?" From the analysis of the answers, the distribution shows us the following order: Affirmative - 8 answers; Negative - 12 answers. (Figure 3.6). I find this very encouraging, because these children want to overcome their situation and therefore can set an example for their colleagues.

(Are overweight children exempt from physical education?)

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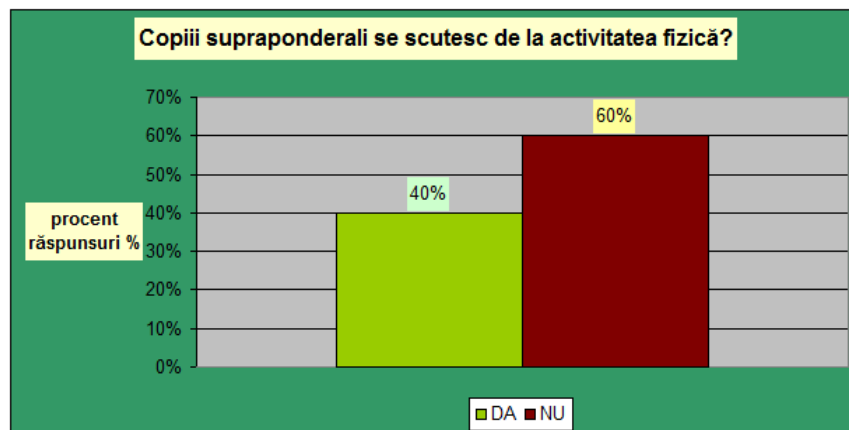


Figure 2 - Share of physical activity exemption

The last question asked to physical education and sports teachers: "During physical education class, do you consider that you have the necessary time to work with pleasure using games or other means?"

From the analysis of their answers to the question, the distribution shows us the following order: Yes - 8 answers; Negative - 12 answers. (Figure 3.9). The time to achieve everything we set out to do in the physical education and sports classes is not enough because a lot of time is wasted in bringing children to the gym, to change in equipment, to put them in training and to organize them during the lesson. These issues should be taken into account and an attempt should be made to find a solution to this problem.

**Discussions:**

- In parallel with the development of physical activity, it is necessary to carry out educational programs on a healthy diet adapted to the age and needs of these children;
- It is necessary to introduce some contents in the form of a game because the efficiency of the children's physical activity is completed within an activity of this kind;
- The time allocated to physical activity in school is not enough to be able to achieve a harmonious physical development and it is necessary to supplement it with activities in the form of play in free time.

**Conclusions**

- We can say that after studying the specialized literature and conducting the sociological survey, the following conclusions can be drawn:
  - In recent years, the desire to practice a sport has decreased substantially because today's children have other concerns and sport is not part of their area of interest.
  - Physical education and sports classes are insufficient to achieve everything teachers aim for, and the actual working time is very short.
  - Developing an exercise program that is entirely designed from movement games would attract people to exercise and we could avoid obesity and visibly reduce the number of exempt students.
  - Physical activity during school hours must be supplemented with other activities, such as practicing a sport in an organized club.



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## **DYNAMICS OF FUNCTIONAL AND DRIVING INDICATORS OF GYMNASIUM STUDENTS**

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### **Abstract**

The issue of the studied topic is of remarkable importance because it corresponds to the present from the horizon of axiological, formative-educational and social phenomena and presents a topic of increasing interest to multi and interdisciplinary research, namely vectors of intellectual, motor and health development, in especially those with an important impact on the quality of life, the particularities of manifestation of the behavior of modern man, all of which involve to a greater or lesser extent, the practice of physical education from an early age.

The European Union recommends with priority the development of projects with the theme "Life course stage - a good start in life", which must include preconception, conception, pregnancy and birth, the first days, preschool and primary education.

European documents also state that participation in activities specific to the field of physical education and sport is "a fundamental right of all", and their practice has multiple effects on strengthening health and on the evolution of character and intellectual development of individuals.

**Key words:** student, behavior, physical education and sports, health.

### **Introduction**

Lack of sports leads to weight gain, obesity and chronic diseases, cardiovascular disease and diabetes, which damage the well-being and endanger the quality of life of individuals, which affects the budget of the economy and funding distributed to health.

In this situation, the public authorities responsible for initiating, planning and carrying out sports and physical education activities must commit themselves to fulfill more responsibly the task of initiator that promotes the strengthening of health, through the capacities of specialists in the field: teachers, teachers, methodologists, physiotherapists and by implementing prophylactic alternatives, applied according to the particularities of age, sex, level of training, in order to perform tasks specific to the field of competence of specialists.

Physical education and sport are fundamental human rights, recognized by major international organizations.

Throughout life, all people have the right to quality education, which ensures a complete evolution of their personality.

The organization of conferences, meetings and debates initiated and recommended by the commissions of the European Union encourages the support of physical and sporting activities through policy proposals, in the field of education and training.

In Romania, one of the principles that governs pre-university and higher education, stipulates that the lifelong learning process will have to initiate and encourage educational programs to strengthen health,



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highlighting active participation in physical education lessons and at recreational sports you practice in your free time.

Thus, it is specified that it is a state guaranteed right of any person, without discrimination, to participate in educational activities of a sports and recreational nature. The local and central authorities, administrative, educational and sports institutions have the task of guaranteeing the measures for carrying out and supporting the specific actions of school, university physical education, sports for all age categories, the practice of performance sports.

We notice that there is a conceptual and legal framework through which the social function of sports activities is recognized and the conditions for their organization, development and participation are ensured. In this situation is physical education and sports activities are part of general education and by practicing them can act to strengthen health, growth and development of the body, and mental and intellectual processes, promotes socialization. Thus we can say that the functions of school and extracurricular physical education have an effect in the biological, psychomotor and social spheres, and are related to the concept of a balanced and integrated development of children's personality.

Physical education is a form of education that values moments through the physical development of the body, the development of the intellect, the movement skills needed throughout a lifetime. A component of general education, school physical education is carried out according to well-established rules, includes various forms of organization and development, in order to optimize the biological and psychomotor potential of the individual, in order to improve the quality of life.

Sport is part of the universal culture and has always played an important role in maintaining and strengthening health. Also, through its competitive characteristic, the sport favors the aspiration to be known and to obtain sports victories. These two directions of action of sport create an association with physical education and are preserved throughout life.

The fact that the formation of modern man implies its development from an ethical and aesthetic point of view, from the physical, social, intellectual level, in accordance with the needs of society and according to the aptitudes of individuals, leading to increased living standards and social development. A real support in the didactic activity is represented by a modern orientation of the physical education towards an educational system, in which the family will offer an adequate support.

Decades of research have shown that the sport practiced in the form of games in the physical education lesson, by students in the first year, is an important mediator in the field of physical, social, cognitive and linguistic development of children. However, the game faces threats from many directions in modern life.

Sport has multiple healthy benefits. Practice bad all types of sports from an early age helps children in many ways, especially in group activities to enhance interaction and social integration and to increase the mental and provide a healthy lifestyle to adulthood, because the habits we acquire in childhood are preserved. If we are talking about the psychological or personality level, sports activities (especially those performed in groups) help children to strengthen their social self-esteem and allow them to understand the importance of following the rules.

Improving children's physical and mental development is certainly the most important contribution of children's sports. Due to its size, unparalleled popularity and the foundation of positive values, sport is certainly one of the greatest things man has ever created. It is also a powerful tool that destroys all barriers and helps us feel good about ourselves, physically and mentally. Sport is beneficial for children: through sports, children develop physical skills, exercise, make new friends, have fun, learn to be team members, learn about the correctness of the game, improve self-esteem, etc.



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**The aim of the paper** is to streamline the process of strengthening the health of primary school students by practicing sports activities.

**Research objectives:**

Studying the methodological concepts regarding the optimization of the educational process in physical education in order to maintain the health status of primary school students;

Establishing the necessary didactic contents in the process of maintaining health at the physical education lesson in the primary classes based on the sociological survey.

**The research hypothesis** assumes that the formation of intellectual and motor components in primary school students through the diversity of specific contents of school physical education lessons will allow the organization of a healthy lifestyle, which in turn will have a positive impact on the process of strengthening health.

**The research methods used were:** study of documents, observation, survey, graphical representation and interpretation of data.

The research took place during the physical education classes at the Gymnasium School no. 163 Bucharest. A control group (n = 30 of which: 5th grade / 15 girls and 15 boys,

An experimental group (n = 30 of which: 5th grade / 15 girls and 15 boys

Table 1 Composition of students' body composition

AM= arithmetic mean D= the difference

| components                         | Age / years |      |          |      |          |      |          |      |
|------------------------------------|-------------|------|----------|------|----------|------|----------|------|
|                                    | 12 years    |      | 13 years |      | 14 years |      | 15 years |      |
|                                    | AM          | D    | AM       | D    | AM       | D    | AM       | D    |
| <b>boys</b>                        |             |      |          |      |          |      |          |      |
| <b>Bone mass, kg.</b>              | 4.40        | 0.44 | 4.26     | 0.48 | 4.34     | 0.78 | 3.66     | 0.34 |
| <b>Muscle mass, kg.</b>            | 11.02       | 2.37 | 12.31    | 3.78 | 14.55    | 3.05 | 18.99    | 2.82 |
| <b>Mass of adipose tissue, kg.</b> | 4.78        | 1.23 | 5.26     | 2.31 | 5.24     | 3.19 | 7.66     | 2.61 |
| <b>girls</b>                       |             |      |          |      |          |      |          |      |
| <b>Bone mass, kg.</b>              | 4.85        | 3.37 | 4.63     | 0.73 | 4.93     | 4.60 | 4.35     | 0.64 |
| <b>Muscle mass, kg.</b>            | 10.84       | 2.70 | 11.81    | 3.73 | 16.93    | 6.20 | 15.75    | 3.71 |
| <b>Mass of adipose tissue, kg.</b> | 5.42        | 4.56 | 5.66     | 3.35 | 7.67     | 3.04 | 7.11     | 2.06 |

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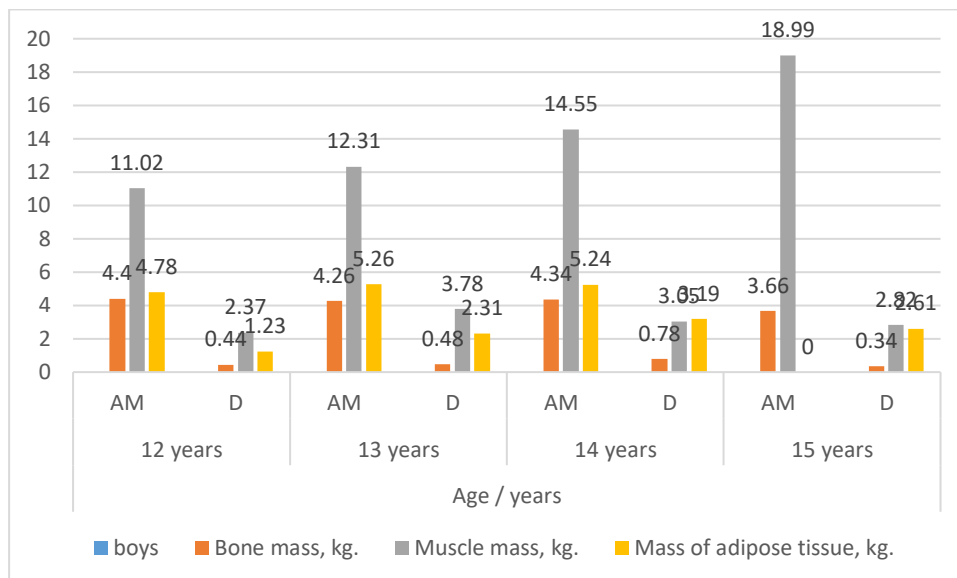


Fig .1 Graphic representation of students' body composition (boys)

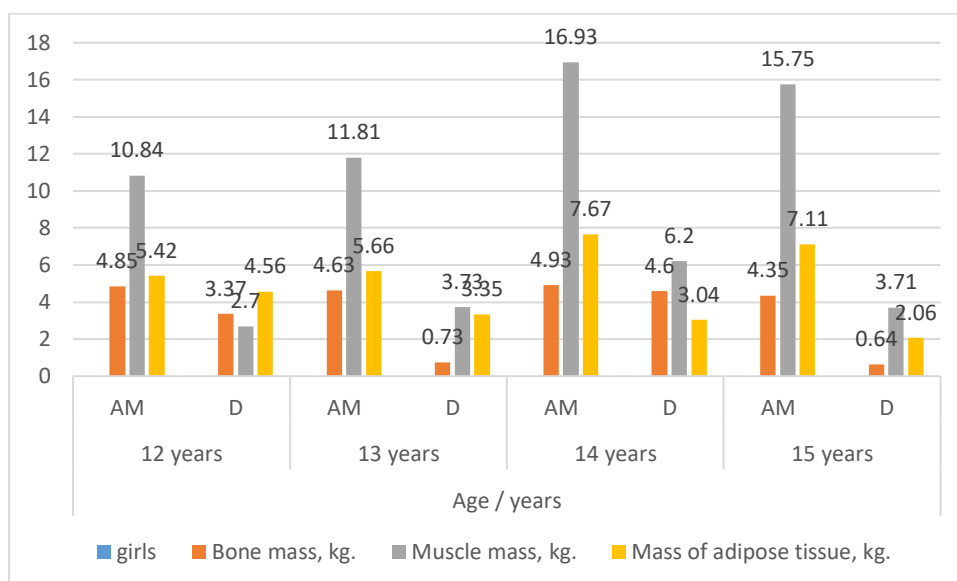


Fig.2 Graphic representation of students' body composition (girls)

## Results

Table 1 and Figure 1 reflect the composition of the body composition of high school students, boys where there is a greater increase in muscle mass at 14 and 15 years respectively compared to 12-13 years the average difference is higher by 2.24 kg. , between 12-13 years, and at 14 years there was a difference of 6.48 kg., muscle mass.

Bone mass at this age does not change significantly, the difference in averages is 4.18 which shows an approximately equal increase, with no jumps to be recorded, and in terms of mass of adipose tissue appears at the age of 14 a difference of 2, 42 kg., Compared to the average recorded in 13- year-old children .



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As previously mentioned in the composition of the large bone mass deviations were not recorded in boys over four years focused between 3.68 at the age of 14 years and 4.42 at the age of 2 years. In our research, as previously mentioned, the muscle mass in boys was higher than in girls at all ages researched except for the indicators recorded at the age of 14 years where the muscle mass of girls exceeded the indices obtained by boys with a difference of 2.38 kg.

**Conclusions**

The presence of physical education and sports classes in school is absolutely necessary to stimulate movement among students and sports performance. Every student has the right to a harmonious education that gives him both access to knowledge that will help him know and better understand the world we live in, to develop his potential and autonomous thinking, but also to practice movement and sports.

The curricular analytical design of the instructive-educational process of the discipline of physical education and sports, allowed us to find that special attention must be paid to school physical education, which, through proper organization, allows us to establish an age-appropriate curriculum structure and particularities of students.

At the same time, the idea of the usefulness of introducing theoretical knowledge about health was formulated, which becomes a central moment and opens a curricular approach that ensures the permanent development of the entire learning-consolidation-evaluation system (differentiated evaluation of each topic studied within newly developed guide).

Following the analysis of the school curricula in force, it was highlighted the need to distribute knowledge into three blocks of intellectual, motor and health. This fact allowed us to obtain the optimization and efficiency of the degree of assimilation of theoretical and practical knowledge, the students thus managing to meet the new requirements of physical training, required by the framework programs.

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## **THE COMPONENTS OF THE POSSESSION GAME**

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### **Abstract**

In the current game, possession is a modern philosophy and tactical way in which teams try to approach victory. The objective of this style of play is for the team to maintain possession of the ball until a solution is found. The success of this concept of play, in which possession is crucial, depends on the technical ability of players to pass the ball correctly and at the right time. And of course, of tactical sense in positioning on the field in such a way as to open the angles for passing the ball to the player leading the ball to give him a variant of continuing the action, the ability to think to find the optimal solution and to identify two or three additional solutions.

**Key words:** football, possession, trends.

### **Introduction**

"The most present technical element in the game of football"

The initiator and promoter of the possession game was Prof. A. Niculescu, who really identified the qualities and abilities of the Romanian player and substantiated the tactical expression called at that time "timing". Possession as a tactical expression is found in the game of South American national teams and especially in Brazil, but also in the game of European club teams such as Ajax representing the Dutch school or Real Madrid (Zidan generation, Figo, Raul, etc.). The improvement of this concept belongs to the FC Barcelona team which bases its game through two complementary tactical modalities - prolonged possession in the opponent's field and recovery pressing executed instantly upon loss of possession (negative possession).

### **Material and method**

The game in attack

"The technique is far superior to the level of 20 years ago - today's one - or two-touch game is amazing"

Boby Robson

*Features of the current game-general trends*

- increasing game speed - fast combinations
- general and specific physical training
- less space and time
- superior game technique at speed rate
- technique / speed
- creativity
- fast transition in attack and defense - the key to success
- fast reform and reorganization
- pressure on the ball area - attacks the man with the ball
- minimizing the risk





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- tactical flexibility
- fluid construction
- individual game
- defensive intelligence
- aggressive attack game
- promoting youth.

*Technical-tactical objectives*

- fast combinations
- fast counterattack
- out of the pressing
- tactical flexibility
- individual game
- team control
- fluid construction
- fixed blows.

*Technical-tactical means for the combinatorial game*

- "one-two"
- doubling the passes
- feints at passing
- combinations of three players
- combinations of four players
- game structures on groups of players.

*Basic forms of positional play*

*Possession game components*

*The game when you are in possession of the ball*

- what do you do when you have the ball?
- there are about 800 passes in a game
- of which almost 50% are short passes
- the thinking time after receiving the ball is 1-2 seconds
- in training is developed the ability to decide the appropriate pass
- the player in possession of the ball has the initiative and decides how the phase will unfold
- the teammates must offer the possibility of the next pass
- by possession to seek to create the situation 2x1
- trustworthy players are very important - they are called game creators (Messi, Xavi, Iniesta, Gerard, Hagi, Ronaldo)
- pass - the most present action in the game of football
- the correct pass to another teammate is the basic factor in the game
- for a correct pass a very good passing technique is needed
- a good pass is characterized by
  - precision
  - speed of passing
  - passing at the right time
- receiving the pass in optimal conditions



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- in the free zone
- to be able to advance
- not to interrupt the pace of advancement
- allow the partner the right movement

*The game without the ball*

Football is largely a game without the ball. The movement of the player without the ball must create the opportunity to pass the players leading the ball and make it possible to develop the practiced and automated combinations, but also the combinations based on the creativity and inventiveness of the players.

At the same time, these moves must make it more difficult for the opposing team to work defensively, inducing insecurity in the defense.

Distance and proximity to the player leading the ball is the key factor in the success of the possession game.

In each attack situation, the player must ask himself the question: "how can I support the player who has the ball?". In most situations, the support starts from the mobility in the game of the players without the ball. The way a player has to move towards the one leading the ball depends on the game situations, but he must always offer him the possibility to make both short and safe passes and long passes.

Possession game is forward oriented and ensures progression to the opponent's goal.

Possession play must rise opportunities to pass for the player leading the ball if it's pressed in front by an opposing defensive player. The advantage of relying on a support player is that a game trainer can have a wide range of passes and a forward angle when receiving the ball. The support player may advance before the player leading the ball and is not attacked.

*Possession game landmarks*

- a team has an average possession for 7 minutes, and a player has the ball in possession between 20 sec. and 3 min.
- analysis shows that a team has possession of the ball for 13-14 min. and a player for 1-2 min.
- the movement of the players without the ball creates the opportunity to pass for the player with the ball and make combinations
- the movement without the ball creates difficulties for the defensive team
- ballless movement is a tactical action that is achieved through the principles of attacking play.

*Communication*

- for a good possession game a good communication between the ball carrier and the teammates is necessary
- communication is done through different forms:
  - by gestures being necessary the visual control between the two
  - verbally by asking to pass because a teammate is located in a free and advanced area

*Principles of the game in attack*

- supporting the player with the ball - supporting the pass
- pass to the direction of attack
- possession to have a tactical purpose
- the game in the opposite area surprises the opponent
- creating and capitalizing on free spaces



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- completion of the players from the second and third line
- high game speed
- verticalization of attack actions
- fast transition in attack
- the game on the side areas.

*Forms of attack*

The combinatorial attack

- study the opposing defense
- is based on creativity
- investigates the possibilities of completion
- land is not gained quickly, only by construction
- changes of direction through short and medium passes
- formation of the group of birds after which the direction of play is changed by passing in diagonal
- double circulation of ball and players
- the possibility of organizing the defense.

Attack at the right time

- possession in the middle of the field to attract the opponent
- numerical superiority by phase and areas by individual actions, group for passing
- superior indices of endurance, speed, strength, technicality, creativity and fantasy
- grouping around the ball of 3-5 players.

Direct attack or attack of the first solution - benefits

- main offensive means
- fast, direct forward transmission of the ball
- verticalization of the action
- attack by 2-3-4 players through long passes to the attackers who left on free spaces at high speed
- simplicity of technical actions
- fast and multiple demarcations
- balloon carrier support
- attack during a "first solution" with the necessary risk
- sharp, fast attack with quick engagement
- moves to the surprise of the opponent
- speculation of free spaces left by the opponent
- disadvantages
- frequent loss of the ball
- resumption of the attack by the opponent
- reduced accuracy and efficiency of actions.

**Conclusions**

We can conclude that the possession game has developed due to the coaches' concern to find new tactical ways to overcome well organized defenses, arranged on three or four defensive lines.

We can also say that the possession game has reached a higher level of technical expression based on individual and group skills highlighted by the philosophy of innovative coaches.



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The possession game is based on the ability to handle the ball in conditions of adversity and aggression but also the creativity and inventiveness of the players to combine in the crisis of space and time.

The possession game requires players to be able to pass quickly, accurately but with a quick and analytical thinking of the moments of the game that will allow him to make the optimal and efficient decision in such a way as to put the game partner in conditions of completion or preservation of possession.

The preoccupation of implementing possession in the tactical expression of a team also determined the change of the acquisition strategy of some players with complementary qualities that would be based on the coach's philosophy.

Passing skills are developed by perfecting the technical factor starting from the initiation stage until full sports maturity, knowing that the technical factor is perfectable throughout the sports career.

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## **MODERN GAME PRINCIPLES - TRANSITION, ANALYSIS AND CHARACTERISTICS**

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### **Abstract**

This article is intended for performance football, being useful to all those who want to deepen modern problems of tactical training of a football team.

The evolutionary nature of the game, the amplification and development of the factors of sports training led to the achievement of sportsmanship, a fact that emerged from the technical analysis of major high-level international competitions Champions League, European Cup, European Championship and World Championship.

The modern development of the game was based on the interdependence between the factors of sports training, each of them becoming a factor of progress depending on the orientations and current trends of the game.

**Key word:** football, evolution, characteristics.

### **Introduction**

We can say that when the technique of great players, exponents of past generations as well as the current generation reached the heights of mastery being decisive in obtaining victory, the physical factor amplified as a methodical necessity by which opponents with a more precarious technical manifestation they could compensate with a higher norm of effort, currently balancing the balance of forces, which led to a different tactical attitude with new tactical dispositions in the two fundamental phases of the game. Thus, after overcoming the romantic era, football became more pragmatic and specialists in the field sought new methods and means of training to achieve success.

New tactical manifestations appeared such as the human-to-human marking on the field that required a different type of effort and an amplification of the effort norm regardless of the specificity of the positions in a team, which led to the amplification of the physical factor and its importance in the philosophy of preparing a team.

Another way to counteract the technical level of the opponents were the tactical innovations highlighted by new dispositions and tactical tasks such as Herera's concrete or the game with libero, which led to the minimization of the attack game of the teams that had large components. players with superior technical baggage.

The new tactics and defensive manifestations, although they led to remarkable results, see the case of the Milan International team, diminished the offensive side of the game, the essence and spirit of the game that offered spectacle, which determined the specialists to look for new ways of success, which led to the development of the game tactically. Thus, new tactical models, concepts and methodical principles such as possession, positional play, translation, transition, rapid attack, zone play, pressure, pressing appear in the field of tactical expression.



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**Content**

In the following we will refer to a modern and decisive game principle in achieving success - the transition

**WHAT IS THE TRANSITION?**

"The speed of transition in the game is much higher today and involves a number of 4 or 5 players attacking (Sir Alex Ferguson).

Collective tactical action often encountered in the game is characterized by the rapid transition from attack to defense and from defense to attack in order to obtain a substantial tactical advantage - scoring or avoiding a goal.

**PURPOSE OF THE TRANSITION**

**-in attack**

- creating numerical superiority
- surprise the unprepared opponent
- by recovering the ball to take the initiative in the game
- recovering the ball as close as possible to the opponent's goal in advantageous areas
- after taking possession of a quick transition or a quick counterattack
- forcing the opponent to make mistakes (fouls, penalties, card fouls, eliminations)

**-in defense**

- covering the areas to be done as quickly and efficiently as possible
- not to be caught in numerical inferiority
- achieving an efficient collaboration between players
- not to offer spaces to the opponent
- to keep the opponent as far away from his own goal as possible
- to determine the opponent to a slow lateral orientation
- to block the verticalization of adverse actions
- orientation of adverse actions to less important and more dangerous areas

**FACTORS INFLUENCING THE TRANSITION**

The number of transition situations in a game differs

**Value level of competition**

- if the competitive level is low, the way of making the transition suffers, being influenced by the technical abilities of the players, by the physical abilities necessary to make the transition optimally, by the level of tactical knowledge and by the mental abilities of the players,
- the higher the competitive level, the more the possibility of achieving an efficient transition is based on a high level of psycho-technical-tactical manifestation necessary for success.

**The value level of the teams that play the game**

- if there is an obvious value gap between the two teams, then the more valuable team will make a greater number of successful transitions, taking advantage of a weak response capacity of the opponent.
- if the teams are of equal values then the success of the transition will depend on the level of technical, physical and mental training of each team.
- the better trained these factors on which the transition depends are, the higher the success rate will be.
- the success of the transition will also depend on the necessary tactical knowledge and the opponent's ability to counteract this collective tactical action.





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**The stakes of the game**

-the stake of the game depends on the position of the team in the ranking, the place of dispute, home or away, the level of competition in which the game is played, the value of the opponent, the result at that time, the need for a result for a qualification in a competition.

**Arbitrary manner**

-a modern refereeing manner that ensures the smoothness of the game facilitates the transition.  
-a refereeing manner that fragments the game prevents an optimal transition.

**Game conditions**

-when the playing surface is of good quality it facilitates the combinations in speed and an optimal transition in attack.  
-when the playing surface has imperfections, the combinations on the grass are not recommended, mainly using the pass at half height or on top, which makes the transition difficult in attack.  
- the quality of the playing surface is closely correlated with the atmospheric conditions that can negatively influence the transition in attack.

**The tactical manner approached by the two teams**

-if the two teams have an open way of playing based on an offensive game then both fighters can find spaces and can choose the optimal moments in which to make the transition.  
-if one of the teams practices an eminently defensive closed game then the transition in attack will be sporadic, with a small number of players with little chance of success, with more emphasis on the defensive phase.  
-if one team is a follower of the positional game, but with a deficient transition in defense, the other team can make a quick transition in the optimal moments offered by the development of the game that would bring it closer to success.

**The degree of knowledge of the opponent**

-the better the coach knows the opponent, the more he can counteract the opponent's quick actions and take the necessary measures for a quick transition in defense that would prevent the opponent's opportunity to score.  
-knowing very well the composition of the opposing team, the qualities and defects of the opponent's coach must introduce in the weekly training cycle the methods and means of training that will allow him to annihilate the good parts of the opponent and exploit his weaknesses.

**Number of top players on the team**

-when the team benefits from a large number of top players who have the ability to make this collective tactical action the chance of success is higher.

**The mentality of the players**

- forming a professional mentality and behavior is the major goal of every coach.  
- the players' mentality must be formed early by implementing to the players a professional education necessary for the performance.

**OPTIMAL MOMENTS OF TRANSITION TRIGGER**

**How the team manifests when the ball leaves the playing surface**

**In the offensive phase**

-the team must act quickly and occupy advanced positions.  
-advanced players must exploit the free spaces where they can dive at high speed to receive the ball in future positions.  
- the player who puts the ball back into play to do it at the highest speed to catch the opponent discovered and unorganized defensively.



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-after putting the ball back into play, the ball carrier must be supported by 2-3-4 teammates in order to offer him the possibility of optimal continuation of the attack action.

-foundation of the defensive phase

-ensuring the defensive balance.

**In the defensive phase**

-delaying as much as possible the resumption of the game by regulatory means

-defensive reconfiguration

-rational occupation of areas

-participation of all players without exception in the defensive phase and recovery

-preparing the attack phase after a quick recovery

**Discontinuation of the game by the referee for regulatory reasons**

-free blows

-resumption of the game from the center of the field

-accidents

-player changes

-the referee's ball

-if following a decision of the referee the team is in possession of the ball, the team must run at the highest speed the offensive moment created by the decision, while putting the germs of a defensive attitude to prevent receiving a goal.

-if following the referee's decision, the team loses possession of the ball, the team must enter the defensive device, preventing by any regulatory means the receipt of a goal, substantiating at the same time the moment of a quick transition after recovery.

**The place where recovery is made and the transition to attack is triggered**

-the area where the ball is recovered depends on the transition

-the number of players participating in the transition depends on the area where the recovery is made

-if the recovery is made in the own third of the transition, 3-4-5 players can participate, diving at high speed on the free areas towards the opponent's goal, abandoning their own areas from the defensive device

-if the recovery is made in the middle of the field, the most advanced players near the recovery area will participate in the transition.

**The advantageous or disadvantageous numerical ratio of the two teams at the time of recovery**

-if the numerical ratio is in favor of the team that recovers the possibility of completion, it has a higher chance of success.

-if the numerical ratio is unfavorable to the team that is in possession of the ball, the chances of success decrease.

-if the defensive team is numerically superior in the defensive moment, the possibility of blocking a fast attack increases.

**The value of the players influences the way of transition**

-technical mistakes -to take over

- in charge

- for construction

- unsuccessful individual actions

- wrong tactical solutions

-technical-tactical successes



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- observing or not respecting the game tasks
- capacity and quality of reading the game
- the level of physical training
- the level of psychological, mental training
- motivation
- acts of indiscipline
- chance

**WAYS OF TRANSITION**

**From defense to attack**

- the player with the ball is obliged to think quickly to take the optimal solution

**Through individual actions**

- the player who recovers the ball starts in an individual action when he considers that he has chances of success

**Decisive counterattack**

- the most advanced striker receives a long pass from his teammate and takes individual action
- the goalkeeper takes possession of the ball after an adverse attack and through a long clearance puts the most advanced striker in the attacking position

**Changing the game to an opposite free zone where the number of players is small**

- if the recall is made in an area of the field where the share of players is high, the direction of attack is changed to an opposite area to facilitate the continuation of the transition

**Safety care**

- when after recovering the ball the player is inferior use a side pass or back until he gets the support of teammates

**Quick combinations with eliminating opponents**

- after recovery the ball owner can develop quick combinations if space allows him in order to eliminate opponents between him and the goal

**Surprising participation in combinations of attacking players but also from the second and third line**

- can participate in the quick combinations initiated after the recovery the players from the defensive lines ensuring the tactical surprise by their appearance at a fast transition or at the end

**The departure of some players from the base area must be temporarily replaced by another player from a neighboring area in order not to be surprised at a possible transition in attack of the opponent.**

- after recovery, the players from the second or third line can participate at the transition in attack, their departure from the base area being replaced by a defensive midfielder, or a lateral midfielder

**Leaving the basic areas rationally to eliminate the hazard**

- only one central defender goes to the construction or attack and not both simultaneously
- the attack of the lateral defenders is done alternately
- not both central midfielders go out in the side areas simultaneously to take the pass from the defenders

**From attack to defense**

**Making the right tactical decision when losing the ball**

**Advanced pressing and block**

- the loss of the ball automatically leads to a reconversion that forces players regardless of the position in the team to press for a quick recovery



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-fast recovery of the ball is facilitated by the advanced position of the defensive block but also by the compact way in which it is arranged

**Fast and rational coverage of the main areas**

- if the recovery is not possible the team must reorganize defensively covering the vulnerable areas
- density is ensured on the central area
- temporarily cover vulnerable areas even by players from other positions

**"Technical" fault**

-when the team fails to recover by pressing and is caught discovered on vulnerable areas, it is necessary to stop the opponent's attack by a technical foul even if the player is exposed to a disciplinary sanction

**THE MAIN ERRORS OF PLAYERS IN TRANSITION**

Mentally, don't focus

- many players consider that in the game they should only participate in one of the phases of the game attack or defense
- the forwards consider that their role ends with the loss of the ball and that the recovery is the exclusive task of the defenders

**The lack of a tactical and theoretical culture leads to mistakes in placement or interpretation of the game**

- players do not understand the tasks of the game at the time of transition
- they do not understand the purpose and role of the transition
- ignorance leads to a wrong tactical vision without the possibility of fixing mistakes.

**Poor collaboration**

- delayed replays to the transition in defense
- delayed participation in the transition in attack
- not participating in some important tactical moments such as pressing, folding, covering areas, forming the compact defensive block, keeping the optimal distance between the lines within the defensive block and the distance between the components of the same line.

**Giving up caused by an inadequate physical level**

- the lack of a necessary training to support a certain tactical attitude leads to the non-fulfillment of the obligations within the expected tactical system
- against the background of an inadequate physical training, the players have an uncooperative attitude.

**Exaggerated risks in attack or defense**

- repeated and unjustified leaving of the moments of the game of the impotent areas
- physical exhaustion due to repeated and irrational abandonment of important areas

**Exaggerated precaution that leads to a withdrawal in the own third in the defensive phase**

- fear of losing the game leads to a defensive exaggeration, the resulting in the team retreating into its own third
- exaggerated withdrawal makes it difficult to carry out the transition in attack

**Tactical errors**

- mistakes in the tactical attitude of some players regarding marking, dubbing, demarcation, replenishment, retreat, support

**THEORETICAL AND METHODOLOGICAL RECOMMENDATIONS FOR TRAINING**

- good theoretical training
- using intuitive means in theoretical and mental preparation such as the video method
- forming a tactical culture regarding: -the principles of the game



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- playing systems
- phases and forms of attack
- phases and forms of defense
- play in the area
- playing systems
- loads on positions within the systems
- mental preparation to aim - players' participation in both phases of the game
  - physical training adapted to the new dynamics of the game
  - transition based on optimal collaboration and cooperation
- the problems in the game can be solved by knowledge, intelligence and will
- good communication between players and technical staff through professional dialogues

**TRAINING METHOD**

- simplification method -reduced field games
  - reduced field games with numbers proportional to the size of the field
- official game simulation -11x11 game simulating the official game
  - 11x11 game simulating the principles of the game
  - 11x11 game simulating fixed moments in attack and defense
- important attitude and choice of intelligent solutions by players in training
- in the simulations, the necessary corrections are made, replaying permanently until success
- structures and exercise complexes that refer to both phases
- adversity games on antagonistic positions in the 1x1, 2x2, 3x3 relationship
- standard structures for deployed on different areas of land
- practice the positional game
- practicing the counterattack
- exercising the game in numerical superiority or inferiority for attack and defense

**Conclusions**

The transition is a modern game principle that implemented, trained and perfected determines the change of game dynamics, the change of the players' attitude in the phase of positive or negative transition but also of the training methods and training means used by the technical staff of a team.

The implementation of this modern game principle to be effective requires that the team to be composed of players who are liable to high intensity effort, who react quickly in the possession and non-possession phase, who have a high technical background attack actions at high speed, in a coherent and efficient way but which are able to instantly switch to the defensive attitude.

An important role is played by the interdependence between the physical factor, the technical factor, the tactical factor but also the mental of the players to facilitate their transition from an offensive to a defensive attitude and vice versa.

Also determining is the value and quality of the players of and the way in which they can apply this principle of play.

A major desideratum for the implementation and improvement of the transition is represented by the means and training methods used in the trainings.



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## **PARTICULARS REGARDING MOTOR LEARNING IN THE RUGBY GAME**

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### **Abstract**

The increased possibilities of thinking, as well as the richness and variety of knowledge acquired within the school determine restructuring in the methodology of sports training. It is the age when one can learn the perfect technique. It is possible and indicated to call for understanding, to explain the elements and implications of each motor act, the meaning and need to follow the advice given. The movements must be learned consciously, but this implies a clear, precise exposition of the principles of the exercises. Behavior towards the child must be tactful to counteract crises of shyness, anxiety, fear of not appearing ridiculous in front of members of the training group, resulting from incorrect execution of exercises. Encouraging, praising, breaking down complicated exercises into simpler exercises, which can be performed successfully, are as much as concrete work procedures.

A psychological indication, valid for all ages, is to conduct training in an atmosphere of optimism, understanding, friendship and sincerity.

**Keywords:** sport, fitness, coordination, physical exercise, biological parameter.

### **Introduction**

Post-puberty, also called adolescence, begins in boys at the age of 15 and lasts until the age of 19. During this period, the indicators of body growth register a progressive slowdown until stagnation. The increase in height is now replaced by the development of body segments. The muscles are well represented, being accompanied by a good neuromotor coordination and a capacity for learning, assimilation and learning, which is the basis for improving performance capacity. At this age, the second stage of improving motor performance appears, the emphasis being on the intensity of the effort. The balance of body proportions, reaching the adult level of biological and functional parameters, mental stability and intellectual level make this period the period of perfecting technique and acquiring all the physical qualities specific to a sport.

During this period, anaerobic alactacid effort is well tolerated because it addresses the nervous and muscular systems. If the reaction speed can no longer be developed at this age, other forms of manifestation of speed can be successfully improved based on increased muscle strength, coordination and improvement of technique. The post-pubertal stage is the best stage of developing strength and endurance. Exercise dosing restrictions occur only with respect to strong muscle contractions (maximal or supramaximal). From the point of view of strength, the development of intramuscular coordination and power begins, and after the age of 18 you can work to increase the maximum strength.

At this educational cycle there are great availabilities regarding the acquisition of specific procedures for sports branches and especially for sports games. So, the rapid learning of some branches of sport is a priority task of physical education.



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Around the age of 18, young athletes are characterized by a great instability of neuro-humoral regulation and coordination, which is reflected in the wide fluctuations of functional indices and causes an inconsistency of effort capacity.

In other words, we can consider the instability of the sports performances of these young people as a normal response of the body to the environmental requirements and, as such, the performance fluctuations are, from this point of view, justified. The younger the age of young athletes, the more attention must be paid to their training. Juniors need careful medical supervision and supervision. This measure results not only from the more pronounced instability of physiological indices, but also from the tendency of young people to overestimate their strengths.

The correct dosage of the effort, the strict observance of the age peculiarities of the juniors, the hygienic framework of the training, the differentiated and systematic medical control are the harmonious conditions of their organism, preparing them for the great subsequent performances.

In the management and scientific organization of performance sports activity, the systematic selection of talents is currently an increasingly important issue. In the future, in the context of the continuous increase of performances, the rationalization and optimization of the actions of early detection of children with special aptitudes for different branches of sports will directly and to a decisive extent condition the formation of great performers, of young people and technical-tactical mastery will further stimulate the interest and attention of the masses for the activity of physical education and sports.

As in other sports, and in rugby, of great importance in the training of future performance athletes, is the creation of a system of adequate means for optimizing both motor skills and technical-tactical training, which allows coaches and instructors to achieve goals established.

The study was carried out by the team of junior rugby players U 16 from the Aurel Vlaicu National College.

**Research tasks.** The realization of the preliminary research aims at validating the tests and the means that will be used in the research itself. The research aims to establish structures of means that will be applied to the experiment group, a battery of tests that will be applied in the actual research and the realization of a coherent training program.

During the research we went through the following steps:

- the realization of the research organization plan and the formation of the group of subjects necessary for the development of the research;
- selection of bibliographic sources customized on the chosen topic in order to adapt the information present to the purpose and premises of the research;
- stating the purpose and hypotheses of the research;
- elaboration of a training plan comprising specific means applied during the research;
- the selection of their tests, in order to start the research, as well as the selection of the athletes subject to the study;
- centralization and interpretation (graphs) of the obtained data and performance of a comparative analysis of the data obtained by the subjects subjected to the research;
- formulating the conclusions derived from the research.

**Research premises**

In conducting this study we started from the idea that the use of specific means can positively influence specific cues in order to educate and develop technical and tactical skills. According to her, the premises from which we started can be formulated as follows:



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- quantitative and qualitative optimization of the training process in accordance with current training trends internationally;
- in order to achieve the competitive performance potential, it is necessary to improve the training process by applying individualized training, valuable methodological experiences and the latest research in the field;
- programming and planning the content of the training in accordance with the morpho-functional particularities of the experiment group;
- establishing the entire training process by using the most appropriate means and working methods;
- optimizing the training of all players through the rational application of drive systems.

**Research hypothesis**

In order to objectify the research, we used, in addition to the game test, a technical-tactical test that. Currently, the control tests include tests that reflect both the physical training and the technical-tactical training of the athletes. However, it must be taken into account that the game of each athlete can be influenced by a whole series of factors: emotional state, state of the field, collaboration with partners, etc., which greatly prevents the presentation of his baggage of technical and tactical knowledge. In this idea we sought to eliminate all subjective factors for the athlete to display his technical knowledge.

In order to carry out the research, we formulated a series of hypotheses meant to provide a clear and precise direction on the aspects presented during this paper.

- the first hypothesis concerns the extent to which the selection and application of specific means contributes to the improvement of the technical-tactical level and aims at the possibility that the use of specific means has a greater impact on the education and development of technical-tactical skills.

- the second hypothesis presents the degree of effectiveness of the basic technical tests presented during the research in monitoring, measuring and improving the qualities of rugby players at the level of U16 juniors.

The research is carried out over a period of one year, during which time rationalized and standardized means applied in the basic research were applied. This year we tried to observe how the means selected by us influence the specific parameters of preparation of the experiment group, optimal programming and planning.

The research took place during the 2017-2018 school year and began with the initial testing. The final test was performed at the end of the stage, under the same conditions and using the same tests as in the initial test.

The subjects who participated in the research were 22 athletes aged 15-16 years, athletes members of the junior team.

The trainings were planned daily from Monday to Saturday, their duration varying between 70 minutes and 120 minutes depending on the training theme.

The control tests at which the athletes were tested were the following:

- 50m running test
- 10x5m shuttle run
- tractions
- Sargent test
- knee flexion test
- 1000 m running test



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Table 1. Athletes' results on initial testing

| No.<br>No. | 50m running test | shuttle<br>running<br>10x5m | traction | Sargent test | knee flexion<br>test | 1000 m<br>running<br>test |
|------------|------------------|-----------------------------|----------|--------------|----------------------|---------------------------|
| 1          | 7.10             | 25                          | 1        | 32           | 29                   | 3.80                      |
| 2          | 8.53             | 34                          | 1        | 20           | 26                   | 4.50                      |
| 3          | 9.14             | 38                          | 0        | 17           | 27                   | 4.60                      |
| 4          | 8.64             | 38                          | 0        | 22           | 48                   | 4.55                      |
| 5          | 9.35             | 40                          | 11       | 19           | 48                   | 4.65                      |
| 6          | 7.59             | 24                          | 5        | 28           | 49                   | 3.70                      |
| 7          | 7, 59            | 25                          | 5        | 28           | 40                   | 3.75                      |
| 8          | 7.50             | 24                          | 13       | 36           | 24                   | 3.50                      |
| 9          | 7.38             | 27                          | 6        | 33           | 28                   | 3.45                      |
| 10         | 7.85             | 25                          | 5        | 37           | 25                   | 3.65                      |
| 11         | 7.25             | 28                          | 14       | 49           | 27                   | 3.55                      |
| 12         | 7.12             | 30                          | 14       | 47           | 42                   | 3.40                      |
| 13         | 7.20             | 30                          | 15       | 44           | 39                   | 3.55                      |
| 14         | 7.10             | 32                          | 10       | 50           | 35                   | 3.50                      |
| 15         | 5.90             | 20                          | 25       | 30           | 45                   | 3.40                      |
| 16         | 6.99             | 22                          | 20       | 44           | 2. 3                 | 3.55                      |
| 17         | 7.00             | 27                          | 15       | 49           | 36                   | 4.00                      |
| 18         | 7.41             | 28                          | 13       | 49           | 41                   | 4.15                      |
| 19         | 5.95             | 21                          | 14       | 35           | 42                   | 3.60                      |
| 20         | 5.90             | 21                          | 6        | 46           | 2. 3                 | 3.55                      |
| 21         | 6.52             | 24                          | 8        | 48           | 39                   | 3.75                      |
| 22         | 6.72             | 26                          | 7        | 48           | 46                   | 3.90                      |

Table 2. Athletes' results in the final test

| No.<br>No. | 50m running test | shuttle<br>running<br>10x5m | traction | Sargent test | knee flexion<br>test | 1000 m<br>running<br>test |
|------------|------------------|-----------------------------|----------|--------------|----------------------|---------------------------|
| 1          | 7.00             | 22                          | 1        | 40           | 34                   | 3.65                      |
| 2          | 8.50             | 33                          | 1        | 20           | 31                   | 4.30                      |
| 3          | 9.00             | 38                          | 0        | 18           | 30                   | 4.50                      |
| 4          | 8.58             | 37                          | 1        | 27           | 55                   | 4.20                      |
| 5          | 9.27             | 40                          | 15       | 21           | 54                   | 4.40                      |
| 6          | 7.50             | 22                          | 7        | 35           | 56                   | 3.50                      |
| 7          | 7.50             | 2. 3                        | 6        | 36           | 49                   | 3.65                      |
| 8          | 7.50             | 2. 3                        | 16       | 42           | 28                   | 3.35                      |
| 9          | 7.33             | 24                          | 7        | 40           | 36                   | 3.35                      |



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|    |       |      |    |    |    |      |
|----|-------|------|----|----|----|------|
| 10 | 7, 59 | 24   | 6  | 46 | 33 | 3.50 |
| 11 | 7.25  | 24   | 17 | 53 | 37 | 3.40 |
| 12 | 7.11  | 26   | 15 | 51 | 49 | 3.35 |
| 13 | 7.13  | 25   | 15 | 50 | 47 | 3.40 |
| 14 | 7.07  | 28   | 12 | 56 | 44 | 3.35 |
| 15 | 5.85  | 20   | 27 | 40 | 50 | 3.30 |
| 16 | 6.90  | 21   | 20 | 51 | 30 | 3.40 |
| 17 | 6.90  | 25   | 15 | 56 | 44 | 3.90 |
| 18 | 7.38  | 25   | 15 | 57 | 49 | 4.05 |
| 19 | 5.91  | 20   | 15 | 45 | 49 | 3.55 |
| 20 | 5.90  | 21   | 6  | 51 | 35 | 3.40 |
| 21 | 6.50  | 2. 3 | 9  | 54 | 46 | 3.60 |
| 22 | 6.71  | 24   | 10 | 55 | 50 | 3.80 |

Table 3 Average results of initial testing and final testing

| No | Running speed 50 m |      | Running 10X5m |       | Traction in the arms |       | Test Sergeant |       | knee flexion |       | 1000m endurance running |      |
|----|--------------------|------|---------------|-------|----------------------|-------|---------------|-------|--------------|-------|-------------------------|------|
|    | IT                 | TF   | IT            | TF    | IT                   | TF    | IT            | TF    | IT           | TF    | IT                      | TF   |
|    | 7.34               | 7.27 | 27.68         | 25.81 | 9.45                 | 10.72 | 36.86         | 42.90 | 35.54        | 42.54 | 3.82                    | 3.67 |

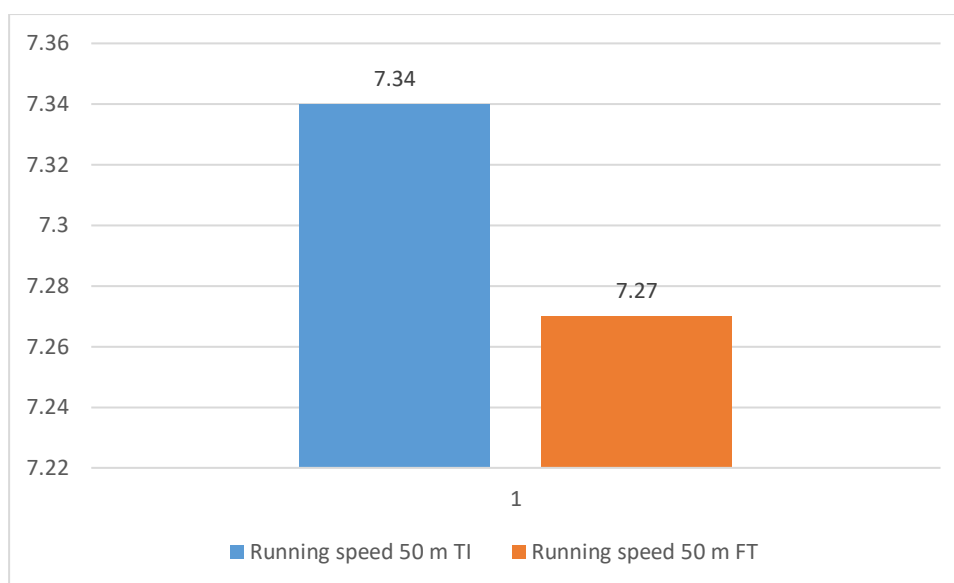


Fig.2 Graphical representation of the averages of the results at the initial test and the final test at the 10x5m running test



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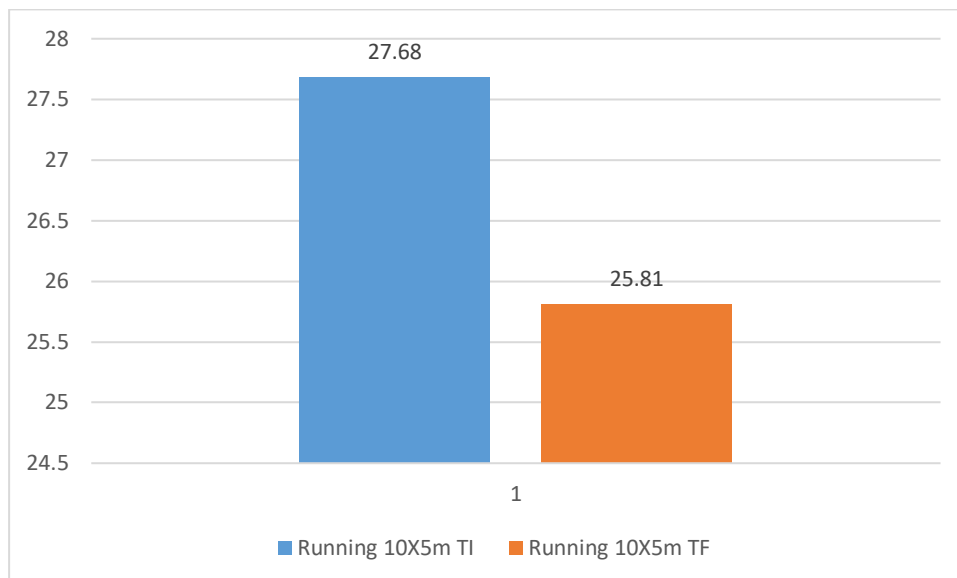


Fig. 3 Graphical representation of the averages of the results at the initial test and the final test at the arm traction test.

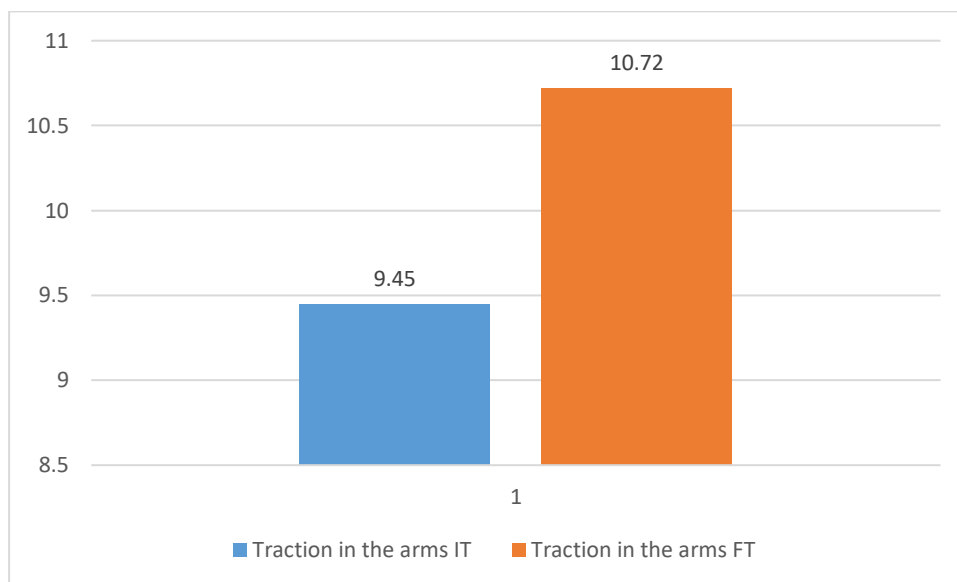


Fig.4 Graphical representation of the averages of the results at the initial test and the final test at the Sargent test.





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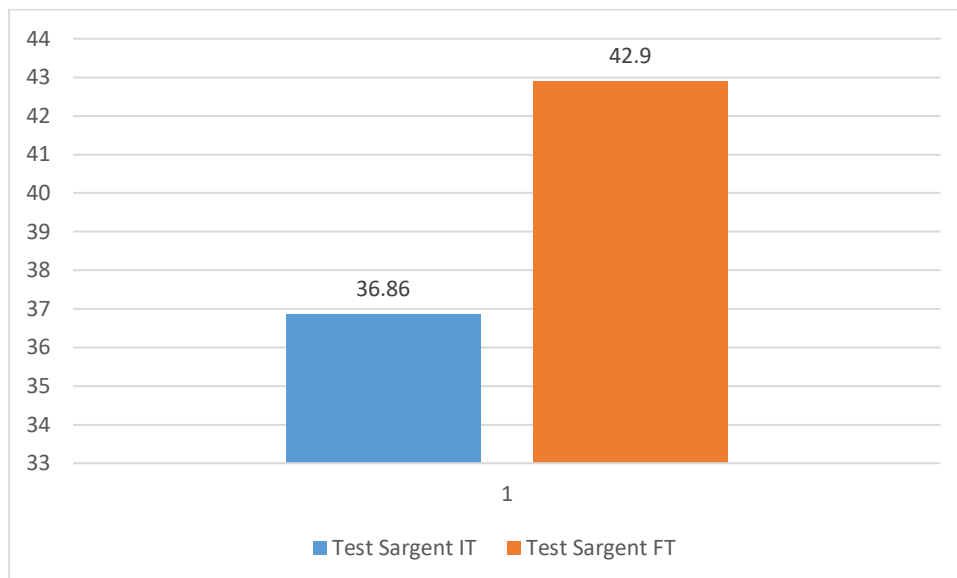


Fig.5 Graphical representation of the averages of the results at the initial test and the final test at the knee test

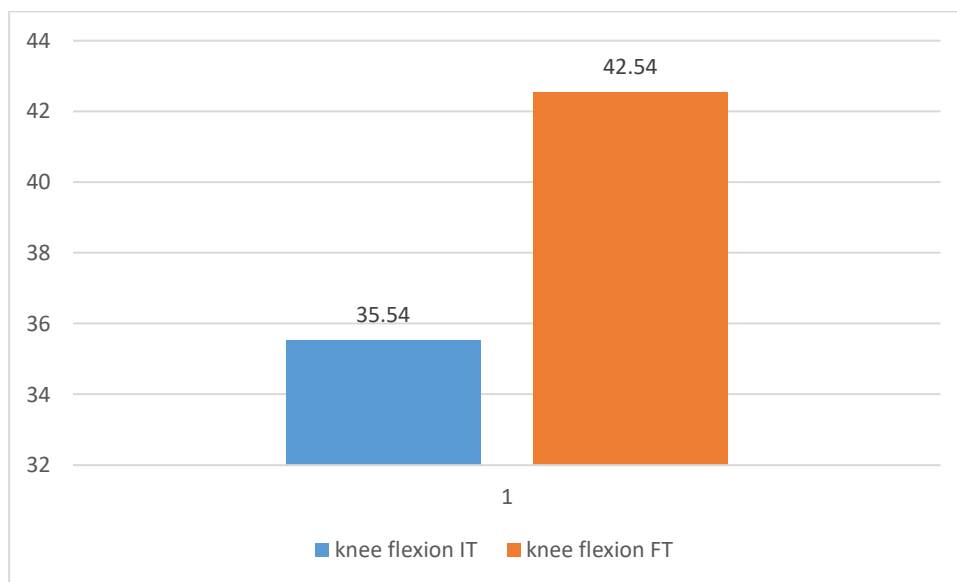
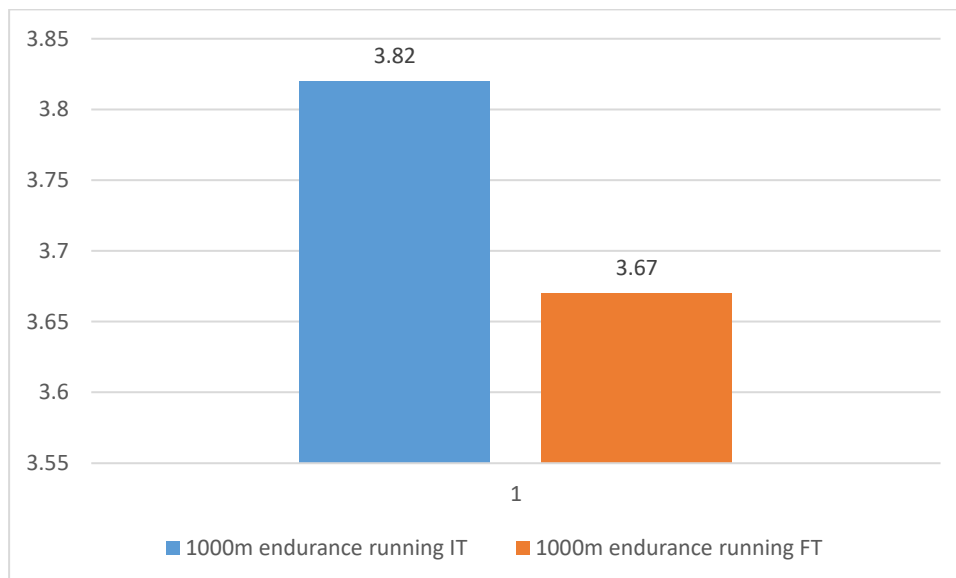


Fig.6 Graphical representation of the averages of the results at the initial test and the final test at the 1000m endurance running test



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### Results

- the evolution of the averages in the case of their samples , between the initial test and the final test, is positive. We mention that the relevant progress between the two tests is quantitative.
- the level of homogeneity of the group of subjects improved between the initial testing and the final testing, fact revealed by the results of the indicators.
- the distribution of the results around the average is in most cases positive.

### Conclusions

We can say that research conducted on rugby players shows that the morphological changes in biological evolution have improved both the effort capacity of athletes and the general condition of the entire musculoskeletal system.

Moreover, medical knowledge has a very important role in the scientific organization of the process of practicing physical exercises.

Through this paper we have highlighted certain peculiarities of rugby players from an anatomical and functional point of view. In order to highlight these particularities, I chose to present information on the origin and formative value of this sport, as well as aspects that highlighted the considerable evolution of rugby. Through this, we have managed to maintain a high standard of sportsmanship, ethical behavior and fair play.

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## **THE IMPACT OF DIGITALIZATION AND ON LINE ACTIVITIES IN SCHOOL PHYSICAL EDUCATION**

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### **Abstract**

The speed with which new tools are being created in the field of digital applications dedicated to sports is very alert. As well as the speed with which the sports consumer market is willing to accept them, try them and then use them regularly. Perhaps it should be mentioned the speed with which some of these products "burn" (disappear) in competition with the new ones. We can speak of a rapid cannibalization between the products of the same company or between competing companies. When we talk about **digitalization or digital transformation** we consider this definition: "the adoption of digital technology to transform practices, services or businesses, through replacing non-digital or manual processes with digital processes or replacing older digital technology with newer digital technology. Digital solutions may enable – in addition to efficiency via automation – new types of innovation and creativity, rather than simply enhancing and supporting traditional methods" ( [www.wikipedia.org/wiki/Digital\\_transformation](http://www.wikipedia.org/wiki/Digital_transformation))

**Key words:** digitalization, SWOT analyses, physical education

### **Introduction**

An eloquent example is the speed with which EXi (a company that creates applications designed to help people who have been ill for long periods of time) has developed a recovery program for people who suffered from COVID-19 virus. According to [www.fittechglobal.com](http://www.fittechglobal.com), EXi co-opted Muir Gray, a renowned British specialist, to design this program, which includes movement-based recovery sessions for those recovering from COVID-19 infection. In the first 12 weeks the sessions are limited to low or medium intensity exercises and if the clients present a good state of health, EXi also unblocks the exercises that require a high intensity. Two things are worth mentioning here:

1. EXi is a company **accredited in the design of digital applications for patients** (accredited by the NHS - National Health Service, a British organization, funded by public funds, and has the ability to certify such software companies).
2. EXi **already deliver** this kind of service with real results. It could be a model to follow for Romanian authorities and third party companies with competencies in IT, fitness or health domains.

In analyzing the opportunity offered by the digitalization in PE, our study takes into account the statements made in the introduction of the second edition of the book **"Telling isn't training"** published in 2011 by the **American Society For Training And Development** which states: "To summarize the conclusions of hundreds of studies, we will tell you that the **effectiveness of teaching** messages is NOT related to the way they are taught, but rather to the way the messages themselves are **designed**. The didactic message meant to transform you, will reach its goal or not, depending on the quality of its conception, not on the fact that we send it to you face to face, through this book, with the help of a video material or via internet." Knowing this we can focus on sports and PE specific context.



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**1. Digitization in the field of sports and physical activities:**

Why take advantage of technology in the field of **physical activities**?

What are the **sports-related areas** impacted by digital technology today?

At the first question we can argue that is no doubt that technology has transformed, and will continue to transform, businesses across many industries, radically altering all the parts involved in a specific domain. The sports industry, in particular, is undergoing rapid upheaval, and digital technology is unlocking unprecedented opportunities for development. In order to fully capitalize on those opportunities, sports organizations will likely need a **digital overhaul**. "Doing digital" is not enough: They will have to implement digitalisation in every aspect of the **processes, in trainings, in transforming people, educate coaches, businesses and sport gear**.

Going through any kind of organizational transformation is not to be taken lightly. But given the significant opportunities that exist for sports organizations, the undertaking is well-worth considering. These opportunities fall into five categories:

**1. Expansion of sport customer market**

Technology is playing a larger role than ever in the lives of fans, opening the way for sports organizations to create new, innovative customer experiences. Partnering with broadcasters and new distribution platforms can give fans the experiences they want, and capture viewership across multiple devices, including mobile. The rise of the smartphone and the tablet may have contributed to an erosion in live game attendance, as more people switch to live streaming. Attendance for the National Basketball Association (NBA) has declined since the 2012 season. At the same time, over-the-top (OTT) platforms are emerging as the new engine for growth: While the NFL has seen a drop in TV ratings, fans streaming NFL games increased 25 percent in 2017. Ultimately, digital optimization of content across platforms will help to expand content reach for sports organization.

**2. Improve and control fan experience**

Many sports fans are no longer interested in the game alone—they crave the kind of exclusive and shareable experiences that can be amplified by technology. Sports organizations could grow stadium attendance by using immersive technologies such as augmented and virtual reality to create an intensely exciting viewing experience. They can also increase engagement by leveraging loyalty and customer relationship management data to tailor experiences to individual fan preferences.

**3. Engage sponsors**

Through new technologies fans are interacting with sport media more than ever before. Main channels are: **audio consumption, TV viewership, and application usage**. Connecting this with the fact that sports fans are increasingly receptive to personalized engagement, and therein lies a world of opportunity. Targeted advertisements are reported to be **twice as effective** on average as non-targeted ads: **60 percent** of millennials would willingly share their data for coupons or promotions, and **71 percent** of consumers would rather see ads focused on their interests. (*Abramovich, Giselle. "Ad Targeting," CMO, 16 July 2014*). Digital analytics allow for a better understanding of what excites fans, giving sponsors insight into what types of ads and engagement models work for individual audiences. Digital tools can also provide sponsors with more information about fans so that they can tailor the timing, content, and delivery of messaging for greater effectiveness.

**4. Create new streams of revenue**

In a world where big data predominates, sports organizations can mine fans' data to better understand their habits, preferences, and demographics, ultimately unlocking new revenue streams by reaching fans in



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innovative ways—for example, by adding new services to existing offerings. They can also use data to improve core business operations, build and solidify partner relationships, and even develop entirely new business models. But perhaps even more compelling is the direct monetization of anonymized data through external products and solutions. In fact, today, one third of all companies are commercializing or sharing their data to create new revenue streams. **Four ways that sports organizations can enter the game include:**

- Selling raw data through an established exchange
- Selling persona and device ID data on ad exchanges
- Media activation based on customer contextual data (in-home/out-of-home)
- Selling of raw or interpreted statistical analysis of sport games (as data collected from tennis games by **hawk eye technologies**)

**5. Transforming the workplace and the work experience**

In order to build digital capabilities, sports organizations need to not only **integrate digital talent** but also give their **employees digital skillsets** through ongoing training and access to equipment. This will help them to observe the problem through a digital lens. In Romania this will be a very difficult challenge because we are far behind other countries in this domain. We don't have a statistic on how many people are hired in public sector or private to collect, analyzes and interpret this kind of data. In sports universities we only have one or two courses based on digital skills in sports field. Compared to Germany where is already a field of undergraduate studies in **e-sports management** at the University of Applied Management (UAM). UAM is Bavaria's largest private university, the headquarters are in Munchen. This program deepens topics such as:

- Management of e-sports –teams
- Event management in e-sports domain
- Marketing in e-sports domain
- Digital innovation in domain of gaming

In addition we can find a **research institute focused on e-sports** established in 2019 also in Germany ([www.institut-esports.de](http://www.institut-esports.de)).

**The very existence of this type of organization could be a warning sign about the ways sports field will expand in the future.**

**2. Context of on line physical education classes**

Observing the long introduction from above, we can see that the priorities of today society focus more on business development and search for profit than on education (physical education to be more specific). **This situation creates a gap who needs to be covered and this is the purpose of this paperwork.**

Trough on line **physical educations (PE)** classes the teacher is on “another planet” compared to face to face PE classes. With all the novelty and many problems they succeed to organize the class and make kids move and enjoy the sport hour. Even if they have been forced to teach online classes (due to quarantine), this can turn into an advantage and should reap all the benefits of online teaching for a better, more performant education. In such a short period (under 4-6 month) we can see working together the following:

- Hardware capabilities (router; internet connection; laptop or tablet, cameras)
- Dedicated on line applications (Zoom, Teams, Skype)
- Computer software (Windows, IOS)
- Adapted tools for classes (tennis balls; water bottle; rope; etc)
- Adapted physical exercises – instructed vis internet
- Happy kids who are performing PE exercises





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The objective of this paper work is to elaborate a framework for the future of physical education classes after the pandemic of COVID – 19 will be under control and we will meet in a safety environment. We think that is plenty **advantages to transfer** in the future and a few **threats that we can avoid** by conducting a SWOT analyze regarding digitalization and PE classes.

### **2.1 Method used**

**SWOT analysis** (short description from [www.wikipedia.com](http://www.wikipedia.com))

“SWOT is an acronym from **Strengths, Weaknesses, Opportunities** and **Threats**. This is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or project planning.

This technique, which operates by 'peeling back layers of the company is designed for use in the preliminary stages of decision-making processes and can be used as a tool for evaluation of the strategic position of organizations of many kinds (for-profit enterprises, local and national governments, NGOs, etc.). The first and most important step is to determine Internal and external factors.

**Internal factors** are viewed as **strengths or weaknesses** depending upon their effect on the organization's objectives. What may represent strengths with respect to one objective may be weaknesses (distractions, competition) for another objective. The factors may include personnel, finance, manufacturing capabilities, etc.

**External factors** include macroeconomics, technological change, legislation, and sociocultural changes, as well as changes in the marketplace. SWOT analysis is a method of categorization for which lists are compiled, uncritically and without prioritization, rather than seeking important factors to achieving objectives; weak **opportunities** may appear to balance strong **threats**.

SWOT analysis can be used in any decision-making situation when a desired end-state (objective) is defined, not just profit-seeking organizations. SWOT analysis may also be used in creating a recommendation during a viability study/survey and is presented in a 2/2 matrix format.”

### **STRENGTHS**

1. Very good internet signal (Romania is in the top 3 among European countries in terms of internet transmission speed)
2. In Romania we have a large number of IT professionals (companies, programmers, free lancers, etc)
3. Easier adaptation to the student's needs
4. Ability to monitor and archive data (related to body weight, health, fitness, etc.) related to students and the ability to view in a graph the evolution of his condition.
5. In the future, effort monitoring methods (electronic bracelet) can be used, which become very affordable during physical education classes. Thus, the coach has a feedback on the effect of the applied exercises.

### **WEEKNESES**

1. Poor internet infrastructure in rural areas
2. Equipping children with deficient tablets in rural areas
3. People's resistance to change
4. Dependence on the method of things over which they have little control (electricity, computer and software operation, internet signal)
5. Fear of losing jobs



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| STRENGTHS                                                                                                                                                                                                                                                                | WEAKNESSES                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Very good internet signal</li> <li>2. IT professionals in Romania</li> <li>3. Easier adaptation to the student's needs</li> <li>4. Ability to monitor and archive data</li> <li>5. use of effort monitoring methods</li> </ol> | <ol style="list-style-type: none"> <li>1. Poor internet in rural areas</li> <li>2. Lack of tablets or computers</li> <li>3. Resistance to change</li> <li>4. Dependence of facilities</li> <li>5. Fear of losing jobs</li> </ol> |
| OPPORTUNITIES                                                                                                                                                                                                                                                            | THREATS                                                                                                                                                                                                                          |
| <ol style="list-style-type: none"> <li>1. Credits</li> <li>2. Conditions</li> <li>3. Options</li> <li>4. Flexibility</li> <li>5. Reduce bullying situations</li> <li>6. Personalized program</li> <li>7. Talent selection</li> <li>8. More PE activities</li> </ol>      | <ol style="list-style-type: none"> <li>1. Boomerang effect.</li> <li>2. Job cuts</li> <li>3. Less socialization.</li> </ol>                                                                                                      |

Table 1. SWOT analysis regarding digitalization on PE class

### OPPORTUNITIES

1. **Credits.** For kids and students in some countries is necessary to take a number of credits for attending PE classes, so it will be a benefit for them to attend on line PE classes in order access those credits.
2. **Conditions.** Taking PE at school is a hard task for some students. Getting sweaty during the school day, dealing with lack of showers or locker room issues, (in Romania we experience a lot of these conditions) or even exercising in a group environment can be **uncomfortable**. Being able to work on a course on your own place, from the security and comfort of your home or just about any location is a huge opportunity.
3. **Options.** Being able to **choose your physical activities** is another advantage. When students choose activities they enjoy, they are more likely to **get started and stick** with it over time. This sets students up for a continuous healthy lifestyle—which is, after all, the goal of a quality physical education. Students may pick and choose their own activities. PE teacher can focus on health-enhancing levels of physical activity (cardio, strength, and flexibility) and students can pick and choose their preferred activities in order.
4. **Flexibility.** Although students do focus on their muscular flexibility (as well as cardiovascular health and muscle strength) here we are referring to situational flexibility here. Students have the flexibility to work on their courses **anytime anywhere**, all they need is internet access. While students are encouraged to complete class work on a **regular basis**, there are **no set times a student has to be online**. Students can work at their own pace—as fast or slow as needed. In completing the physical activity requirement, as noted, they have the flexibility to choose **when, where, and how they want to exercise**. And maybe a new feature in software will help them choose even with **whom they will practice** (preferably colleagues from the same class or school).



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**5. Reduce bullying situations.** This new feature (mentioned above) will reduce the chance of bullying situation – a important cause in PE activities drop out. Even though we should stay alert on this because of this new form of discrimination – cyber bullying!

**6. Personalized program.** Choosing when, where, and how to exercise are an important part of a individualized PE program. This kind of courses are student-centric and goal oriented. Students establish their base level of fitness, set personalized goals for improvement, and, with structured guidance, develop their own exercise program. They regularly track their milestones and successes. There is **no comparison to other students' fitness levels or progress**. Throughout a course students also learn about the principles of fitness and how to train properly. They analyze how those principles apply directly to themselves and learn how to adjust their program as needed.

Even students with **academic or physical limitations can still participate** in a online PE class, as the requirements can be adjusted to cater to these specific needs. In addition to developing a personalized program, students are supported by highly qualified instructors—kind of like having **your own online personal trainer** to provide motivation and assistance.

**7. Talent selection.** After a period of time collecting data about athletes we can observe some outstanding performances which can lead to a better selection of talented athletes.

**8. More PE activities.** A mix of face to face (traditional) PE classes with on line PE classes can lead to a multitude of benefits:

1. More hours spend doing sport
2. Possibility of MOTOR SKILL assessment at the face to face PE classes
3. Possibility to learn specific sport skills (football, volley, tennis, etc.) at the face to face PE classes and train motor skills (strength, flexibility, conditioning) at home

### **THREATS**

**1. Boomerang effect.** The classes lead to a more sedentary population (for example, we can observe situations of students in the USA who can receive the credits requested from PE only by simply participating in some courses on nutrients - organized online). **So no movement at all!**

**2. Job market.** Offering online courses and classes that can be recorded and played countless times. This can lead to job losses for physical education teachers, maybe even coaches especially on private companies focused on cutting costs in order to enhance **profit**.

**3. Less socialization.** A technology mediated meeting can lead to a less socialization in a PE class.

### **3. Conclusions and recommendations**

The period of the pandemic with the isolation brought, forced us to find solutions for the online PE classes. We should take advantage of what we have learned so far and introduce into the future organization system the experience gained during this period. **The digital skills newly learned by the teacher must be maintained and perfected.**

This is not a call for **online PE classes** to the exclusion of **traditional PE classes**. Outstanding traditional PE teachers and classes are out there waiting in Gyms or sport halls, to be sure. The majority of students are successful in their traditional high school PE class. Many teachers will blend their traditional classes with online materials and the latest technology tools related to their content area; for those in physical education who are not, there are effective teaching practices in the online venue that can enhance the traditional PE setting for students. In order to continue to improve education methods, it can only help to learn all we can about **effective teaching and learning practices in the online environment**.



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This study has meant to add to the dialogue, with information about the **Strengths and Weaknesses** of educational environment and more important about **Threats and Opportunities** we can observe in applying online PE class. **After seeing the opportunities revealed by the SWOT analyze we can definitely say that a blend of on line and face to face PE class will bring a lot of benefits to the students and to physical education field of study.**

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## **DIE AUFGABEN UND ZIELE DES SPORTUNTERRICHTS AN WEITERFÜHRENDEN SCHULEN/**

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Die Aufgaben und Ziele des Sportunterrichts an weiterführenden Schulen

Fußballspezifische Spielformen als Alternative zum Erreichen der im Rahmen des Sportunterrichts bestehenden Ziele

In der gemeinsamen Erklärung für die Bedeutung des Schulsports für Lebenlanges Sporttreiben, verfasst von Prof. dr. Johanna Wanka, Manfred von Richthofen und Thomas Rowekamp, wird die Wichtigkeit des Schulsports wie folgt beschrieben:

„Der Schulsport ist ein unverzichtbarer Bestandteil umfassender Bildung und Erziehung.

Er soll bei allen Kindern und Jugendlichen die Freude an der Bewegung und am gemeinschaftlichen Sporttreiben wecken und die Einsicht vermitteln, dass kontinuierliches Sporttreiben, verbunden mit einer gesunden Lebensführung, sich positiv auf ihre körperliche, soziale, emotionale und geistige Entwicklung auswirkt. Gleichzeitig soll Sport in der Schule Fähigkeiten wie Fairness, Toleranz, Teamgeist, Mitverantwortung und Leistungsbereitschaft fördern und festigen. Als einziges Bewegungsfach leistet der Sportunterricht seinen spezifischen Beitrag für eine ganzheitliche Persönlichkeitserziehung.“

Der Sportunterricht in den weiterführenden Klassen baut die in der Grundschule gesammelten Bewegungserfahrungen aus.

Die besondere Bewegungsfreude und Geschicklichkeit der Schülerinnen und Schüler in den Jahrgangsstufen 5 und 6 sind günstige Voraussetzungen, ihnen ein möglichst breites und differenziertes Angebot an Sportbereichen und Sportarten zu unterbreiten.

Dabei muss jedoch die einsetzende Pubertät, die psychisch und physische Auswirkungen auf die Schüler haben kann, berücksichtigt werden.

Individuelle Belastungsdosierung, unterschiedliche Organisationsformen des Unterrichts und das Angebot zur Mitgestaltung der Lernsituation, kommen den Schülern hierbei entgegen.

Es sollten bewusst Arbeitsformen gewählt werden, in denen die Schüler Verantwortung für ihre Mitschüler übernehmen können.

Im Verlaufe der Pubertät kommt es bei den Schülerinnen und Schülern zur Ausbildung ihrer individuellen Erscheinung und meist zu einer Änderung ihrer Interessen.

Daher sollte eine zunehmende Spezialisierung vorrangig in den späteren Klassen oder im außerunterrichtlichen Schulsport geschehen.

Unter Berücksichtigung dieser allgemeinen Grundregeln und der damit zusammenhängenden altersgemäßen Voraussetzungen, ergeben sich Ziele, die für den Sportunterricht an gymnasialen Klassen von Bedeutung sind.

Im Folgenden sind die wichtigsten Ziele des Sportunterrichts an gymnasialen Klassen aufgelistet und Punkte, die mir besonders wichtig für meine Abschlussarbeit erschienen, wurden weiter ausgeschrieben.



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- Unterschiedliche Auswirkungen von sportlicher Betätigung auf die Gesundheit erkennen und beurteilen.

Im Sportunterricht sollten Situationen gestaltet werden, die die physiologischen Prozesse wie Atmung oder Muskularbeit bewusst werden lassen, die Willenskraft herausfordern und das Gefühl des Wohlbefindens vermitteln.

Auch Fragen der Körperhygiene und Ernährung stehen im engen Zusammenhang mit der Durchführung von Sport.

- Sportspezifisches Verhalten erlernen

Es sollten vermehrt Übungen angeboten werden, die die Zusammenarbeit von mehreren Schülern erfordert.

Übungen, die ein individuelles Konkurrenzverhalten verstärken und begünstigen, müssen reduziert werden und Wettkämpfe sollten auf Mannschaftsebene verlagert werden.

Dabei sollten Zielsetzungen vorgegeben werden, die die Verbesserung der eigenen Leistung über den Sieg im Wettkampf stellt.

Anforderungen müssen durch ein differenziertes Lernangebot so gestellt werden, dass alle Schüler ihren Möglichkeiten entsprechend befriedigende Aktivitäten im Sport ausführen und erfolgreich sein können.

- Individuelle motorische Eigenschaften (Kraft, Schnelligkeit, Ausdauer, Beweglichkeit und koordinative Fähigkeiten) verbessern
- Die Handlungsfähigkeit im Spiel entwickeln

Eine allgemeine Spielfähigkeit wird in der Grundschule vorbereitet.

In den Jahrgangsstufen 5-8 sollen die Schülerinnen und Schüler befähigt werden,

- sich an Sportspielen beteiligen zu können, das heisst technische und taktische Grundsituationen eines Sportspiels zu beherrschen,
- Sportspiele selbst organisieren zu können (Festlegung von Regeln, Einigung über Spielfeldgröße, Mannschaftsstärke, Übernahme von Spielerrollen, Schiedsrichtertätigkeiten ...)
- systematisch zu üben und zu trainieren.

Das Spielen selbst sollte jedoch im Vordergrund stehen und das methodische Vorgehen bestimmen.

Damit das Spielverständnis und das Zusammenwirken der Mannschaftsteile verbessert wird, sollten Spielgruppen über längere Zeit zusammen spielen.

Ein Spiel von etwa gleichstarken Mannschaften, führt auf Dauer für alle zu befriedigenden Ergebnissen.

Die Unterstützung schwacher Mitspieler und deren Integration in das mannschaftliche Zusammenspiel sind anzustreben.

- Richtiges Verhalten in den natürlichen Sportstätten erlernen





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- Sportliche Aktivitäten organisieren und variieren und dabei Schuler zu selbständigem Sporttreiben hinführen
- Sporterfahrungen der Grundschule ausbauen und weitere Sportarten kennen lernen
- Zu bewusstem Sporterleben hinführen

Über das Beherrschen motorischer Eigenschaften und Fertigkeiten hinaus, sind Kenntnisse und Erfahrungen über die Wirkungen von gezielten Trainingsprozessen besonders wichtig.

Fußballspezifische Spielformen als Alternative zum Erreichen der im Rahmen des Sportunterrichts bestehenden Ziele.

Fußball ist eine der bekanntesten und beliebtesten Mannschaftsportarten der Welt und auch fester Bestandteil der Gesellschaft. Dieser Sport erfreut sich nicht nur einer überaus großen Sportgemeinschaft, sondern ist darüber hinaus ein bedeutsamer Publikumsmagnet.

Deshalb ist der Sport, bei der Jugend geläufig und überdurchschnittlich beliebt.

Fußball wird im Sportunterricht und auch abseits der Sporthalle häufig gespielt.

Für Kinder und Jugendliche, ist Fußball häufig mehr als ein strategisches und zweckrationales Handeln in Mannschaften mit vorgegebenen Regeln auf normierten Plätzen.

Neben der herkömmlichen Thematisierung dieses Sports, bieten sich noch weitere Möglichkeiten Fußball im Unterricht zu inszenieren.

Spielsportarten im Allgemeinen und Fußball aufgrund seiner großen Beliebtheit verfügen über einen hohen motivationalen Charakter. Diese Eigenschaft kann vor allem in einem Konditionstraining positiven Einfluss auf das Engagement der Sportler haben.

In einem Schnelligkeitstraining zum Beispiel, ist eine maximale Motivation entscheidend für den Erfolg des Trainings.

Schnelligkeitstraining mit submaximalen Belastungen führt nicht zu den gewünschten Anpassungserscheinungen und Leistungssteigerungen bei Schüler und Sportlern.

Die Ausführung schneller Bewegungen ist eine zentrale Leistungsvoraussetzung vieler sportlicher Disziplinen.

Doch weil dieser Sportsport das Potential bietet, die entsprechenden Rahmenbedingungen für ein erfolgreiches Schnelligkeitstraining zu schaffen, können Sportart und Zielsetzung des Trainings gemeinsam einen idealen Zugang zur Auseinandersetzung mit dem Körper und seines Leistungsvermögens für die Schüler darstellen.

Des Weiteren wird die gestaltete Unterrichtseinheit die Vermittlung gesundheitsrelevanter Inhalte ermöglichen und ein Bewusstsein für die Bedeutung des Sports für einen modernen, aktiven und gesunden Lebensstil schaffen.

In Zeiten zunehmenden Bewegungsmangels ist deshalb eine Rückbesinnung auf kleine Fuß-Ball-Spiele, die den Interessen und Wünschen möglichst vieler Schüler stärker Rechnung tragen, nicht nur sinnvoll, sondern notwendig.



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Für den Stellenwert des Fußballs im Schulsport wird deshalb in Zukunft nicht zuletzt entscheidend sein, ob und in welchem Ausmaß es gelingt stärker als bisher die kleinen Fuß-BallSpiele an Stelle des normierten Wettkampfspiels Fußball zum Gegenstand des Unterrichts zu machen.

Fußballspiele sind dazu geeignet, Schülern sowohl in ihrer allgemeine Spielfähigkeit zu fördern, als auch konditionell und physisch auf das Wettkampfspiel Fußball in den höheren Jahrgangsstufen vorzubereiten.

Zu oft wird der Unterricht darauf beschränkt eine Schulklasse in zwei Mannschaften aufzuteilen und spielen zu lassen.

In der Regel sind viele Schüler damit überfordert und Unfälle oder Missverständnisse werden geradezu provoziert.

Für den „Fußballunterricht“ sind spielerisches Üben und Vorbereiten unverzichtbar, deshalb könnten sich Übungs und Spielformen sich optimal zur Verbesserung der motorischen Fähigkeiten eignen.

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## **KINESIOTHERAPY IN KNEE SPRAINS OF ELITE FOOTBALL PLAYERS**

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### **Abstract**

It is also important to monitor the diagnosis of the training level and the current biological balance of the athlete, based on the conclusions drawn from the cardiovascular tests performed in standard effort and according to the assessment of some biomechanical indicators and thus we tried to highlight as many notions as possible presented in the theoretical part, which we hope to provide a real and general image of the different factors involved in sports traumatology and of some methods of injuries prevention.

**Key Words:** diagnosis, injuris, traumatology, preventive measures.

### **Introduction**

The variety and multitude of sports branches, the special demands imposed on these ones determine a diverse and extended range of diseases whose treatment must be targeted, in order to achieve the complete and rapid recovery of the functional capacity of the injured segment. "Thus, the main objective of sports traumatology is not only the treatment of traumatic diseases in reversible stage but especially the prevention of their occurrence by diagnosing and administering treatment in the preclinical stage. These principles also apply to meniscus injuries which, if properly treated, enable the athlete reintegrate into the competitive activity as soon as possible. Knowing the causes that can lead to injuries in different sports is particularly important not only for determining the diagnosis but mostly for finding preventive measures."

Sports activity involves the risk of injury which is generated by known causes such as the improper method of training, deficits in effort dosing and even the accidents, the latter being the most common. The identification and treatment of the preclinical forms, the therapeutic conduct, the recovery of the athlete are just a few ideas to be taken into consideration in order to find viable solutions to improve performance.

Injury prevention can be done by determining and eradicating the contributing factors (low concentration of Ca<sup>+</sup>, Mg<sup>+</sup>, reduced circulation, viroses, inadequate sports equipment, improper material resources, errors of training), by prophylactic exercises introduced in the training programs for increasing the elasticity of articular and periarticular structures (primary prophylaxis), as well as by the correct treatment and recovery of the injuries (secondary prophylaxis), thus reaching the full solving. The specialized training must be reconsidered and focused on the prevention of trauma. Theoretically, all musculoskeletal injuries can be prevented through a properly initiated and conducted training and through an adequate physical training.

In order to include in the training process some specific exercises for the high risk areas, meant to increase the flexibility and mobility, to strengthen the joints and prevent the injuries, it is absolutely mandatory to know the factors and mechanisms of injuries occurrence.

Sports training programs must be adapted to the training periods, with an emphasis on prevention and prophylaxis. In consequence, during the preparation period the training sessions are carried out daily, with a duration of one and a half hours, with a general physical training share of 50-60% of the training time; the rest of time is dedicated to specific technical and tactical training. One training session per week can focus on



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strength; a recovery training session will be performed at the end of the weekly cycle with the inclusion of all known means of recovery.

During the pre-competitive period, the general physical training represents a share of 20%; the strength training sessions are carried out once a week or maybe every 2 weeks.

The prophylactic program must address in equal measure the strengthening of tendons and ligaments, the increase of elasticity and muscular strength, in order to tone the joints they cross, to enable both increased stability and mobility at this level.

Within the trauma there is a physiological vicious circle, namely the trauma causes pain, edema and antalgic contracture. The pain increases the edema and contracture and these ones will intensify the pain. The oldest way to reduce pain and inflammation is cryotherapy. Currently, special packages are used (Cold Pack): ice massage, refrigerant spray, refrigerant dressings etc.

The main response of the body, immediately after application, is local vasoconstriction of the subcutaneous blood vessels with decreased blood flow and reduced inflammation, blood extravasation and histamine release.

### **Knee sprains**

This term refers to the syndesmotomic injuries caused by a forced, abnormal movement, especially of rotation, which ends up producing only a short movement with immediate return of the bone surfaces. Injuries may affect the lateral ligaments, the capsule, the cruciate ligaments or both. The severe cases, with tearing of the bone insertions of the ligaments, can lead to the post-traumatic swaying knee.

The articular vascular reactions in sprains are pathophysiologically important. The intensity of these reactions is not so much related to the intensity of the lesion as to its location; the strongest responses are generated by the injury of the more innervated and vascularized regions. The disproportion often observed between the low intensity of the contusion and the severity and tenacity of the joint and surrounding tissues reaction can be explained only by the reflex nature of the strong post-traumatic disorders. Even if the macroscopic anatomical lesions are missing, the functional troubles are almost constant and find their microscopic expression (always present) only a few minutes or hours after the accident.

Sprains can be considered an aseptic inflammatory episode of traumatic nature. As a result of the irritating action of the aggressive factor, the local metabolism increases, which implies a more intense blood flow, therefore a hyperemia clinically manifested by redness and heat. As the oxygen supply is not sufficient to ensure a complete catabolism, intermediate metabolites are formed and consequently the number of osmo-molecules in the interstitial fluid sometimes increases considerably.

Knee sprains show two clinical pictures in their acute phase:

1. **BENIGN SPRAIN** - occurs after a forced movement of the leg on the hip, with exaggeration of the valgus or varus, or after a strong twist. The pain is located internally or externally, at the level of the ligament insertions, with the knee in semiflexion. Most often, hemarthrosis is present, settling after a few hours of injury and manifesting itself by the relaxation of bursa bottoms, patellar shock, fluctuation or even resistance to pressure. Knee hyperextension is painful; the flexion is made with difficulty and to a small extent. The movement of abduction (internal lateral ligament) or adduction (external lateral ligament) causes pains. X-ray must show bone integrity.
2. **SEVERE SPRAIN** - is characterized, in addition to hemarthrosis and painful points, by the presence of abnormal movements. In extension, the abduction and adduction movements are abnormally wide, and sometimes the return of the shank to rectitude causes a shock by the sudden contact of the articular surfaces.



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Orthostatism but especially the walking is impossible at first. The X-ray shows the unilateral clamping of the joint and the enlargement on the opposite side, depending on the attitude given to the knee.

GRADE 1 SPRAINS –manifested by sharp pains in the affected joint caused by a wrong movement, followed by swelling of the region and discomfort or dysfunction of that joint. Anatomically, there is a relaxation of the ligamentous and capsular apparatus of the knee joint, possibly with microscopic lesions. The X-ray does not highlight significant changes.

GRADE 2 SPRAINS – besides the pain, there is swelling, total articular dysfunction and a purplish coloration of the area skin as a result of the hematoma caused by the rupture of the capsule or ligaments. The X-ray shows a low degree of joint instability.

GRADE 3 SPRAINS – in addition, there are lesions of the fibrocartilages and cartilages with total ligamentous rupture or tearing of the ligaments together with a bone fragment belonging to the joint. The X-ray in maintained position highlights a large dislocation of the articular surfaces.

**Principles of treatment**

- Immediate treatment (in the first 24h)
- Spray refrigeration, application of ice or cold compresses;
- Local and general analgesics and anti-inflammatory drugs (5 to 7 days) (diclofenac, indomethacin, phenylbutazone);
- Segmental rest;
- Elastic restraint.

**CONTRAINDICATIONS:**

- Continuation of the effort;
- Massage;
- Local heat immediately after the sprain.

**EVOLUTION:**

The grade 1 sprains immobilized for 5 to 7 days are completely healed. Grade 2 sprains remain immobilized for 10 to 14 days. The total recovery of joint function requires 2-3 weeks subsequently, during which physiotherapy treatment and medical gymnastics are performed. Grade 3 sprains require prolonged immobilization (3 to 4 weeks) in plaster cast and a complex healing and recovery treatment for another 1- 2 months.

**In conclusion** it should be mentioned that the establishment of a treatment is absolutely essential for the recovery of the injuries caused to the knee joint; the post-surgery, post-traumatic and prophylactic recovery are mandatory.

Thanks to these measures of recovery, we become fully aware of the numerous benefits of the treatment, as follows:

- Control and elimination of pains;
- Prevention and control of inflammation;
- Regaining joint mobility or increasing joint mobility;
- Strength improvement and increase of muscular endurance to prolonged effort;
- Increase of the capacity for effort;
- Improvement of cardiovascular and respiratory system;
- Speeding up the healing process;
- Reflex induction of muscle relaxation through facilitation techniques;
- Attenuation of nervous tensions and stress;



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- Relaxation of muscles; control of contractures and muscle pulls;
- Quick return to sports, professional and daily activities.

*Recommendations for maximum therapeutic effect*

In order to return as soon as possible to the competitive activity, the athletes in general and the football players in particular must respect certain rules so that the recovery progress normally and the period of immobilization of the affected area be as short as possible:

- active and optimistic involvement in the treatment process;
- strict observance of the appointments in treatment sessions;
- the affected segment or area should not be forced;
- scrupulous execution of the exercises given by the therapist;
- proper warm up of all muscle groups;
- even if mild pain occurs during the recovery process, the treatment should not be discontinued;
- continuation of the treatment until the end, even if the beneficial effects are not observed from the first sessions.

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**STUDY ON THE PRACTICE OF SPORTS GAMES AS BASIC MEANS OF PHYSICAL  
EDUCATION AND SPORT**

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**Abstract**

Rugby is defined as a collective wrestling sport, with varied and rich motor content, having integral formative valences. In this sports game, reason and passion are combined, respectively the technical and the human, thus, it does not reduce the player to a biomechanical, bioenergetic machine, seen bioinformationally according to fashion theories, defining and modeling his personality. The rugby player presents, at the same time, a good technical-tactical training as well as the courage, enthusiasm, spirit of sacrifice, necessary for team integration and play.

Several specialists in the field have written about the game of rugby, characterizing it as a spectacular game, a game of the brave.

**Keywords:** sports game, physical training, rugby, competence, control tests, technique.

**Introduction**

An essential feature, which differentiates the game of rugby from other sports games, emphasizing its complexity, is the possibility of maneuvering the ball with both hand and foot, distinguishing forms of hand play, as well as the form of foot play.

Unlike other sports games, the rules governing the game of rugby present difficulties for the uninitiated. It can be easily understood if we start from the criterion of moral reason that underlies the rugby phenomenon and state some simple rules:

- pass by hand only backwards;
- the balloon is transmitted with the foot in any direction;
- any player in front of the ball is "out of the game";
- any action on the opponent is performed only on the ball carrier, from the shoulders down, with the arms, the palm being open;
- the points are scored with the hand (attempt) or with the foot (sitting kick, transformation kick and dropped kick).

Hence the purpose of the game of rugby which aims to achieve victory by scoring as many points as possible. In the literature, the authors claim that the main ways to improve sports training are presented under the following aspects:

- planning the preparation process;
- means and methods of training;
- physical effort and its dynamics;
- evaluation and control of the activity;
- non-traditional means of training.



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Any training process is based on a series of planning documents that ensure optimal continuity and rhythmic training. In this sense, the theory of sports training records a series of formulations regarding the planning of the training process of athletes.

One way to improve the sports training process is the range of means and methods used in training athletes. The main means that are used in sports training are exercise, exercises that have a multilateral influence on the body of the athlete and various performance factors.

Within the sports training, general development physical exercises, special exercises and exercises from the sports branch for which the respective athlete specializes are used. The choice of the most indicated means is difficult, because both the simple and the complex exercises are many in number, and from their multitude we must choose the ones that contribute directly to the accomplishment of the tasks we have set. It is important that all these means of training are rationalized and standardized, to come to the aid of each coach.

In the game of rugby, the complexity of the means used ensures a preparation close to the demands of effort, existing during the game.

The aim of the study is to increase the efficiency of the training system for junior rugby players, based on the directed development of coordination skills.

Research objectives:

- Studying the particularities of the development of the coordinative capacities in the training process of the junior rugby players;
- Evaluation of the level of sports training of junior rugby players;
- Determining the content of the program for the development of the coordination capacities of the 16-17 year old rugby players in an annual training cycle;
- Experimental argumentation of the efficiency of the application of the program for the development of coordinative capacities for rugby players aged 16-17.

To achieve the proposed objectives we used a complex of research methods, closely related, permanently or temporarily, throughout the research:

- Analysis of the specialized scientific-methodical literature;
- Pedagogical observation;
- Survey method;
- Testing method;
- The pedagogical experiment;
- Statistical-mathematical methods;
- Graphic and tabular method;

Our study presents the evolution of athletes in a training mesocycle, with the following objectives of the stage:

- improving the capacity of effort;
- development of muscular endurance using means for the development of coordinative capacities;
- improving the individual technique with emphasis on the development of coordination capacities;
- improving individual and group tactical actions.
- improving mental concentration.

In the case of the proposed experiment and depending on the competitive calendar, microcycles with a duration of 7 days were used for the preparation and competitive stage and recovery, having an almost identical development.

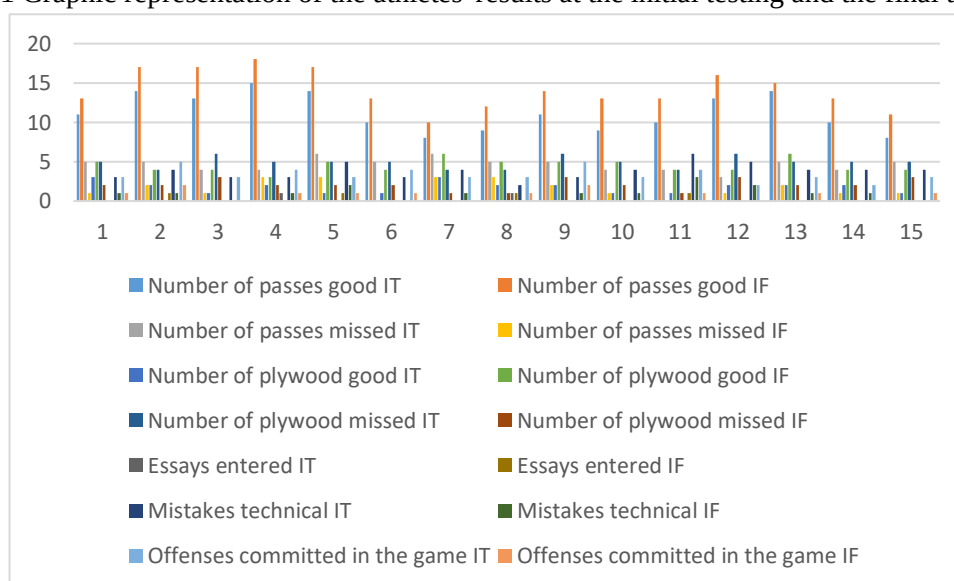
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Table 1 Recording the results of the athletes at the technical tests at the initial testing and the final testing

| 1  | Number of passes |    |        |    | Number of plywood |    |        |    | Essays entered |    | Mistakes technical |    | Offenses committed in the game |    |
|----|------------------|----|--------|----|-------------------|----|--------|----|----------------|----|--------------------|----|--------------------------------|----|
|    | good             |    | missed |    | good              |    | missed |    |                |    |                    |    |                                |    |
|    | IT               | IF | IT     | IF | IT                | IF | IT     | IF | IT             | IF | IT                 | IF | IT                             | IF |
| 1  | 11               | 13 | 5      | 1  | 3                 | 5  | 5      | 2  | 0              | 0  | 3                  | 1  | 3                              | 1  |
| 2  | 14               | 17 | 5      | 2  | 2                 | 4  | 4      | 2  | 0              | 1  | 4                  | 1  | 5                              | 2  |
| 3  | 13               | 17 | 4      | 1  | 1                 | 4  | 6      | 3  | 0              | 0  | 3                  | 0  | 3                              | 0  |
| 4  | 15               | 18 | 4      | 3  | 2                 | 3  | 5      | 2  | 1              | 0  | 3                  | 1  | 4                              | 1  |
| 5  | 14               | 17 | 6      | 3  | 1                 | 5  | 5      | 2  | 0              | 1  | 5                  | 2  | 3                              | 1  |
| 6  | 10               | 13 | 5      | 0  | 1                 | 4  | 5      | 2  | 0              | 0  | 3                  | 0  | 4                              | 1  |
| 7  | 8                | 10 | 6      | 3  | 3                 | 6  | 4      | 1  | 0              | 0  | 4                  | 1  | 3                              | 0  |
| 8  | 9                | 12 | 5      | 3  | 2                 | 5  | 4      | 1  | 1              | 1  | 2                  | 0  | 3                              | 1  |
| 9  | 11               | 14 | 5      | 2  | 2                 | 5  | 6      | 3  | 0              | 0  | 3                  | 1  | 5                              | 2  |
| 10 | 9                | 13 | 4      | 1  | 1                 | 5  | 5      | 2  | 0              | 0  | 4                  | 1  | 3                              | 0  |
| 11 | 10               | 13 | 4      | 0  | 1                 | 4  | 4      | 1  | 0              | 1  | 6                  | 3  | 4                              | 1  |
| 12 | 13               | 16 | 3      | 1  | 2                 | 4  | 6      | 3  | 0              | 0  | 5                  | 2  | 2                              | 0  |
| 13 | 14               | 15 | 5      | 2  | 2                 | 6  | 5      | 2  | 0              | 0  | 4                  | 1  | 3                              | 1  |
| 14 | 10               | 13 | 4      | 1  | 2                 | 4  | 5      | 2  | 0              | 0  | 4                  | 1  | 2                              | 0  |
| 15 | 8                | 11 | 5      | 1  | 1                 | 4  | 5      | 3  | 0              | 0  | 4                  | 0  | 3                              | 1  |

Fig.1 Graphic representation of the athletes' results at the initial testing and the final testing



## Results

Regarding the current game test, the following results:

- at the edge, the game is oriented towards the forms of hand play, especially group-penetrating game (GPG). Mention the significant number of mistakes. At the ordered pile, the game is relatively balanced, both in terms



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of the hand-to-hand / foot-to-foot ratio, and the ratio between the three concrete forms of play. Also a significant number of mistakes.

- in agglomerations, a hand game is observed predominantly through both concrete forms of play, the game with the foot (GPG) representing less than a fifth.

This orientation of the game in its launch and continuity is related to the line of advantage, pressing, preservation of ball possession, the degree of organization of teams in defense.

- the actual playing time, the large number of game phases, as well as the number of passes and plywood substantiate the idea that expresses the orientation of rugby from rugby-football to rugby-handball, with implicit ergophysiological implications. The number of errors can be considered high, compared to the level of the participating teams and normal in relation to the specifics of the game.

### **Conclusions**

Following the study, we reached the following conclusions:

- increase in the number of edges and relative stagnation of the number of ordered piles and agglomerations. This phenomenon is due to a relatively recent regulatory provision, which allows a team receiving a penalty kick to send the ball to the edge and retain possession;

- the increase in the actual playing time and the number of phases confirms the orientation of the rugby game towards a hand game, an open game, with total commitment, which requires a superior training of all components;

- on the whole, the game of rugby remains in the mixed zone in terms of oxygen consumption, but, from the temporal structure of the game phases, we notice the significant tendency to orient the effort within them towards the lacticid anaerobic, which is doubled by the number of phases, lasting over 40 seconds;

- with regard to the launch of edge play, the emphasis on hand play continues, especially group-penetrating play (GPG). Note the reduction in the number of mistakes. In an orderly pile, there is a considerable reduction in the number of mistakes, against the background of strengthening the hand game, but with a balance of concrete forms of play;

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## **STUDY ON THE HARMONIOUS PHYSICAL DEVELOPMENT OF CHILDREN**

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### **Abstract**

It is usually considered that play is a minor activity, specific only to the child's age, although it was used as an educational method and was considered more as a means of entertainment, an activity less used in lessons than in free time. Research shows that play characterizes not only childhood, but people in general, at all ages, and that its educational importance is much greater. In the game, the individual tries his skill, seeks to see if he can achieve a proposed goal. The game involves a transition from uncertainty to certainty. The game puts the student in new situations, which he seeks to solve, putting into action his initiative, a lot of fantasy, perseverance and spontaneity. The pleasure of the game is related to the risk and the performance obtained. It was found that the game is played only as long as it is the exercise of a more or less imperfect activity.

**Key words:** game, sports activities, physical education, student, competence

### **Introduction**

Many discoveries were born from the "game" of people with the unknown. Probability theory was born out of the game of chance. They mention several types of problem situations, namely: when a disagreement arises between old knowledge and the requirements imposed by solving a problem, when students realize the insufficiency of their knowledge and interest in solving it; when the student must find in the situation to choose from a system of knowledge only those that are necessary for him to solve that situation; when the student is in the impasse caused by the contradiction between the possible theoretical solution and his impossibility of practical application; when the student is asked to apply in new conditions the previously assimilated knowledge; Within the teaching of the disciplines, problem situations arise when the student is asked to "see" the dynamics of the movement in the statics of a scheme.

J. Brunner stated that "play must be conceived as an exercise in confronting the environment." Thus, any activity that takes place at a certain degree of competence becomes interesting, which is a reason for the competence. Learning through play becomes enjoyable and engaging. In this context, an important intrinsic motivation for learning can be ensured through play. This can be considered the main reason why, in certain stages of student learning and development, the instructive-educational process can be achieved through play.

Through play, students can reach the discovery of truths, they can train their abilities to act creatively, because the strategies of a game are basically heuristic strategies, in which wisdom, spontaneity, inventiveness, initiative, patience, boldness, prudence, etc. are manifested. In addition to informational and cultural content, the game can create for students an attractive competitive environment for requesting and exercising intellectual, emotional and volitional abilities.

Through games, it is possible to identify logical connections that can be applied means of acquiring and fixing knowledge, some being useful in the exploratory activities of the initial stage, others in the second stage of exploration. In the game, the desire to compete, the discipline of strict observance of the rules, perseverance, loyalty, fair play conduct, etc. are required and practiced. Attitudes and moral beliefs are



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practiced in the attractive competitive environment of the game. The first moral habits and habits are formed in and through play.

The concept of dynamic games or the game of movement comes from the Latin word "jocus" and the French word "dynamique".

The need for children's play can be identified by the following eloquent aspects:

- the game helps preschoolers to assimilate knowledge, life experiences, to experience feelings;
- the game generates in children spontaneity, sociability, creativity, emotion developing their intellect;
- through play, children can manifest their imagination and develop knowledge;
- play is the child's main occupation as work and creation are the major concerns of an adult;
- play is the foundation of learning for all children;
- play is also a social action, because through play, the child will learn to share some things with others, to wait his turn, etc.

Usually, the child plays and learns or in other words, learns by playing. Therefore, the child performs an activity that is most enjoyable for him, and through this he ensures at the same time through the contact with the things he has in the game, the need for knowledge. Thus, the game becomes for the child, the basic activity of the preschooler and a real educational source with various formative values.

Play as a learning process depends on the existence of material conditions and motivation in the selection of a certain game by children. This is because through play, the child redefines situations in life, in the surrounding nature, which allows them to learn the social function of the things used through play, thus mastering the environmental world. Through play, the preschooler contributes to the development and restructuring of mental activity.

By identifying the new in the game situations selected by children, by demonstrating ingenious facts, such as certain intrigues of the characters encountered in stories, children can develop self-confidence and form a series of common social skills that.

Discovery through play also has an important role in children's learning. Referring to the discovery in the process, J. Brunner stated that "...the discovery process consists in the fact that the student generates certain information himself, which he can then control or evaluate, using the source and thus obtaining new information", and the process of discovery would consist in the "internal reorganization of previously known ideas" to establish some connections.

Discovery is finding what lies behind the temporary boundary between the known and the unknown. What can children discover in the training process through play? Children can make discoveries in the field of morality, respectively in case of finding an appropriate attitude and behavior in certain circumstances, especially when it is an easy thing. Thus, the rules of conduct can also be the object of personal discovery. Each child through play makes continuous discoveries during his experience, acquires new lessons and new knowledge. From birth, throughout life, man has the opportunity and possesses the necessary tools (at first imperfect, but then develops and improves) to cope with circumstances, acquiring the knowledge necessary to improve the action by his own means.

Studies show that the little ones in the game try their skill, looking to see if they can achieve a proposed goal. For example, when they build a castle of cubes or when they launch the kite, the child tries his strengths and skills, because in the play situations there are difficulties that he has to overcome. Thus, they tend to achieve performance, to win a race and to defeat a real or imaginary opponent. The game involves a transition from uncertainty to certainty. If there were no uncertainty in the game, it would no longer be attractive and of no interest. Game-specific mental states are related to risk. Therefore, the game is close to heuristic behavior





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and activities. The game puts the child in new situations, which he seeks to solve by putting into action the initiative, a lot of fantasy, perseverance and spontaneity. Through play, the child asserts his strength, skill, personality as a whole, in relation to a more or less conscious goal.

Children's games become a method of instruction if they acquire an organization and succeed each other in the order implied by the logic of knowledge and learning. The simple games that children practice spontaneously have formative values, but in education we are interested in games imagined with a well-defined educational purpose and organized in accordance with it. In the didactic game, entertainment is not an end in itself, but only a means of stimulating cognitive energies.

Movement games consist in the use of the body set in motion and through which the physical and mental state of the child in a wide connection with the bodily evolutions is practiced and developed.

Movement games are activities specific to physical education and have a positive influence on children, if we refer to their formative-educational and informational purpose. These games can be used in various forms of physical education. The main element of this type of game is the motor act practiced in a variety of forms in order to ensure the optimal framework for the development and improvement of children's basic skills, the formation of motor qualities: speed, endurance, skill, agility, accuracy, mastery self, perseverance.

Given its essential features we can mention that the game of movement differs from other means specific to physical education as follows:

- ensures and promotes the simultaneous development of basic or specific motor skills, motor qualities, as well as moral-volitional traits and skills;
- the game of movement involves and involves cooperation, collaboration with game partners, harmonization of interests, motives, actions and personal efforts with those of the team, acceptance and recognition of the leader, taking on responsibilities, critical attitude and self-criticism;
- the game of movement allows at the same time the possibility to have own and independent initiatives in actions;
- the movement game imposes the existence of motor qualities on those who practice it, as they train competition and competitiveness.

The movement games used in various extracurricular sports activities represent, as in the case of the didactic ones, a repetition of those taught during the physical education class or are planned in stages.

Through movement games, children train their intellectual abilities such as: attention, synthesis, analysis, and the consolidation of motor skills and their use in various forms also leads to their mental involvement. All these contribute to the education of some essential characteristics and qualities of children such as: courage, self-confidence, will, perseverance, self-control, etc.

Team games lead to the development of cooperation and collaboration between children, to increase the spirit of attachment and solving common problems identified during the game.

The motor skills acquired by children in movement games have a positive influence on children in the sense of providing them with the ability to effectively solve specific activities in the family, school and those related to the use of free time in a pleasant and useful way.

The actions performed in the game must fully correspond to the children's ability to direct their own movements, as well as the level of development of their strength and dexterity, abilities on which depend the speed and rationality of the execution of actions, so that they produce a deep satisfaction to the child. During the games organized in the school environment, the information already known and the previously formed



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skills are highlighted, and the practice of friends enchants the child, making him more alert, more lively, which produces a satisfaction.

The game actions must be assimilated within a systematic course, and in their execution a series of rules must be observed, the degree of difficulty of which gradually increases. For a gradual and consistent increase in the complexity of the applied games as well as for their diversification, it is recommended to change the rules of the game as they are assimilated by students. The rules must have a general character, their observance will lead to the efficient accomplishment of the necessary actions.

Motor skills formed at preschool age, monitored through movement games, can contribute to the integration of children in various activities beneficial to their connection with nature, adults and other children, as well as their protection from "incidents" and accidents, which allows them to increase their self-confidence. Given the influence of exercise on the formation and development of children, complemented by the fact that they are generally one of the attractive means of physical education, we can mention that they need to be used systematically, both in educational programs and classes, physical, as well as on the occasion of refreshment exercises.

In stages, within the game, especially of the didactic ones, the transition from the spontaneous perception, unorganized to the organized one, intentional, oriented towards a certain purpose which is the observation takes place. Through movement games, some complex forms of perception are organized and perfected: the perception of space, time, movement. In this context, highlighting the spatial features of objects (size, shape, relief, spatial position, etc.), generates the interaction of several sensory modalities (visual, tactile, kinesthetic, etc.), and the detachment of significant features is to facilitate, to direct and strengthen communication. Thus, the child manages to perceive the sequence in time of some actions and the time of their accomplishment, an important role having the practical exercises, the organized games, the program of the instructive-educational activities in the school.

The organization of the game, the choice of the participants in the game, the strict observance of the rules must be attributed entirely to the children, who must be taught to consider them as binding laws for all. Moreover, the research carried out had an interdisciplinary character, given the complexity of the investigated phenomenon, presenting the specific aspects within the activity of the development stages and research methods.

*The objectives of the research* were materialized in the goal we set out to achieve, so that, through the thematic tasks monitored during the scientific research activity, we aimed to confirm the veracity of the working hypothesis and obtain its final results. .

Specifically, these objectives were aimed at the following:

1. Studying the current theory and practice regarding the socialization of primary school students and extracurricular activities.
2. Assessing the level of socialization in accordance with the physiological particularities .
3. Elaboration of models of extracurricular activities specific to the primary school cycle.
4. Arguing the efficiency of using extracurricular activities in children aged 7-10 years.

The scientific methods used in the research and which have proven to be relevant are:

questionnaire survey method;  
observation method  
measurement and evaluation method;  
testing the theoretical-practical training;  
the experimental pedagogical method;



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statistical-mathematical methods;  
graphical and tabular method.

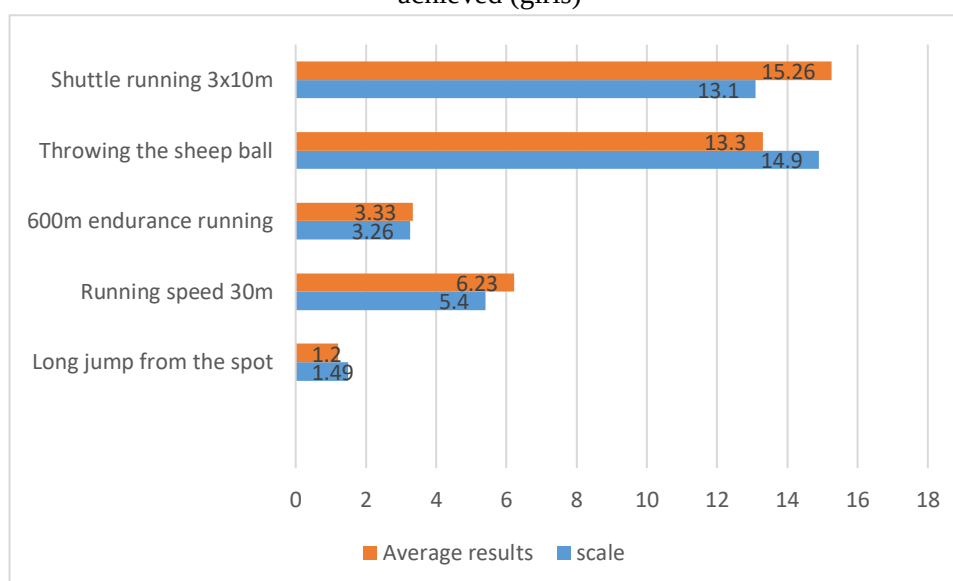
**General hypothesis:** the use of movement games in extracurricular activities will contribute to the qualitative modeling of the behavior of primary school students, as well as to the development of their imagination and creativity through the practice supported and assisted by specialized teachers.

Starting from the importance of motion games and to achieve the purpose of the research, we developed the model of extracurricular activities through algorithmic motion games at sea. It can be seen that the extracurricular activities that can be done by students in camps at sea are water games, water games, sand games, camp games, childhood games, games to develop the child's independence. This typology of games must of course be complemented by dynamic games which, in fact, are the way to the child's sublet. Camp games can be materialized in: games of knowledge and communication, funny games, in those that involve the presence of spirit and the spirit of observation, in games of agility, speed, skill, and last but not least in games for the development of thinking. Usually, camp games focus on certain topics and are organized in small or large teams, and the spirit of competition is encouraged, so as to stimulate creativity and logical thinking in students.

Table No. 1. Average measurements at motor tests (girls)

| No. No. | Control test            | scales | Average results |
|---------|-------------------------|--------|-----------------|
| 1       | Long jump from the spot | 1.49   | 1.20            |
| 2       | Running speed 30m       | 5.4    | 6.23            |
| 3       | 600m endurance running  | 3.26   | 3.33            |
| 4       | Throwing the sheep ball | 14.9   | 13.30           |
| 5       | Shuttle running 3x10m   | 13.1   | 15.26           |

Fig. 1 Graphical representation of the average of the results at the control tests compared to the scale to be achieved (girls)



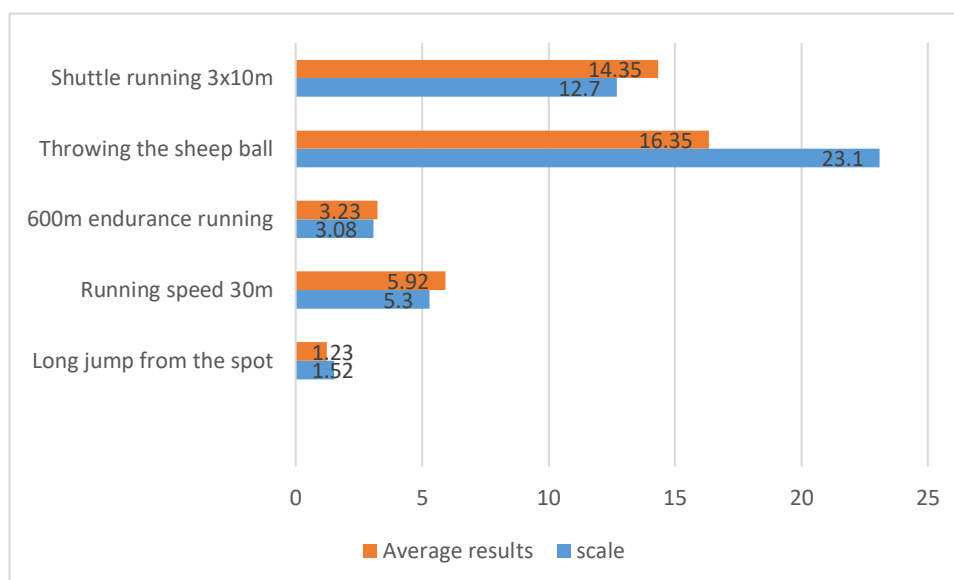
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Table No.2 Average of motor test measurements (boys)

| No.<br>No. | Control test            | scales | Average results |
|------------|-------------------------|--------|-----------------|
| 1          | Long jump from the spot | 1.52   | 1.23            |
| 2          | Running speed 30m       | 5.3    | 5.92            |
| 3          | 600m endurance running  | 3.08   | 3.23            |
| 4          | Throwing the sheep ball | 23.1   | 16.35           |
| 5          | Shuttle running 3x10m   | 12.7   | 14.35           |

Fig.2. Graphical representation of the average of the results at the control tests compared to the scale to be achieved (boys)



### Result

When jumping in length from the spot, the analysis of the results obtained in this test shows us that the girls register a progress of 12 cm during the 2 years.

The biggest differences between the achieved and the proposed performances are registered in the case of both boys and girls in the second class, when the achieved performances are over 30 cm lower than the reference ones.

When jumping in length from the spot, the boys get the best performance.

When running at a speed of 30m starting from the feet, the highest increases are observed for both girls and boys. In the case of girls, the performance achieved is 0.43sec better than that achieved in the previous study year, and in the case of boys the performance is improved by 0.23sec.



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In the 3x10m running test for the evaluation of the general coordination ability of the movements, it is also observed that the evolutions of all the subjects, in girls and boys, register an ascending curve with advancing age.

**Conclusions**

The systematic practice of movement games in extracurricular activities is necessary for the harmonious development of students and contributes to the significant improvement of students' behavior, socialization, imagination and creativity. At the same time, the use of movement games in extracurricular activity will strengthen basic motor skills and abilities, such as walking, running, throwing, catching, jumping, as well as utilitarian ones: climbing, balance, crawling, traction, pushing, transport, climbing.

The systematic practice of movement games in extracurricular activities will contribute to the significant improvement of students' behavior, socialization, imagination and creativity, compared to the situation of their systematic non-use. At the same time, the use of movement games in extracurricular activity will strengthen basic motor skills and abilities, such as walking, running, throwing, catching, jumping, as well as utilitarian ones: climbing, balance, crawling, traction, pushing, transport, climbing.

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**STUDY ON THE IMPORTANCE OF EXTRACURRICULAR SPORTS ACTIVITIES IN  
THE FORMATION OF STUDENT PERSONALITY**

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**Abstract**

The systematic practice of movement games in extracurricular activities contributes to the significant improvement of students' behavior, socialization, imagination and creativity, compared to the situation of their non-systematic use. At the same time, the use of movement games in extracurricular activities strengthens basic motor skills and abilities, such as walking, running, throwing, catching, jumping, as well as utilitarian: climbing, balance, crawling, traction, pushing, transport, climbing.

For the teacher, who carries out extracurricular activities, the presence of a theoretical-practical guide to movement games at sea is an auxiliary teaching aid, which suggests the size of their realization, the amount of information and their rules of exercise.

Within the instructive-educational process carried out in the direction of students' development and socialization, a special importance belongs to the teachers - who besides the students' intellectual development effort, also have an important role in forming the basic behaviors of their personality.

**Key words:** physical education, student, physical development, sports activities, lesson.

**Introduction**

Free time, as mentioned above, is another component of major importance and the student in this case should have attractive alternatives and to develop the skills acquired in school. Thus, extracurricular activities will appear as suitable alternatives, and the goal will remain the same, multilateral personality development, boosting self-confidence. In this context, there is a need for students to learn through play, in order to acquire new horizons included in the non-formal framework, mentioned above. The teacher's obligation consists in creating students a comfortable spatial area, able to contribute to unleashing the imagination, to capitalize on the vocation evolving until it reaches performance.

The approached activities offer to the students another spectrum of properties of some feelings, of major importance necessary for the social life. Children, when they are young, should learn moral values, to enjoy the noble ones, to be aware of the importance of religion on the formation of individuals to participate in events of major importance to their family, which would be a vital solution. for a balanced habitat, regarding the experience of moments that cannot be matched within the family, and that lead to the formation of the responsible individual necessary for contemporary society.

Personality is a constellation of attitudes, traits, feelings and ways of behaving.

Modern society through its dynamism or, through its flexibility, openness to innovation requires a model of human personality that would be able to meet the requirements of the 21st century, the millennium of continuous change. Education becomes the impetus for social progress, and the demands of time continuously raise new approaches and capitalization of pedagogical, psychological, political, social,





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economic sciences, in order to form a young generation able to continue to ensure a level of well-being, an interaction increased social conditions, optimal conditions for human development.

At the end of the twentieth century, with the reform of our society, there were changes in the education system, the essential orientation being the democratization of education, ensuring the quality of education being a necessity of modernization.

We note the place and role of non-formal education, as an integral part included in the area of the pedagogical concept of democratization of education, which "defines a certain availability of the system, depending on its functioning structure, which validates at the level of political decision: organizing levels / steps school and the evaluation methods of the pupils / students; the managerial management of the institutions; curricular design of formal and non-formal training programs; building relationships with the national, territorial and local educational community ". Currently, the assertion of a competitive personality, able to shape its future is an essential condition in the development of the human being, education being in the modern world a key dimension that strengthens individuals. The human being perceives the influences of the environment in relation to his own way of thinking and acting, he also has the availability to structure his behavior according to social requirements. The process of socialization and extracurricular activities train children for social stimuli and develop their skills and awareness social obligations.

The transmission of norms, traditions, values, conceptions or ways of life by the group or by society, aims, in fact, to integrate the individual in the structures with a conduct appropriate to the fundamental social goals, ensuring social order and stability.

Contemporary psychopedagogy today fully recognizes the fact that young ages are periods of substantiation of the construction of the child's personality and development of adaptive structures that will allow him an optimal social insertion. It is justified then the increased attention for the reconsideration of the documents that regulate the development of the educational programs at these ages, in the sense of defining the finalities so as to ensure:

- reflection of the profound transformations of the contemporary society, objectified in new exigencies of training of the young generations;
- compatibility of education with similar levels of education in other countries by connecting to the orientations and valuable acquisitions in psycho-pedagogical plan and of the educational practice realized on international level;
- reflection of the latest contributions of development and learning psychopedagogy for understanding the specifics of school age;
- assimilation of the general principles and paradigms of the profound reform of the national education system;
- reflection of contemporary orientations in the issue of educational purposes;
- continuity within the same curricular cycle.

Extracurricular activities contribute to the formation of the student's personality, being both important and useful. There are certain aspects that could influence the success of extracurricular activities such as: performing them according to the curriculum, when students are already tired or before they can no longer concentrate in the instructional-educational process. Thus, we mention that the students' program is more exaggerated, and the teachers try to find solutions for their fruition: following the student's program for that day.

Regarding these issues, students noticed that it is quite difficult to carry out many extracurricular activities, because the school curriculum is overloaded, as we determine students to get involved in organizing and directing extracurricular activities.



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For long periods of time, extracurricular activities have taken various forms, all of them, the aim being non-formal learning and adequate leisure. The activities mentioned above cover very wide areas, and students can develop skills and abilities necessary for harmonious development for proper integration into social life. In cases where extracurricular activities are discussed, we focus on the program in which the student participates voluntarily and should enjoy it for the simple reason that the goal is to train the skills necessary for harmonious development, also contributes to the formation of the student's personality. he will later discover his vocation, talent and the field in which they will perform.

The development of extracurricular sports activities can be organized by:

- teachers, outside the school environment;
- other qualified persons within the summer / winter camps;
- other institutions: fitness halls, sports clubs, etc.

Regarding the importance of extracurricular activities, we can mention that they contribute essentially to the formation of a positive attitude towards learning, to the achievement of higher school performance by students, as well as to the formation of various practical skills. At the same time, they have an important role in the development of self-esteem, with a pronounced emphasis on the feeling of fulfillment and self-efficacy. Sports activities are the favorites of most parents, because they help children to have an orderly life, to have an established schedule, which they follow daily, a healthy diet and lifestyle.

Thus, we can conclude that sport has an essential role in the physical and intellectual development of the child, because during this period the body undergoes changes from a physiological and anatomical point of view.

We can also mention that sports promote the social integration of children, including all individuals of all ages, cultivate the skills and qualities required by professional activity, as well as moral qualities designed to ensure social balance. In other words, sport contributes to the perfection of the human personality. Thus, the sports activity continues to be accompanied by the idea of fair play behavior, of fair competition in the relations not only between the members of the same team, but especially with the opponent or even with the spectators. In this context, sport also educates children, and the education of the spirit of fair-play since childhood contributes greatly to the formation of their personality.

Also, the replacement of computer games with sports will be beneficial for both children and parents, because during this period, the child is quite physically developed and can successfully practice a certain sport. Through sports, the child can integrate effectively into a new team, can easily show interest and pleasure in various sports activities, thus managing to increase their chances of continuing to promote a healthy lifestyle since childhood. Hiking and excursions directly contribute to the achievement of the objectives of physical education, but also of some belonging to intellectual, aesthetic, moral and patriotic education.

This studio is designed to follow the ideas outlined above.

The research included a group of students who frequently participate in extracurricular sports activities both on weekends and holidays.

The group of students consisted of 20 subjects aged between 12-14 years, students of the Gymnasium School no.192.

I followed the students' activity during a semester and participated in their semester evaluation. Subjects were assessed by control tests at the beginning of the semester (initial testing) and at the end of the semester (final testing).

Assumption. We assume that by participating students in extracurricular sports activities we will obtain improved motor indicators, students benefiting from optimal development and physical fitness.

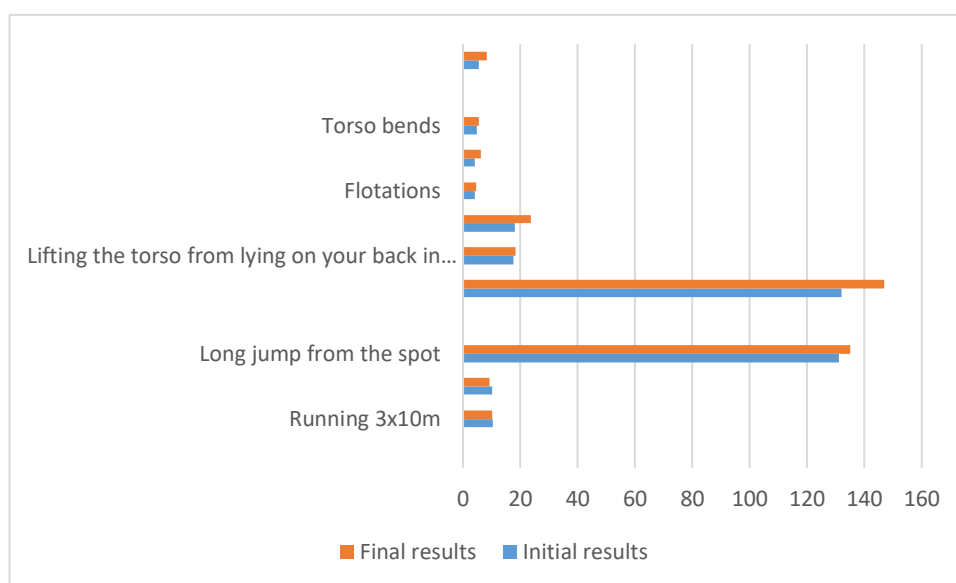
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Table 1 Average of the results of the motor tests obtained at the initial and final testing  
G=girls, B=boys

| Nr.crt | Tests                                               | Subject groups | Initial results | Final results |
|--------|-----------------------------------------------------|----------------|-----------------|---------------|
| 1      | Running 3x10m                                       | G              | 10.3            | 10.1          |
|        |                                                     | B              | 10.1            | 9.3           |
| 2      | Long jump from the spot                             | G              | 131             | 135           |
|        |                                                     | B              | 132             | 147           |
| 3      | Lifting the torso from lying on your back in 30 sec | G              | 17.6            | 18.3          |
|        |                                                     | B              | 18.1            | 23.6          |
| 4      | Flotations                                          | G              | 4.1             | 4.5           |
|        |                                                     | B              | 4.2             | 6.1           |
| 5      | Torso bends                                         | G              | 4.9             | 5.6           |
|        |                                                     | B              | 5.6             | 8.4           |

Fig. 1 Graphic recording of students' results at control tests, at the initial test and at the final test.



### Results

We observe from table and graph 1 that students participated in the 5 sports events, getting involved from a motor point of view.

In all control tests, students obtained better results in the final test than in the initial test.



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**Conclusions**

Extracurricular activities can create additional conditions for affirming students with difficulties in the school environment, reduce anxiety levels and increase their intellectual potential. Attempts to articulate or integrate different types of learning or experiences are made both within the educational and extracurricular systems.

Extracurricular activities provide an awareness of the contact with the environment, the triggering of an interest in knowledge, the possibility without prescriptions, the development of personal research and last but not least the management of self-training.

Extracurricular activities must respond to the diversity of needs, interests, aspirations of young people, to lead to the formation of a strategic vision of the world, to ensure in complementarity the coherence of the educational act.

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## **STRATEGIES OF KINETOTHERAPEUTIC INTERVENTION USING THE VIRTUAL INTERACTIVE MOTOR GAME**

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### **Abstract**

The theme of the paper is in the area of advanced theory and practice in the field of kinetotherapy, being one of actuality and of practical relevance, within the requirements of 21<sup>st</sup> century education, by implementing modern educational means and using appropriate strategies in kinetotherapy activities with the pupils from special education, to improve the psychomotor disorders encountered in them.

Study hypothesis: Knowing as many aspects of modern education methodology as possible, certain strategies of kinetotherapeutic intervention can be established for special education, using the virtual interactive motor game.

Purpose of the paper: Through this study we aimed to promote the possibility of applying in kinetotherapy various strategies of differentiated and personalized intervention, using the virtual interactive motor game.

Conclusions: Establishing appropriate strategies, in general, and using the virtual interactive motor game, in particular, leads to the achievement of the educational-therapeutic objectives in the kinetotherapy activity with the children with psychomotor disorders.

**Key words:** kinetotherapy; psychomotricity; motor game; Kinect sensor

### **Introduction**

The theme of the paper is in the area of advanced theory and practice in the field of kinetotherapy, being one of actuality and of practical relevance, within the requirements of 21<sup>st</sup> century education, by implementing modern educational means and using appropriate strategies in kinetotherapy activities with the pupils from special education, to improve the psychomotor disorders encountered in them.

Over time, there have been concerns for the efficiency of the activity with the children, adapting didactic methods and means to the particularities of their intellectual development, using various didactic materials and devices.

One of the means used in the educational-therapeutic process is the play, it being the favorite activity of children. According to the conception of Edouard Claparède, Swiss doctor, psychologist and pedagogue, through play, the child asserts his own personality and broadens his sphere of knowledge and interests. (Cucos, 2001, p. 227)

The play, part of movement therapy, can be used to achieve educational-therapeutic objectives through ludic programs for the improvement of the psychomotor disorders encountered in children with mental deficiency.



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The ludic activity is all the more pleasant as the materials used in the play are varied, dynamic and modern. Modern educational techniques, through which certain information-carrying materials (software) are associated with devices specially designed to highlight those materials (hardware), make their mark on ludic activities with the children with special educational needs. (Cerghit, 1988, quoted by Cojocariu, 2002, p. 75; Griffiths, 2002, p. 48-49; Karal, Kokoç & Ayyildiz, 2010)

The current technology allows the creation of educational systems that help to develop virtual environments, useful in the activities carried out in the special school, to make the educational-therapeutic process more efficient. In this sense, in kinetotherapy activities, we can use the virtual interactive motor game, using the Kinect sensor, a 21<sup>st</sup> century invention, its name coming from *kinetic* (movement) and *connect* (direct person – device connection). Using this device, the person interacts with the virtual environment through natural gestures. (Melgar & Diez, 2012, p. 25; Cojocaru, 2019)

### **Study hypothesis**

Knowing as many aspects of modern education methodology as possible, certain strategies of kinetotherapeutic intervention can be established for special education, using the virtual interactive motor game.

### **Purpose of the paper**

Through this study we aimed to promote the possibility of applying in kinetotherapy various strategies of differentiated and personalized intervention, using the virtual interactive motor game.

### **Methods**

In the kinetotherapy activity carried out, within an experimental research, with the pupils from the Special Gymnasium School no. 2 from Bucharest, during the 2017-2018 school year, we used virtual interactive motor games, for which we performed analyzes, selections and classifications, following various strategies of personalized and individualized intervention, in order to improve the psychomotor disorders encountered in these children.

### **Strategies of kinetotherapeutic intervention**

#### ***Strategies of differentiated intervention in kinetotherapy***

In the kinetotherapy activity with a ludic character, aimed at improving psychomotor disorders, we used various strategies of differentiated intervention:

- the selection of virtual interactive motor games according to the educational-therapeutic objective pursued (Table 1);
- the selection of games according to the type of movement: imitation movements, simulation movements (Table 2);
- the selection of games according to the category of game: games with rules, free games (Table 3);
- the selection of games according to the way the game is played: individually, in a group/team (Table 4).





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Table 1. Virtual interactive motor games used to achieve educational-therapeutic objectives

| No. crt. | The educational-therapeutic objective |                               | The game                                                                                                                                                          |
|----------|---------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.       | Education of the body scheme          |                               | <ul style="list-style-type: none"> <li>• <i>Do Like</i></li> <li>• <i>Golf - Ocean Driver</i></li> <li>• <i>Skiing</i></li> <li>• <i>Freeze Dance</i></li> </ul>  |
| 2.       | Education of the laterality           |                               | <ul style="list-style-type: none"> <li>• <i>Do Like</i></li> </ul>                                                                                                |
| 3.       | Education of the spatial orientation  |                               | <ul style="list-style-type: none"> <li>• <i>RuniRoon</i></li> <li>• <i>Golf - Ocean Driver</i></li> <li>• <i>Skiing</i></li> <li>• <i>Freeze Dance</i></li> </ul> |
| 4.       | Education of the temporal orientation |                               | <ul style="list-style-type: none"> <li>• <i>Do Like</i></li> <li>• <i>Freeze Dance</i></li> </ul>                                                                 |
| 5.       | Education of the balance              |                               | <ul style="list-style-type: none"> <li>• <i>Do Like</i></li> <li>• <i>Freeze Dance</i></li> <li>• <i>Skiing</i></li> </ul>                                        |
| 6.       | Education of the coordination         | - general coordination        | <ul style="list-style-type: none"> <li>• <i>Freeze Dance</i></li> </ul>                                                                                           |
|          |                                       | - intersegmental coordination | <ul style="list-style-type: none"> <li>• <i>Freeze Dance</i></li> <li>• <i>Do Like</i></li> </ul>                                                                 |
|          |                                       | - lower limbs coordination    | <ul style="list-style-type: none"> <li>• <i>Skiing</i></li> </ul>                                                                                                 |
|          |                                       | - upper limbs coordination    | <ul style="list-style-type: none"> <li>• <i>Do Like</i></li> </ul>                                                                                                |
| 7.       | Relaxation                            |                               | <ul style="list-style-type: none"> <li>• <i>U-Paint</i></li> <li>• <i>Seishin</i></li> </ul>                                                                      |

Table 2. Virtual interactive motor games used depending on the type of movement

| No. crt. | The type of movement | The game                                                                                                                                                                               |
|----------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.       | Imitation movements  | <ul style="list-style-type: none"> <li>• <i>Freeze Dance</i></li> <li>• <i>Do Like</i></li> </ul>                                                                                      |
| 2.       | Simulation movements | <ul style="list-style-type: none"> <li>• <i>Golf - Ocean Driver</i></li> <li>• <i>Skiing</i></li> <li>• <i>RuniRoon</i></li> <li>• <i>U-Paint</i></li> <li>• <i>Seishin</i></li> </ul> |



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Table 3. Virtual interactive motor games used according to the game category

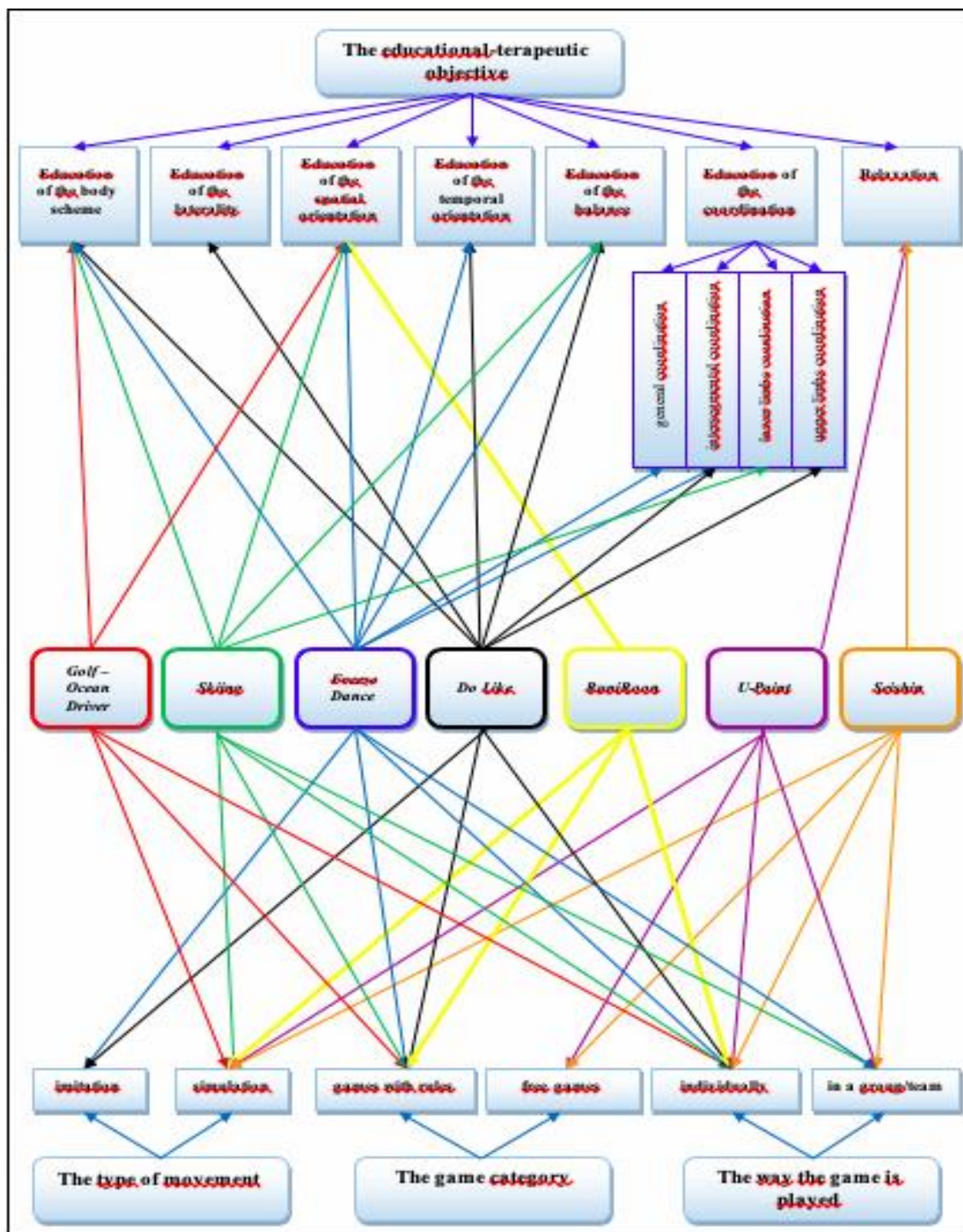
| No. crt. | The game category | The game                                                                                                                                                                                    |
|----------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.       | Games with rules  | <ul style="list-style-type: none"> <li>• <i>Freeze Dance</i></li> <li>• <i>Do Like</i></li> <li>• <i>Golf - Ocean Driver</i></li> <li>• <i>Skiing</i></li> <li>• <i>RuniRoon</i></li> </ul> |
| 2.       | Free games        | <ul style="list-style-type: none"> <li>• <i>U-Paint</i></li> <li>• <i>Seishin</i></li> </ul>                                                                                                |

Table 4. Virtual interactive motor games used according to the way the game is played

| No. crt. | The way the game is played | The game                                                                                                                                                                                                                                        |
|----------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.       | Individually               | <ul style="list-style-type: none"> <li>• <i>Golf - Ocean Driver</i></li> <li>• <i>Skiing</i></li> <li>• <i>Freeze Dance</i></li> <li>• <i>Do Like</i></li> <li>• <i>RuniRoon</i></li> <li>• <i>U-Paint</i></li> <li>• <i>Seishin</i></li> </ul> |
| 2.       | In a group/team            | <ul style="list-style-type: none"> <li>• <i>Skiing</i></li> <li>• <i>Freeze Dance</i></li> <li>• <i>U-Paint</i></li> <li>• <i>Seishin</i></li> </ul>                                                                                            |

A graphical representation of the selection of virtual interactive motor games that were used to improve the psychomotor disorders is illustrated in Figure 1.

Figure 1. Graphical representation of the selection of the virtual interactive motor games



### Strategies of personalized intervention in kinetotherapy

We used the following strategies of personalized intervention:



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- for each child who participated in the kinetotherapy activity, we prepared a Personalized Intervention Program (PIP), which includes: purpose, objectives, therapy strategies, time interval, evaluation;
- we selected games that would encourage the child's progress; for example, in *Golf-Ocean Driver* game, the child receives an extra „hit” for each achievement of maximum score (at 3 points), stimulating his interest to get a final score as high as possible;
- we used educational games from the *Kinems* collection (<https://www.kinems.com>; <https://academy.kinems.com/games>), that are designed for special education and that offer the possibility of custom settings (Table 5).

Table 5. Virtual interactive motor games from the *Kinems* collection. Custom settings

| No. crt. | The game        | The custom settings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.       | <i>Do Like</i>  | <ul style="list-style-type: none"> <li>- <i>Category for:</i><br/> <i>I. Postures. Combined postures</i><br/> <i>II. Sequential body movements</i><br/> <i>III. Hold a body posture</i><br/> <i>IV. Movement repetitions</i></li> <li>- <i>Time per movement</i> (the time given for the imitation of each movement, e.g. 10 or 15 seconds).</li> <li>- <i>Duration time</i> for the category: <i>III. Hold a body posture</i> (e.g. 5 or 10 seconds)</li> <li>- <i>Custom postures</i> (to select specific movements or postures for the child to imitate).</li> <li>- <i>Number or repetitions</i> for the category: <i>IV. Movement repetitions</i> (e.g. 3 or 5 times).</li> </ul> |
| 2.       | <i>RuniRoon</i> | <ul style="list-style-type: none"> <li>- <i>The obstacles</i> that may appear on the route and that the child must avoid.</li> <li>- <i>The number of questions</i> that the child will be called to practice in each game/stage.</li> <li>- <i>Customizable timer countdown</i> for collecting all objects.</li> <li>- <i>Character speed</i> allows to adjust the speed of the RuniRoon on the route according to the need of the child.</li> <li>- With the <i>Visual help</i> option, the type of the objects to be collected will appears on the screen as a reminder to the children.</li> </ul>                                                                                 |
| 3.       | <i>U-Paint</i>  | <ul style="list-style-type: none"> <li>- <i>The duration</i> of the game-play.</li> <li>- <i>The Background</i> option defines the scenery in which the children will be embedded for start coloring (one of the four different themes: night, forest, valley, beach or the real environment).</li> <li>- <i>Balloons</i> with paint will appear in the scenery which could be „hit” by children, thus splashing extra colors if selected.</li> <li>- <i>Brush</i> option defines the texture of the colors that the child can draw with; there is a variety of brushes such as marker, airbrush, pencil, water, sparks, smoke, arrows.</li> </ul>                                     |
| 4.       | <i>Seishin</i>  | <ul style="list-style-type: none"> <li>- <i>The duration</i> (as countdown) for the game.</li> <li>- <i>The number of rows of musical strings</i> that will appear on screen (1, 2 or 3 rows).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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**Description of the virtual interactive motor games used in the kinetotherapy activities**

- **Golf – Ocean Driver** (from *Kinect Sports, season 2* collection)

In this game, the child will be positioned to the side, with the preferred hand on the outside and the non-preferred hand towards the screen. During this game, the child will adjust his position, moving forward or backward, before each „hit” performed with the hands together, so as to hit the target on an island. The score is set as follows: 1 point when the ball reaches the green area, 2 points for the purple area and 3 points for the red area; if the ball does not reach the island, but the water, the child does not receive any points for that hit. The child is entitled to 10 „hits”; he receives the score immediately at the end of the game and is congratulated.

Images from this game are shown in Figure 2.

Figure 2. Images from the virtual interactive motor game *Golf - Ocean Driver* (Cojocaru, 2019)



- **Skiing** (from *Kinect Sports, season 2* collection)

At the beginning of this game, the child receives the necessary instructions from a virtual player on the screen: to lower his body to gain speed, to lean left/right to pass (making slalom) between the same color flags, to jump to send his skier into the air, overcoming obstacles. During the game, at the top of the screen, are displayed: on the left, the running speed and the number of missed gates; in the middle, the color of the gate flags; on the right, the running time. At the end of each round, the running time is displayed, and at the end of the game appears the total running time for each player and the ranking. The player with the shortest running time wins.

Figure 3 shows images from this game.



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Figure 3. Images from the virtual interactive motor game *Skiing* (Cojocaru, 2019)



- **Freeze Dance** (from *Nickelodeon Dance 2* collection)

The child dances, imitating the movements of the corresponding child from the screen. The element of maximum attention is when, at certain moments of dancing, the child must remain motionless. Down on the screen, a series of icons scroll from right to left, that anticipates the movements that the child must make. On the side, at the top of the screen, are three transparent stars that, during the game, are colored according to the fidelity with which the child reproduced the movements of the dancer from the screen. At the end, the colored stars turn golden, representing the score obtained by the child. This game can be played by a single child or two children, in team, thus helping to improve the relationship with the partner.

The figures below show images from this virtual interactive motor game played individually (Figure 4) and in team (Figure 5).

Figure 4. Images from the virtual interactive motor game *Freeze Dance* – individually (Cojocaru, 2019)





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Figure 5. Images from the virtual interactive motor game *Freeze Dance* – in team  
(Cojocaru, 2019)



- **o Like** (from *Kinems* collection)

From a variety of specific postures or movements to be replicated by the child, the teacher can select certain work tasks for the child: to perform single postures or simple movements, to perform combined movements, to follow the order of sequential movements, to hold a position, to repeat a movement. At the end of the game, the child receives on the screen congratulations and the score that includes the number of correct executions and the number of missed executions.

Images from this game are shown in Figure 6.

Figure 6. Images from the virtual interactive motor game *Do Like*  
(Cojocaru, 2019)



- **RuniRoön** (from *Kinems* collection)

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The child must control with his body the avatar character on the screen (a raccoon) who runs on a path to collect objects of a certain type (for example, objects of the same color) that will appear along the way. During the game, the child will help the raccoon to collect the right objects and avoid obstacles or objects that look quite similar (for example, they have the same shape, but differ in color), taking steps to the side, to the right or to the left. When collecting the wrong objects or hitting on obstacles, the raccoon loses energy (hearts displayed at the top right of the screen). At the top left of the screen are the points earned on the correct collection of objects.

Figure 7 shows images from this game.

Figure 7. Images from the virtual interactive motor game *RuniRoon* (Cojocaru, 2019)



- ***U-Paint*** (from *Kinems* collection)

The children „paint” in the air, on a musical background, and let their creativity flow by spreading colors around and drawing various figures with their hands in the air, in response to music. The teacher will decide the duration of the game and if the balloons with paint will appear in the scenery, they could be „hit” by children, thus splashing other colors.

Images from this game are shown in Figure 8.



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Figure 8. Images from the virtual interactive motor game *U-Paint* (Cojocaru, 2019)



- ***Seishin*** (from *Kinems* collection)

The children, through the interaction based on the free movement of their hands with musical strings on the screen, produce songs in the air, without the existence of rules. At the end of the game, the congratulations appear on the screen: „Well done! That was wonderful!”

Figure 9 shows images from this game.

Figure 9. Images from the virtual interactive motor game *Seishin* (Cojocaru, 2019)



### Conclusions

The study of psychomotricity is a topic that is always in the attention of specialists working with children with special educational needs. The variety of intervention possibilities is fundamental to improving the disorders encountered in these children; the hardest thing being to make them persist in their effort when they encounter difficulties. Establishing appropriate strategies, in general, and using the virtual interactive motor game, in particular, leads to the achievement of the educational-therapeutic objectives in the kinetotherapy activity with the children with psychomotor disorders.

We recommend to specialists that in the kinetotherapy activities to approach with more confidence the use, alongside the traditional motor game, also of the virtual interactive motor game. In this sense, we tried to present some virtual interactive motor games, making a classification of them according to the educational-therapeutic objective pursued, the type of movement that it includes, the way the game is played. We've also presented custom settings for games that have this option.



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