Module 4. Strength Individualisation, Control and Evaluation

Unit 4.1 Introduction

Studies conducted in the last 50 years have demonstrated the importance of training conditional, coordinative, and cognitive factors. This has made their evaluation a challenge and also a relevant aid for the development of training programs.

Evaluation techniques are usually developed by breaking down what is to be measured (for example, muscle activation in an exercise) and studying the changes separately. From the perspective of complexity sciences, it has been proposed to evaluate the different elements that make up the phenomenon that is to be measured, and to observe the relationships established between them (for example, coordination during a match among team players). However, we currently only have equipment that allows us to measure isolated and simple phenomena. We still do not have a tool that allows us to know the overall training load, since it is impossible to have a magnitude of global training session impact, since conditional, coordinative, cognitive loads, etc. interact at the same time. Therefore, we must currently settle for the partial explanation of the phenomena that occur in practice, knowing that the sum of these partial phenomena will not explain global performance.

> Monitoring the athlete's movements during training, including strength sessions and official competitions, has been a topic studied and developed by sports scientists for years... This allows us to know the physical demands of athletes and thus be able to intervene through individualised training tasks...
>
> To monitor training, a ton of technological devices have been used... Some of the most commonly used are video analysis, force platforms, linear encoders, force gauges, accelerometers, or global positioning systems (GPS) (Fernández-Valdés Villa, 2020, p. 49).

Furthermore, currently there are applications that, using video, can take indirect data of elements that may be interesting for monitoring (image 1).

Image 1: Elements for monitoring

Source: own creation

Plataforma de fuerza	Force platform
Galgas extesiométricas	Strain gauge sensors
Dinamómetros de presión	Pressure dynamometer
EMG*	EMG*
Encoders	Encoders
Acelerómetros	Accelerometers

APPs	APPs
Placa electronica	Electronic board
Casco	Helmet
Eje	Axis
Rodamiento	Bearing
Carcasa	Case
Clamp	Clamp

One of the most widely used and more researched devices are GPS, especially in [football]. In addition, these devices used in training monitoring offer much more data besides GPS, which is why it is more accurate to refer to them as microtechnology devices, as they are components with several microsensors that, along with GPS, incorporate accelerometers, gyroscopes, and magnetometers.

When referring to exercises with low levels of specificity - Level 0 and Level 1 - there are various measuring tools, such as linear encoders, strain gauge sensors, force platforms, and mobile apps, etc., that allow us to objectively measure the magnitude of some exercise variables, such as force, speed, movement, etc.

To support precise quantification of training loads, it is important that the technology used is valid and reliable. This is particularly important for professionals who use this information to make decisions about subsequent training sessions. The information provided by encoders and force platforms is useful for movements executed in the vertical axis and linear movements, i.e., the usefulness lies in assessing specific actions, such as jumps or running in a straight line, but also in nonspecific tests, such as Olympic movements or lifts, that use gravity as resistance.

These tools are also useful in training methods or strategies that take into account velocity loss thresholds with the aim of mitigating fatigue responses or making programming decisions based on the strength-velocity-power characteristics of a measured exercise. Therefore, these linear tools will be used to a greater extent to objectify changes in the conditional structure of the footballer. In general, linear transducers have shown the greatest accuracy in controlling speed.

> The main problem arises when measuring intermediate levels - N2 and N3 - with a predominance of coordination structure, or groupings (A1-3, A1-2, etc.).
>
> To monitor these intermediate levels, appropriate technology, and algorithms to process the data were not available. (Fernández-Valdés Villa, 2020, p. 52).

The "advancement in technology, and training measurement and monitoring tools allows us, therefore, to go one step further in training assessment" (Fernández-Valdés Villa, 2020, p.50), enabling us to also measure the player's coordinative structure using accelerometers. "These microtechnology devices have accelerometers with a recording capacity of up to 1000 Hz. This sampling frequency is sufficient to use nonlinear techniques such as entropy to analyse acceleration time series" (Fernández-Valdés Villa, 2020, p.52). If linear techniques were used, the motion information would be partial. Nonlinear calculations provide quantitative and qualitative information about the behaviour of the motor system by tracking human movement patterns (Orellana and De la Cruz Torres, 2010).

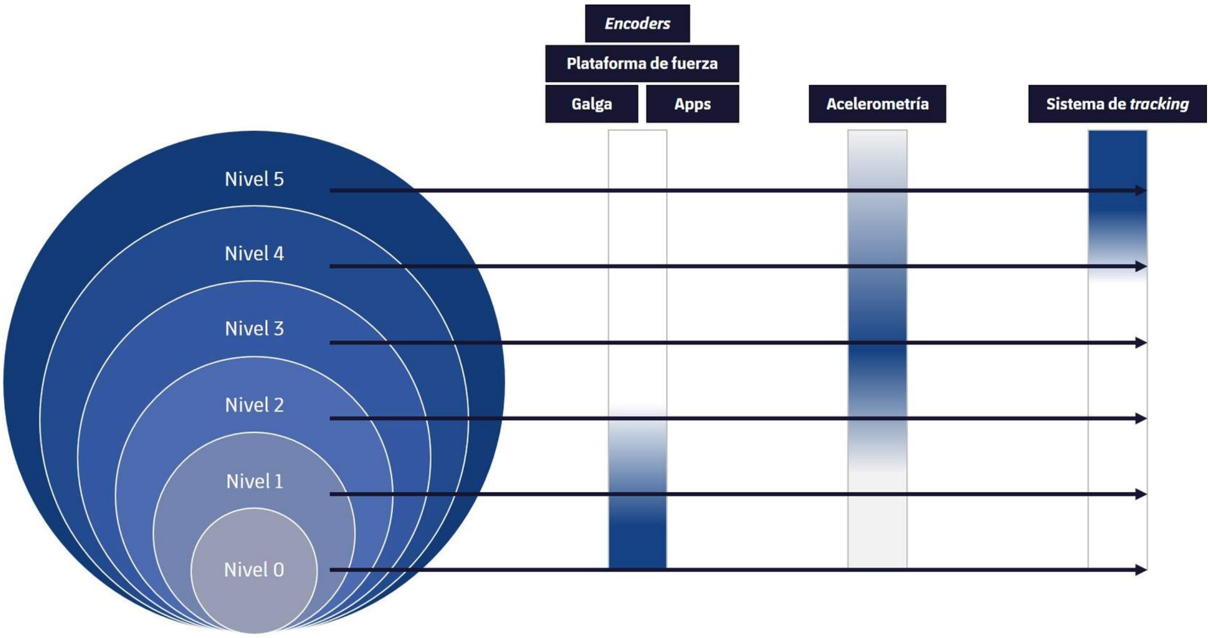
> This recent use of non-linear measures in sports has promoted the assessment not only of the magnitude of human variability, but also of its temporal structure, which allows describing how the neuromuscular control system responds to perturbations (Dingwell & Marin, 2006; England & Granata, 2007). (Fernández-Valdés Villa, 2020, p. 53).

> In the context of the applicability of entropy analysis to a time series such as that obtained through the monitoring of human movement, it will allow for quantifying the predictability of a signal, with more regular and predictable signals having low entropy values, and more unpredictable signals having high values (Yentes et al., 2013). Therefore, the use of nonlinear tools such as entropy can be a good alternative to explore the nature of human movement and its

relationship with coordinative development (Preatoni et al., 2013). (Fernández-Valdés Villa, 2020, p. 54).

“On the other hand, to measure tasks in N4 and N5, other tools such as video analysis are used” (Fernández-Valdés Villa, 2020, p. 51). The microtechnology explained above is also used. It allows quantifying the physical demands in play (Vázquez-Guerrero et al., 2019) (image 2).

Image 2:



Source: own creation

Nivel	Level
Encoders	Encoders
Plataforma de fuerza	Force platform
Galga	Gauge
Apps	Apps
Acelerometría	Accelerometry

Sistema de tracking	Tracking system

4.1.1 Conditional and Bioenergetic Structure Training Control

Regardless of the task and muscle groups involved, the maximum amount of force that the neuromuscular system can produce during a movement depends on the speed of the movement. When football players want to change speed (i.e., accelerate or decelerate) or change direction of movement, they have to project force against the ground, although this production of force in sports movements does not always have to be as high as possible. Given the complexity of actions in football, the athlete often has to be prepared for actions with rapid changes of movement or she has to resist or overcome a resistance, such as contact with an opponent.

Performance that includes ballistic actions is highly determined by impulse and mechanical power. Power production depends on their strength and speed capacities, and on the strength level they can produce depend on the specific context of the action of the match. Therefore, a strength assessment must examine the complete spectrum strength-velocity-power.

Although not all types of actions can be assessed and controlled, it is possible to monitor exercises for vertical jump and sprint acceleration. An individual approach to force-velocity (F-V) profiles could allow for a much deeper analysis and interpretation of strength, performance, and its underlying factors on an individual basis for each player, which could be used to improve training interventions.

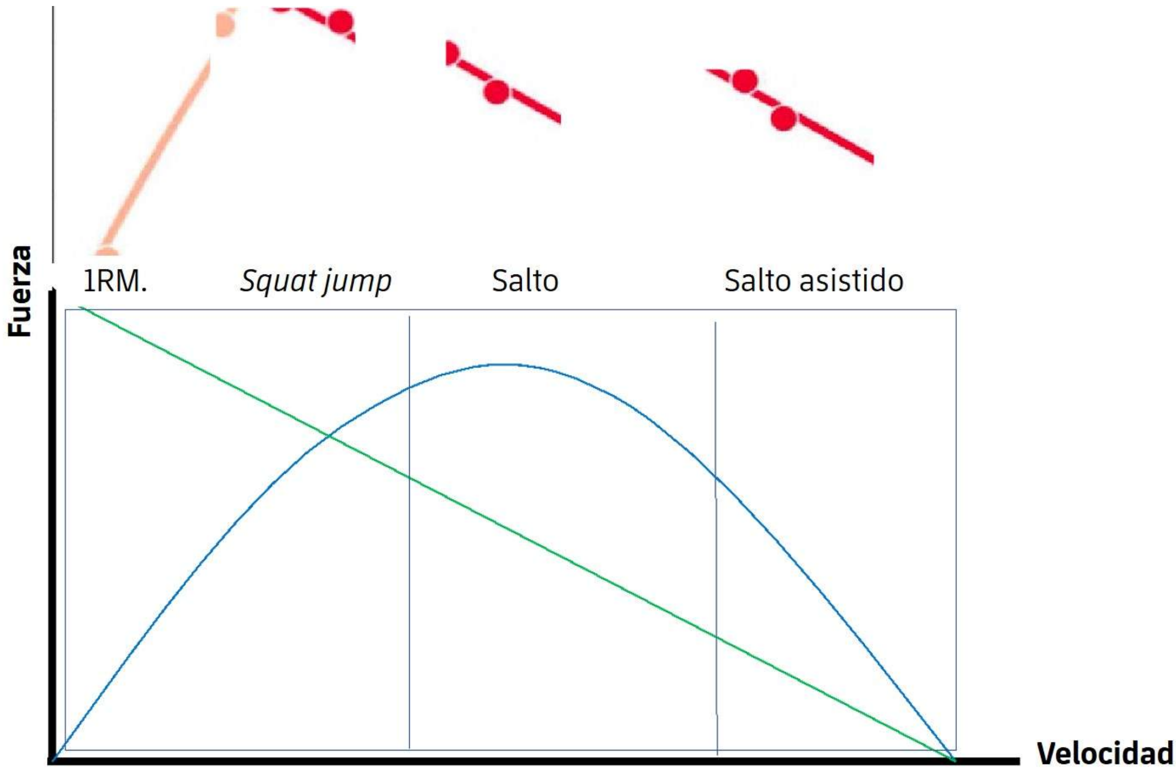
Concentric muscle actions are described as having an inverse force-velocity (F-V) relationship; this is not the case when isolated muscles are analysed. However, during multi-joint functional tasks, such as running movements, linear F-V relationships are constantly observed.

Whenever maximum force production is assessed during a multi-joint movement at different velocities, it has been experimentally observed that the F-V relationship is linear up to at least 90% of the theoretical maximum force and 80% of the theoretical maximum velocity. This difference in models is probably explained by the different biological levels at which force production capacities have been evaluated.

When measured during multi-joint movements, F-V relationships are a complex integration of the different mechanisms involved in the total external force produced during the extension of a single joint, which are not necessarily implicated in the force produced by an isolated muscle. Such multi-joint F-V relationships encompass individual mechanical properties of the various muscle-tendon units involved in the movement (e.g. intrinsic F-V and length-tension relationships, rate of force development, muscle-tendon stiffness), some morphological factors (e.g. cross-sectional area, fascicle length, pennation angle, joint lever arms), neural mechanisms (e.g. motor unit recruitment, activation frequency, motor unit synchronisation, intermuscular coordination), and segmental dynamics.

The inverse F-V relationship mentioned earlier refers to a decrease in the maximum force production capacity of a football player as movement speed increases. Additionally, since it is the product of force and velocity, the maximum power production that an athlete can develop also changes with the change in speed. Individual F-V and P-V relationships offer an overview of strength and power (image 3).

Image 3:



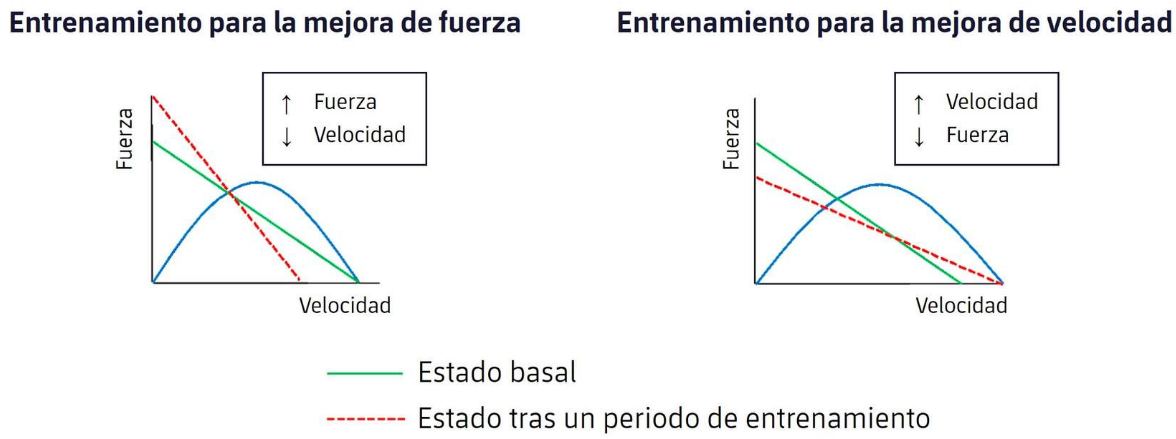
Source: own creation

Fuerza	Strength
Velocidad	Speed

Squat jump	Squat jump
Salto	Jump
Salto asistido	Assisted jump

As discussed in Module 1, we can modify this curve through training.

Image 4: Training to improve strength and speed



Source: own creation

Entrenamiento para mejorar la fuerza	Training to improve strength
Entrenamiento para mejorar la velocidad	Training to improve speed
Fuerza	Strength
Velocidad	Speed
Estado basal	Baseline state
Estado tras período de entrenamiento	State after a training period

Players have different individual profiles of F-V-P (and fatigue), and therefore different training needs. Additionally, they are likely to adapt differently to the specific proposed training (in terms of magnitude and time of response). That is why a modern, evidence-based approach to jump and sprint performance should include these analyses in the process of monitoring and tracking strength for the control of conditional adaptations.

4.1.2 Coordinative Structure Training Control

Co-adjuvant training in football has traditionally focused on conditional and bioenergetic structures (muscle groups) rather than coordinative structures (sports movement). Generally, closed, and predictable exercises are used for athletes.

One proposal of movement-based training is to prioritise the coordinative structure during strength tasks. As mentioned in Module 3, a useful tool for this is the introduction of constraints in the task to change the task structure, making it less predictable and increasing the variability of movement to achieve a more adaptable athlete. By training these constraints, they lose their disruptive effect, so the tasks eventually become too predictable again, losing the predominance of the coordinative structure despite using a coordinative constraint. When this happens, we must modify the task again by changing the nature of the constraint.

Being able to measure movement variability during exercises helps establish a progression of tasks with different constraints and individualise tasks by detecting when they have become too predictable. One tool for measuring this movement variability is entropy, which has been shown to be useful for detecting changes in variability when introducing constraints (Fernández-Valdés Villa et al., 2020). However, an entropy value alone does not provide enough information to determine whether a stimulus is too challenging, insufficient, or appropriate for the athlete, but must be contextualised and compared with the values of that same player based on criteria such as level of approximation or group it belongs, number of sets, repetitions and programmed rest periods in the exercise, and the level of novelty that the task has for the athlete in question. Thus, for example, an increase in the level of variability may be due to the incorporation of a constraint in the task that forces the athlete to find ways to resolve those situations (Araújo et al., 2004), or it may also be due to a coordinative imbalance due to lack of experience in the player's task.

Likewise, a decrease in the level of variability can have different interpretations depending on the context, and may be the result of

> increased fatigue, leading to greater stiffness in movement or a reduction in degrees of freedom... or a challenge that is too low and predictable for the athlete, whether it is a movement that is repeated too often during training and competition... or simply repeating the same task over several weeks of training.
>
> Therefore, we can argue that there is a relationship between movement variability and the concept of adaptability, understood as the degree of adaptation to training loads. (Fernández-Valdés Villa, 2020, pp. 138-139). (Fernández-Valdés Villa, 2020, pp. 138-139).

When we aim to use the coordinative structure, we must generate situations where the task is novel for our athletes, either through the introduction of a constraint or the level of familiarity of the athletes with the task. "When variability decreases, it will mean a decrease in the stimulation of coordinative training, but we must analyse the conditions by which this low level of variability has been reached to understand that sometimes it may have (Fernández-Valdés Villa, 2020, p. 139) sufficient or desired adaptability."

- Variability may decrease due to fatigue. We should modify the task if it is not our goal:

> to improve the performance of [the football players] in the match, especially in the last minutes of the first and second half or in very demanding phases of the match... This type of training must be adequately dosed in training due to the high degree of stiffness that [the players] present when reaching that phase [of low variability due to fatigue], which can increase the risk of injury (Cortes et al., 2014)
>
> (Fernández-Valdés Villa, 2020, p. 139).

- On the other hand, low variability, if not in conditions of fatigue, may be of interest to us if the goal of the task is conditional. Low variability will allow us to reach a higher execution speed (Module 3).

- However, low variability due to the systematic repetition of the task over time, or because it is a sports movement that the athlete has fully mastered at the coordinative level and does not pose a challenge for her must be corrected, as we will not be achieving adaptations.

4.1.3 Strength Training Structure and Control (levels of approximation)

The control and structuring of strength training based on sport movements cover a wide spectrum of the conditional, coordinative, and cognitive needs of the players (Moras, 2000).

To structure coadjutant training using levels of approximation, it is necessary to understand the relationship of the levels with the different structures of the structured microcycle, and to know which variables and analysis techniques (linear and nonlinear) should be controlled to monitor the exercises depending on that level (Image 5), to establish when to change the level and, consequently, the measurement tool.

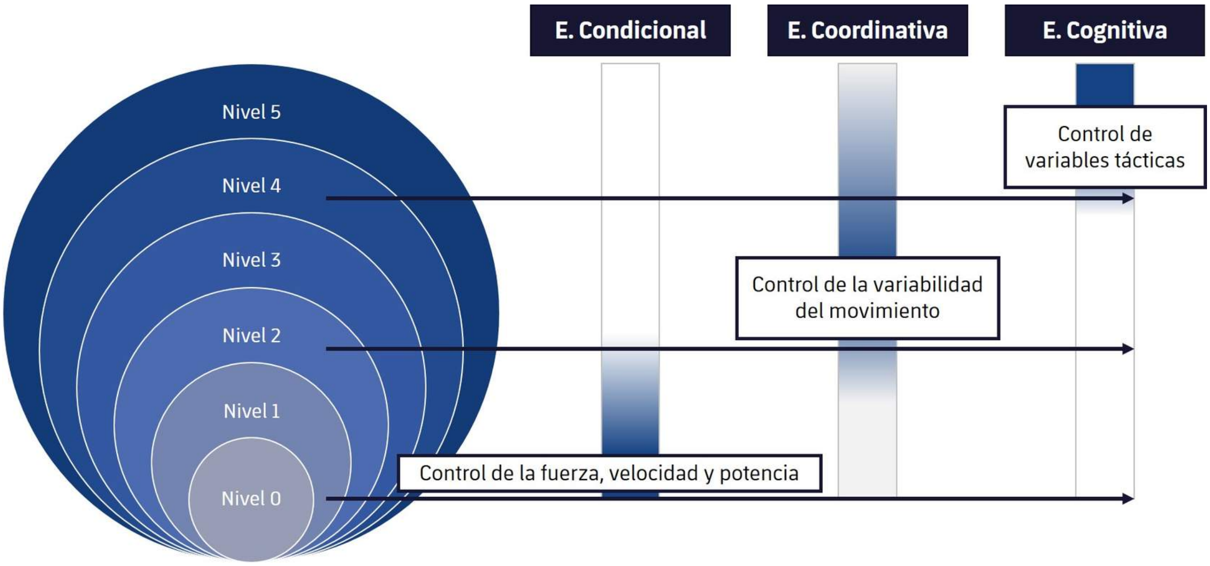
All the structures - as has been said throughout all the modules - are present, but some are preferable to others to facilitate understanding. Since the ones that are not preferable are very open, it has been decided not to include them in the analysis. Similarly, the monitoring variables have been reduced to those that we consider most suitable for each orientation (speed, power, strength, movement variability, and tactical variables) predominant in the training (conditional, coordinative, or cognitive). Thus:

- For levels 0 and 1, where the conditional structure predominates, the most appropriate measurement tools are those that allow us to determine speed, strength, and power. Depending on the movement to be analysed and the information we need, we will use encoders, force gauges, electromyography, etc.

- When we move from an N1 exercise to a 1-3 grouping, we have been able to verify the usefulness that knowledge of movement can have, so we would be interested in using accelerometry and its subsequent analysis through nonlinear methods, such as entropy, to detect possible changes at the coordinative level. This shows the potential that these forms of movement evaluation have when the coordinative structure predominates in the proposed strength tasks. This does not mean that the tools that were previously used in monitoring strength training and their linear analysis are not useful, but simply that they should be complemented. Choosing the appropriate type of tool used to measure exercises at a certain level of approximation will allow us to detect the moment when movement variability stagnates, and therefore we should propose modifications to the task.

- For higher levels, such as 4 or 5, tools such as video analysis or global positioning system (GPS) will be used.

Image 5:



Source: own creation

Nivel	Level
E. Condicional	Conditional Structure
E. Coordinativa	Coordinative Structure
E. Cognitiva	Cognitive Structure
Control de tácticas variables	Tactical variables control
Control de variabilidad del movimiento	Movement variability control
Control de la fuerza, velocidad y potencia	Strength, speed, and power control

In the planning of co-adjuvant training:

> We will find adaptations at the micro level, with work at N0 and N1 and a predominance of the conditional and bioenergetic structures. It is a training that we will carry out in the gym and that would be more related to traditional strength training... [On the other hand], adaptations will occur at the meso level, with the performance of tasks at N2 and N3 and all the groupings (A1-3, A1-4, A2-3, A2-4). Coordinative and cognitive structures gain weight, levelling with the conditional and bioenergetic ones. These tasks are performed in the gym, especially the A1-3 and A1-4 groupings, but also in the field with weights [in specific movements] in the case of the entire group of exercises related to N2, and body weight in the case of N3... [Finally, there are also] adaptations at the macro level, with N4 and N5 and great involvement of all structures similar to what happens during competition. These are field tasks with technical-tactical predominance. (Fernández-Valdés Villa, 2020, p. 145).

> We can observe how the predominance of the conditional and bioenergetic structure will lead us to monitor variables such as changes in acceleration or execution speed through a linear analysis like mean values or peak values to understand these micro-adaptations at the strength level. Meanwhile, a predominance of the coordinative structure will lead us to analyse movement variability through non-linear analysis tools such as entropy to understand these meso-adaptations at the coordinative strength level. (Fernández-Valdés Villa, 2020, p. 146).

Unit 4.2 Goalkeeper's Co-adjuvant Training

Co-adjuvant training - as described in Module 2 - directly affects performance by preparing goalkeepers to train at a higher level in order to perform the necessary optimising loads.

Goalkeepers have different needs than field players: strength is manifested differently. Goalkeeper actions last a short time, are few in number, and intermittent (depending on the team). The actions they perform require great explosiveness, speed, and precision. Additionally, they require eye-hand coordination, as regulations allow goalkeepers to use their hands. As mentioned in Module 1, goalkeepers currently do not have a specialised anthropometric profile, although, based on the profile established in men's football, it is believed that they should be tall and have a large wingspan.

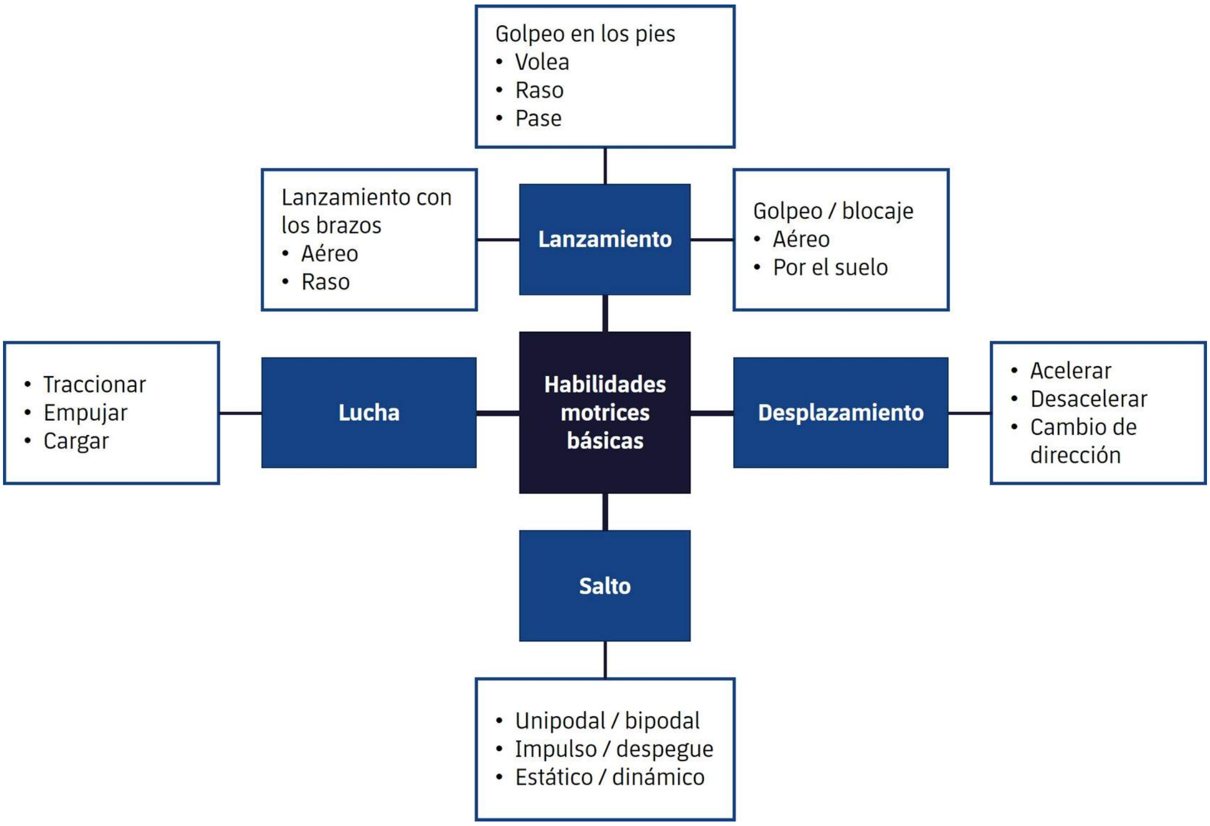
During co-adjuvant training, although all structures will be considered, the conditional, bioenergetic, and coordinative structures will be preferred.

The optimisation of the goalkeeper through co-adjuvant training does not aim to maximise only one of her qualities, but rather to expose her to certain training situations that cause certain stress on some of the structures that make her up, so that she is forced to adapt in a continuous process of self-organisation (Serrano, 2012). It will be through movement (groups of movement) that the match situations will be resolved, through interaction with teammates and opponents. For this reason, specific movements will make the goalkeeper evolve towards specialisation (Seirul·lo Vargas, 2017).

> It is necessary to observe which motor actions and basic motor skills are needed for competition (Jukic et al., 2019; Kokstejn et al., 2019). Seirul·lo (1993a) classifies strength manifestations into four main groups depending on their link to basic motor skills such as throwing, jumping, movements, or skills like fighting [(Image 6)]. (Fernández-Valdés Villa, 2020, p. 39).

The goalkeeper is allowed to use her arms to play, so the different motor skills will have preferential intervention of the upper or lower body, although in both cases the movement will be global, but for classification we will make that distinction.

Image 6:



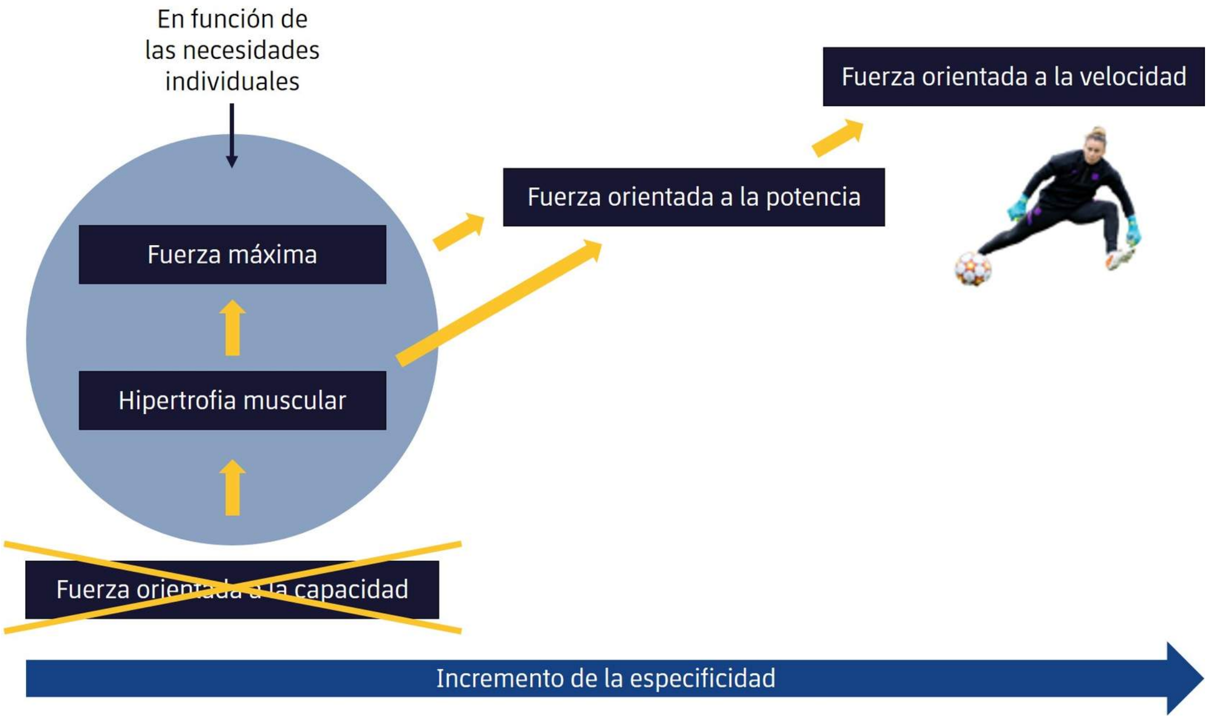
Source: own creation

Golpeo en los pies	*Kicking with feet*
Volea	*Volley*
Raso	*Ground shot*
Pase	*Pass*
Lanzamiento con brazo	*Arm throw*
Aéreo	*Aerial pass*
Raso	*Ground shot*
Golpeo/bolcaje	*Kick/volley*

Aéreo	*Aerial pass*
Raso	*Ground shot*
Lanzamiento	*Throw*
Lucha	*Fight*
Traccionar	*Pull*
Empujar	*Push*
Cargar	*Load*
Habilidades motrices básicas	*Basic motor skills*
Desplazamientos	*Movements*
Acelerar	*Accelerate*
Desacelerar	*Decelerate*
Cambio de dirección	*Direction change*
Salto	*Jump*
Unipodal/bipodal	*One-footed/Two-footed*
Impulso/despegue	*Drive/Take off Drive/Take off*
Estático/dinámico	

The type of sessions used to train the goalkeeper follows the same dynamics as field players (structural, specific qualities, etc.) (Image 7), placing greater emphasis on speed-oriented strength and working it with a higher load of perceptual stimuli, where the player has to react with a specific gesture.

Image 7:



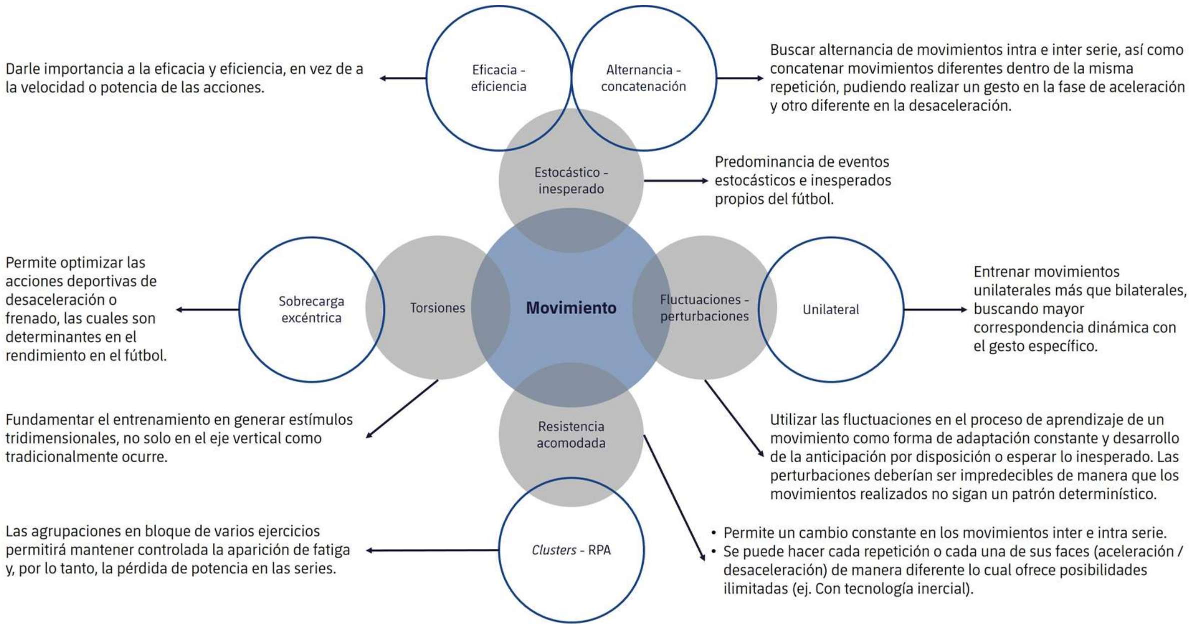
Source: own creation

En función de las necesidades individuales	Depending on individual needs
Fuerza máxima	Maximum strength
Hipertrofiamuscular	Muscle hypertrophy
Fuerza orientada a la capacidad	Capacity-oriented strength
Incremento de la especificidad	Increase in specificity
Fuerza orientada a la potencia	Power-oriented strength

Fuerza orientada a la velocidad	Speed-oriented strength

The training proposal should take into account movement (Image 6) and stimulate it through Tous' training proposal (Image 8).

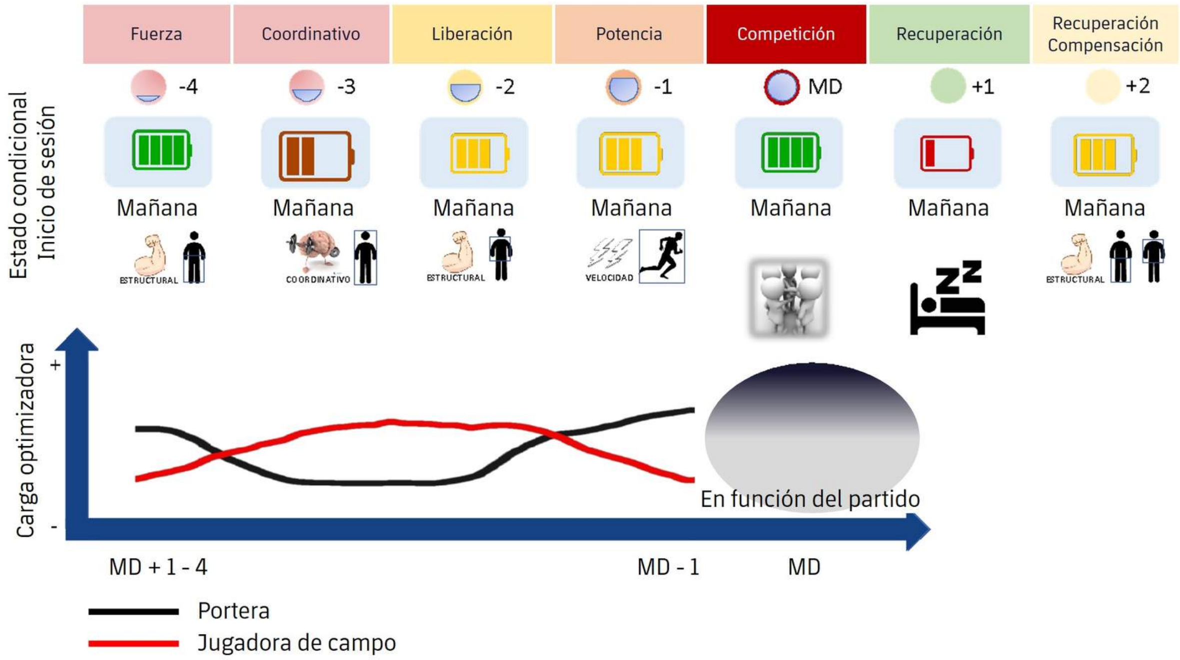
Image 8:



Source: own creation based on Seirul·lo (2017)

The load dynamics in the goalkeeper's micro cycle differs from those of the field players. Due to the training needs of the field players in +1/+2 sessions, goalkeepers usually have higher intensity due to the tasks assigned to the field players that they compensate for. In the middle of the micro cycle, during -3MD sessions, the tasks for field players usually tend to be in large spaces, so the intensity for goalkeepers decreases, although it has more specificity in the stimuli. In -1MD sessions, goalkeepers usually have a higher training load (tasks with more finishing and more stimuli in less time); rotations of the 3-4 available goalkeepers in the optimising training are very important. In coadjuvant training, given the recovery periods required for the different types of sessions, the orientation of the loads is the same as for field players, but the behaviour of optimising training is taken into account (Image 9).

Image 9: Load dynamics of goalkeeper vs field player



Source: own creation

Fuerza	Strength
Coordinativo	Coordinative
Liberación	Release
Potencia	Power
Competición	Competition
Recuperación	Recovery
Recuperación compensación	Compensation recovery
Mañana	Morning
ESTRUCTURAL	STRUCTURAL
COORDINATIVO	COORDINATIVE

VELOCIDAD	SPEED
Estado condicional	Conditional state
Inicio de sesión	Session start
Carga optimizadora	Optimising load
En función del Partido	Based on the match
Portera	Goalkeeper
Jugadora de campo	Field player

Unit 4.3 Coadjuvant Training in Women's Formative Football

Motor development encompasses all the changes that occur in human motor behaviour throughout life, the processes related to these changes, and the factors that affect them (Payne and Isaacs, 2017).

The development of motor capacities and skills is influenced by individual hereditary or biological factors, as well as contextual factors such as sociocultural factors, learning, or previous experience (Payne and Isaacs, 2017). Therefore, we understand development as a broad term that encompasses growth, maturation, learning, and training or practice.

In the case of female players, as we have already discussed in other sections, we know that sociocultural factors have played an important role in determining which activities were appropriate or not for women, which resulted in the number of girls starting in sports being infinitely lower compared to boys, especially in those that were more "masculinised", such as football.

In this this section, the differences between men and women that occur during different stages of development will be explained, but it is important to note that the majority of studies and research carried out to date have been conducted under this context of inequality in terms of practice level, training or stimuli between girls and boys, mainly during childhood.

If we think, for example, of the numerous studies that demonstrate the difference between men and women in terms of anterior cruciate ligament (ACL) injury, two to three times higher in the case of women in sports such as football, we see how most of these studies focus on intrinsic factors (biological, hormonal) as the cause. However, they show the importance and necessity of not focusing solely on these factors to justify these differences, and use the example of activities such as dance, where there are no differences in training ages and gender opportunities. Accumulating both men and women with the same practice in landing techniques with high-risk movements typical of the sport, and similar loads during youth, the disparity in ACL injury rates is not present as in other team sports (Liederbach, Dilgen and Rose, 2008). In addition, female dancers also do not show dangerous landing strategies associated with ACL injury compared to male dancers or team sport athletes (Pappas et al., 2012).

In summary, it is important to understand the context and consider these extrinsic factors that have conditioned the practice of many female footballers during their childhood or adolescence, which has made the starting point in the training process different from that of men. This helps to understand that the existing conditional differences not only have a biological origin but also that changing this context and creating opportunities for equality can minimise differences and generate a context of sports practice with guarantees for female footballers and athletes in general.

Likewise, in the following points, as already explained, we will see the peculiarities during the stages of development in women and, based on them, the importance of introducing and prioritising different contents of coadjutant training from an early age, and with sufficient volume to improve the performance of young women in the future and prevent injuries.

4.3.1 Development Stages

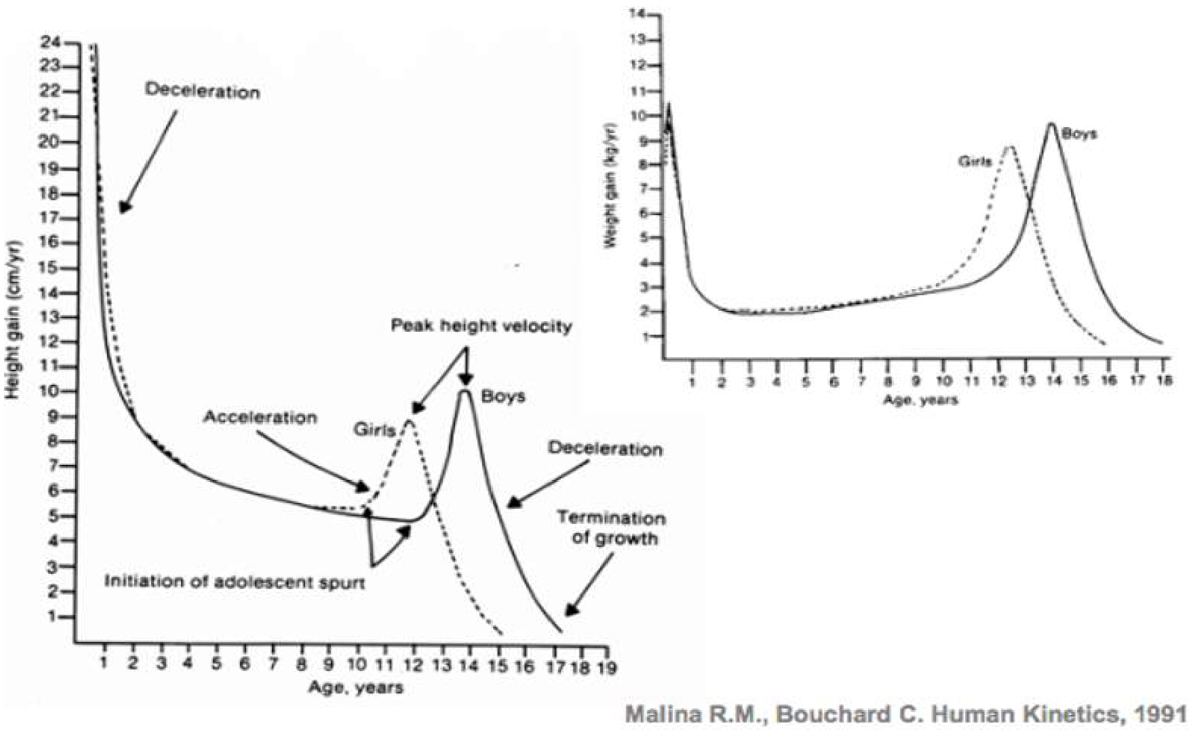
An important aspect in order to intervene in the training process efficiently and safely is to know when our female athletes go through the peak height velocity (PHV) or maximum growth rate in relation to height (Kenney, Wilmore, & Costill, 2021), which, although varies considerably among young women, occurs at approximately 12 years of age, two years earlier than in the case of boys (Philippaerts et al., 2006).

In addition, we must also take into account that the fastest increase in body mass occurs about 12 months after the PHV (Lloyd & Oliver, 2012).

During prepubertal years, boys and girls will follow a similar development in growth and maturation, so they can follow the same training program, and strength, speed, power, resistance, and coordination will develop at similar rates in both sexes throughout childhood, provided that the stimuli to which they are exposed are similar.

Image 10 shows a more graphic representation of the curve of height and weight growth rate:

Image 10: Curve of height and weight growth rate



Source: Malina and Bouchard, 1991.

As shown in the growth curve (either by height or weight), there are two peaks of greater growth, where the most significant structural changes occur in humans.

It is also observed that between 6 and 9-10 years old, growth rate slows down, which carries a mechanical advantage: body segments and levers are shorter, and body weight is lower, so the consequences of impacts, hits, falls, etcetera, are not usually as severe. Due to this, this is the best age to try new challenges/stimuli.

After this phase, we reach 12-13 years old, where there is a rapid increase in the skeletal system, followed by weight gain, which produces high stress and demands on the neuromuscular control system since the body has to adapt to new structures (Payne and Isaacs, 2017).

As we already mentioned, another point to consider is that the maturation process varies depending on the person. According to Malina and Katzmarzyk (2006), we can classify people into three different categories: early, normal, or late maturation. To make this classification, four biological maturation indicators are commonly used: dental, sexual, somatic, and skeletal (Gómez-Campos et al., 2013).

Malina and Bouchard (1991) state that secondary sexual characteristics, skeletal age, and the peak of height velocity (PHV) are the most commonly used indicators to assess the maturation status of individuals, concluding that skeletal age is the most useful maturity indicator. However, in the search for practical, non-invasive, and low-cost methods, other options are considered reliable, such as the proposal based on simple anthropometric measures (Mirwald, Baxter-Jones, Bailey, and Beunen, 2002). Therefore, these methods are the most commonly used in sports.

4.3.2 Development of the Neural System

Regarding the neural system, it is known that it develops between 0 and 8-10 years of age (up to 95% of neural development has already occurred by 7-8 years) (Malina and Bouchard, 1991). The central nervous system undergoes a massive increase in myelination and synaptic connection from 2 to 5 years, a process that is not completed until sexual maturity or even adulthood (Benes, Turtle, Khan and Farol, 1994).

Therefore, before puberty, greater neuronal activation and adaptation can be achieved, focusing on agility, balance, and coordination, in order to take advantage of greater synaptic plasticity, and potentially achieve beneficial neural adaptations for the development of motor competence. This is understood as the ability to contextualise motor skills to provide responses to sports or daily problems or the management and manifestation of motor ability (MA) as a reaction to a complex context to provide intelligent, effective, and efficient responses (Fort Vanmeerhaeghe, Román Viñas, and Font Lladó, 2017). In these early years, neuronal stimulation is more important than muscular hypertrophy, which plays a more important role in athletic development after puberty (Walters, Read, and Estes, 2018).

During puberty, due to the rapid adaptation of new structures, there is a small regression in PHV which leads to a regression of the neuromuscular control, defined by Fort Vanmeerhaeghe et al. (2017) as the precise muscular activation that enables coordinated and effective action during physical and sports activities and in the conditional abilities (specifically strength and resistance) (Vanmeerhaeghe and Rodríguez, 2013).

In the sports field, this period is considered a stage with a high risk of injury, since the muscle strength and power, generated in greater quantity thanks to the natural increase in weight and structural adaptations (hypertrophy), are not usually accompanied by greater neuromuscular control. If this musculoskeletal development that occurs during puberty is not accompanied by adequate neuromuscular adaptation, it can affect biomechanical injury patterns, such as dynamic knee valgus during landings, changes of direction, or decelerations, which are related to the dreaded anterior cruciate ligament injury (Myer, Sugimoto, Thomas, and Hewett, 2013).

For all these reasons, during this time prior to PHV, it is important to prioritise the work of cognitive/perceptual, coordinative, balance, etc., aspects, stimulating the athlete at the neural level to create a base that allows them to continue advancing with sport-specific and more demanding motor skills with greater guarantees and safety once puberty is over.

4.3.3 Development of the Muscular System

Regarding the muscular system, during the 12-18 months after the growth peak and due to a higher concentration of androgens in the body (male sex hormones), there is a natural increase in hypertrophy (growth of muscle cells), resulting in inherent improvements in strength values. However, we should not limit ourselves to thinking about working on strength training from this age due to hormonal advantages, as we know that strength development is multifactorial and is the result of a combination of muscular, neural, and mechanical factors.

The improvement in strength in children, therefore, will not occur due to hypertrophy but rather due to an improvement in neuromuscular activation, intermuscular coordination (motor), and the intrinsic qualities of the muscle. Thus, the main mechanism responsible for gains induced by strength training, in muscle strength and related characteristics before puberty depends primarily on neural adaptations. Therefore, "the focus of strength training for children should be based on goals related to the improvement of muscle strength, function, and control, rather than trying to make substantial increases in muscle size" (Lloyd et al., 2014, p. 117).

Image 11 shows that there is an increase in the ability to produce force with age, but that relative strength to body mass decreases, so a child may have more relative strength (to their body weight) than an adult. That is, the ability to generate force increases with age, but the ability to generate force relative to body mass decreases with age (Paasuke, Ereline, & Gapeyeva, 2000).

Image 11:

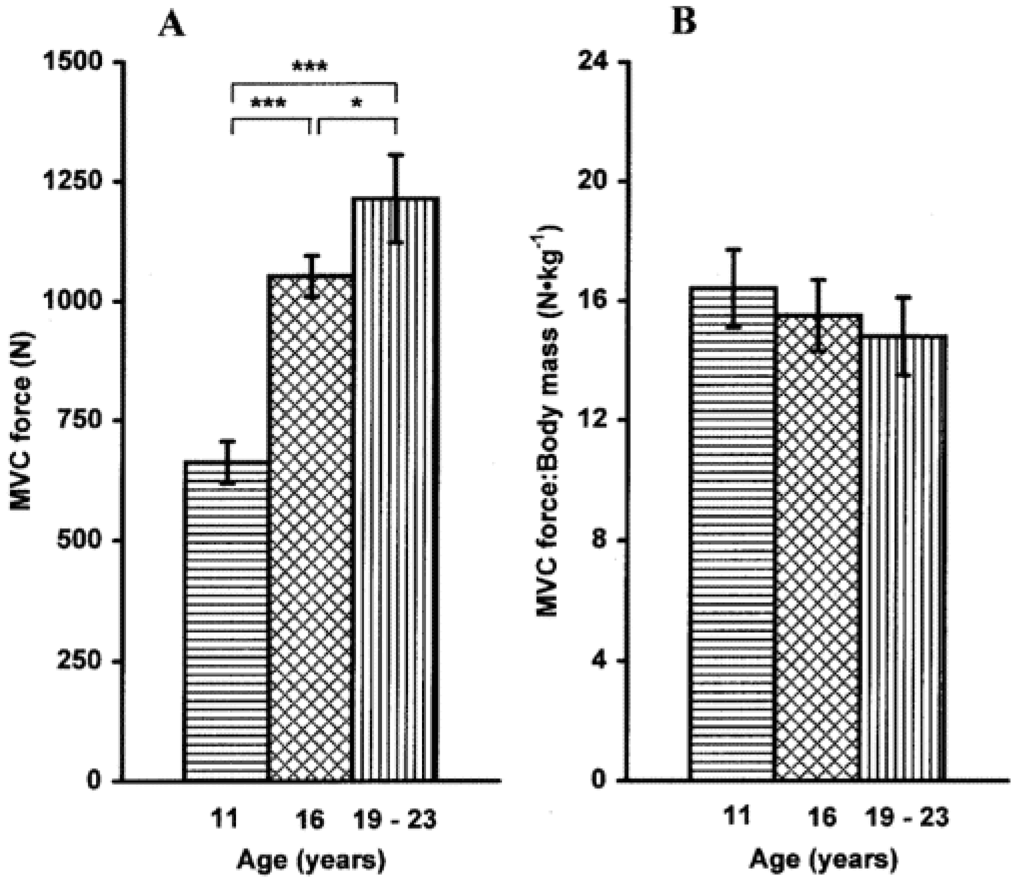


Fig. 1 **A** Maximal voluntary contraction (*MVC*) force, and **B** *MVC* force relative to body mass in pre- and post-pubertal boys and men. Values are mean and SEM. $*P < 0.05$, $***P < 0.001$

Source: Paasuke et al., 2000.

Summarising:

> Research clearly indicates that planned strength training programs can benefit young people of all ages, including children as young as 5-6 years old, achieving notable improvements in their muscular condition following exposure to basic strength training exercises with free weights, elastic bands, and weight machines (Lloyd et al., 2014, p. 116). (Lloyd et al., 2014, p. 116).

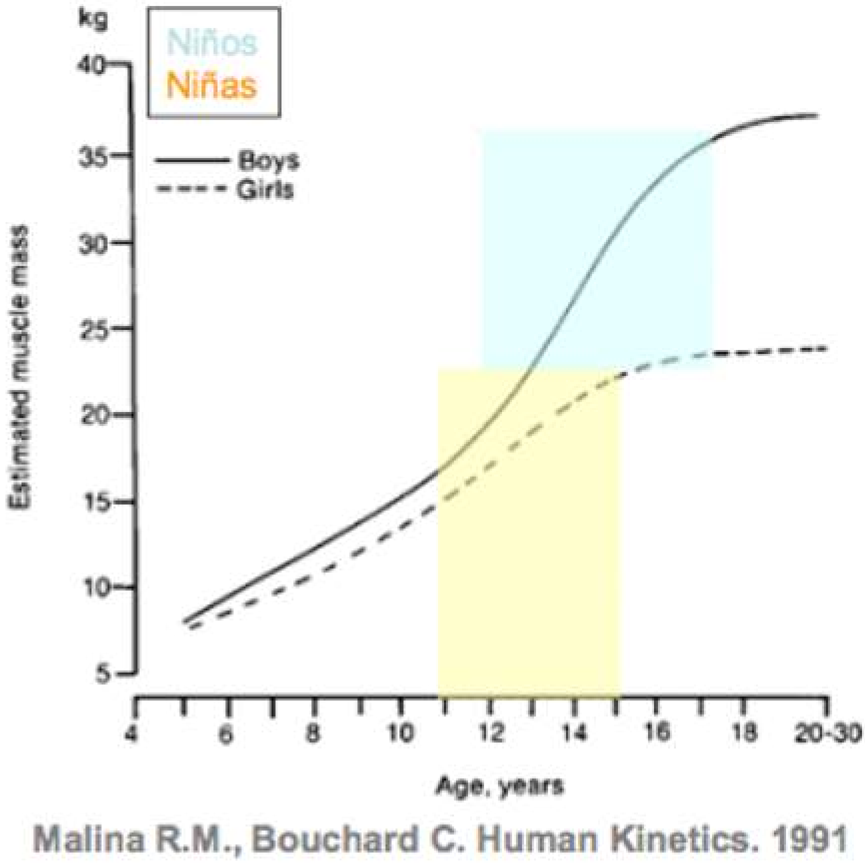
Likewise, "the importance of implementing progressive interventions from the early years of life when children have higher levels of neural plasticity" is emphasised (Lloyd et al., 2014, p. 116), and the effectiveness of strength training in improving motor skill performance in young people is highlighted.

One of the training methods gaining momentum today is based on eccentric overload training with isoinertial machines. Studies such as the one carried out by Fiorilli et al. (2020), which evaluated the effects of 6 weeks of training with two groups of young football players, one group performing a conventional training program (plyometric training group), and another group performing a program with two additional sessions with an isoinertial machine per week. Studies like this reinforce the idea that overload eccentric isoinertial training to practise multidirectional movements in specific sport conditions allows for better performance and better adaptations than those produced with conventional training.

Not knowing the eccentric overload that is applied by the isoinertial device, which is different in each repetition of the exercise, can stimulate the player's neural adaptations and improve more specific football skills, making this type of training especially useful in young athletes due to the coordinative tasks demanded during exercise execution. In addition, especially with young athletes, it is important to introduce variability in training using different methods that pose new challenges for the athlete, so that they can improve the efficiency of complex skills in real match situations (Fiorilli et al., 2016).

In Image 12, we see how the gain of muscle mass after the growth peak is much more evident in boys due to the higher concentration of androgens at this stage, but in girls this gain stabilises and is much lower.

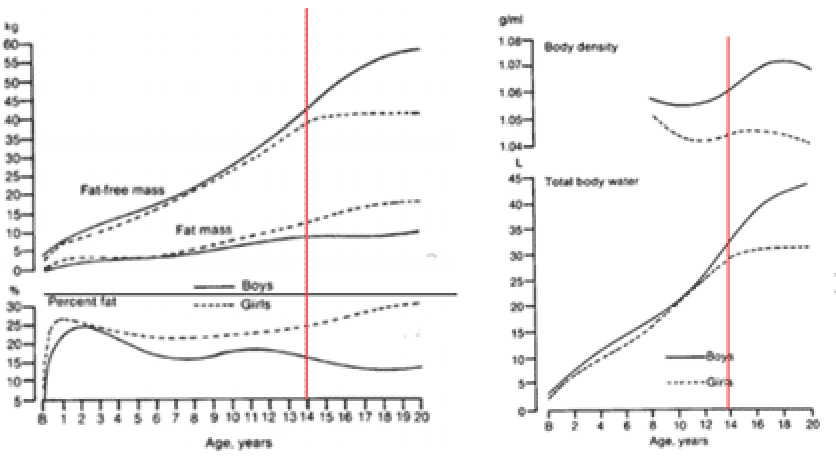
Image 12: Muscle mass gain after growth peak



Source: Malina and Bouchard, 1991.

In addition, in the following images, we also see how the percentage of body fat in girls is always slightly higher, but this becomes more pronounced from adolescence onwards. Similarly, there are differences in terms of water: we see how boys have more water than girls, especially from adolescence onwards, and we know that, if there is more water, it is more difficult to "break".

Image 13: Percentage of fat and water in the body



Source: Malina and Bouchard, 1991.

On the other hand, biomechanical differences between genders have also been demonstrated, and different patterns of muscle activation in basic motor skills have been detected. There are studies on how gender and fatigue influence control strategies when softening landings or when comparing essential movements such as change of direction.

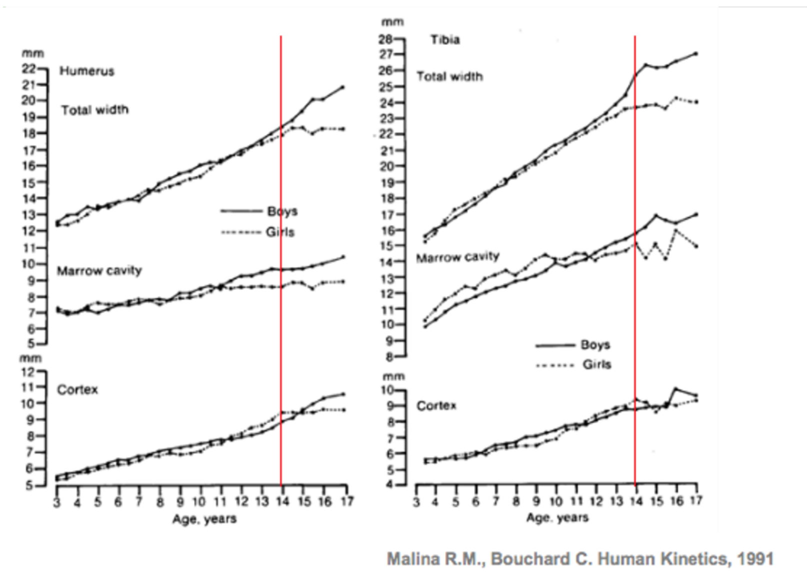
Specifically, during and after sexual maturation, women land and decelerate with less softening (less hip, knee, and ankle flexion), which can be related to the already known higher incidence of anterior cruciate ligament injury in women (Sigward, Pollard, & Powers, 2012).

For all these reasons, we say that with girls, we have to work against the clock. We must work well before reaching the peak, when everything starts to become disadvantageous due to hormonal causes. Strength training seems more necessary in the case of women, as they do not have the natural advantages that are present in males in terms of muscle development.

4.3.4 Development of the Skeletal System

Regarding the skeletal system, we know - as we can see in the following images, which show skeletal length growth of different bones - that there are no significant differences between boys and girls until approximately 13 years old, but from this point on, growth stabilises in females while it continues in males (Malina and Bouchard, 1991).

Image 14: Growth of the skeletal system



Source: Malina and Bouchard, 1991.

Regarding the skeletal system development, it is also important to consider bone density or the amount of minerals in the bone. Most studies in this regard have been done with women due to the well-known problems that menopause brings: a decrease in bone mass, which leads to weaker bones and their consequent problems, such as fractures, need for prosthetics, etc. (Hernández, Beaupré, and Carter, 2003).

The peak of bone density occurs between 25 and 30 years of age according to different studies (Recker, Lappe, Davies, and Kimmel, 1992; Ross, Davis, Vogel, and Wasnich, 1990).

Here, the question we ask ourselves is: is it possible to increase bone mass during growth in physically active children with the aim of achieving higher bone mass as adults? Scientific evidence clearly answers yes.

According to Kemper (2000), intense and high-impact physical exercise during childhood and adolescence produces local increases in bone mass density, and the earlier the child starts with this type of exercise, the more bone mass density will be accumulated.

The prepubertal age is the ideal age to start this type of work and, as we can see, intensity, in terms of muscle contraction, is key. The external load creates a mechanical resistance that causes an increase in the muscular forces required to perform the exercise. These forces constitute a stimulus for bone formation. To achieve this, explosive and power strength training (skipping, sprints, breakings and accelerations, jumps, and plyometrics in general) help more than continuous low-intensity work (walking, jogging, cycling, etc.).

Therefore, it is important to emphasise that all traditional opinions or fears regarding strength training being harmful to skeletal development, and potentially injuring growth zones are not supported by scientific reports or clinical observations.

> In fact, the literature suggests that childhood and adolescence are actually key development periods for increasing bone mineral density, and that lack of participation in moderate-to-vigorous physical activity that involves weight-bearing during these growth stages may predispose individuals to long-term bone health problems (Lloyd et al., 2014, p. 114).

Women, in particular, may be more affected by this due to the problems of menopause mentioned earlier.

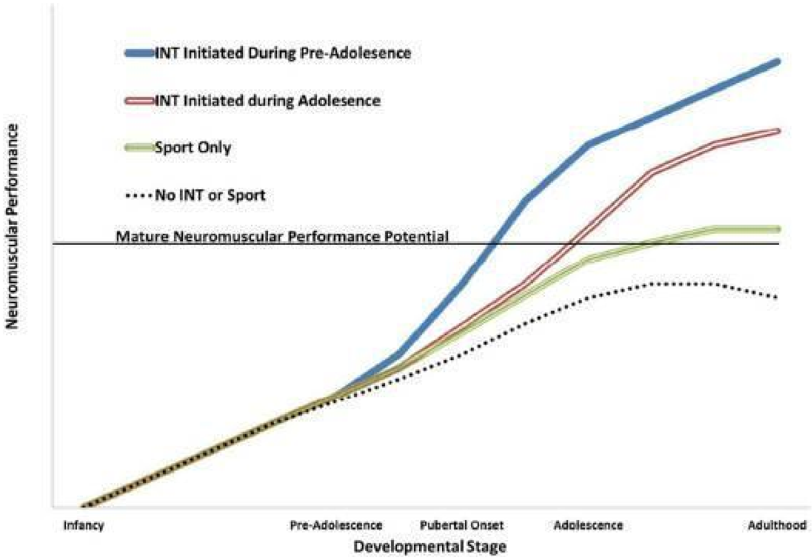
4.3.5 Windows of Opportunity?

Some authors talk about the so-called "windows of opportunity" or sensitive periods that occur during the development years, where girls and adolescents are more likely to achieve adaptations as a result of training. It is believed that if these advantages are not exploited during these windows with appropriate stimulation (training), the future potential of these athletes could be limited (Balyi and Hamilton, 1998).

The fact that different systems have a "critical" period of development does not prevent them from being stimulated at all ages, but the improvement will be greater in these periods or "windows of opportunity".

In the article by Myer et al. (2013), which discusses the optimal age to start strength training, the idea that the athlete's future performance will be conditioned or limited by the training stimuli to which they have been exposed since childhood and pre-adolescence is endorsed. This idea is shown in Image 15

Image 15:



Source: Myer et al., 2013.

Image 15 shows the model that compares the effects of integrated neuromuscular training (INT), understood as a training program that incorporates general and specific strength and conditioning activities,

> including resistance training, dynamic stability exercises, core-centred training, plyometric exercises, and agility training, which should be specifically designed to improve health and fitness components related to physical fitness skills (Myer et al., 2011). (Casas, 2020, p. 72).

Other authors have criticised models that are based on the idea of considering specific periods to train certain abilities/skills, assuming that if these abilities are trained outside of these periods, the results will be lower or, if not trained at certain ages, performance in adulthood will be limited (van Hooren and Croix, 2020).

Critics argue that there is not enough scientific evidence to support this, and that it is reductionist to divide sports skills into five (flexibility, speed, coordination, resistance, and strength), and to measure these general motor skills, such as strength, based on the results of tests such as the number of kilos lifted in a squat, proposing that there are sensitive periods for training these general motor skills.

According to critics, this way of looking at it implies that there are different motor skills that can be trained independently of each other, and that each has separate sensitive periods to be trained. On the other hand, another criticism is that these models do not take into account differences in previous experience levels between individuals, which could alter these sensitive periods or windows of opportunity.

Unidad 4.4 Methodology for Coadjuvant Training Stages in Women’s Formative Football

All the theoretical justification based on experience and scientific evidence that we reviewed in the previous section leads us to be aware of the importance we must give to coadjuvant training in women's formative stages, especially in a club where we seek to train athletes who will compete at the elite level with all the demands that this entails at all levels.

Definitely, what seems evident is the need to start with neuromuscular training from childhood. In relation to the integrative neuromuscular training, we saw before, other authors, such as Fort Vanmeerhaeghe et al. (2016), considering everything we have seen so far, also promote the idea of introducing integrated neuromuscular training in the most sport-specific activities during childhood and pre-puberty, before the period of PHV, in order to improve the efficiency of motor competence, which will allow progress with more specific and demanding skills of the sport.

> Integrative neuromuscular training (INT) is defined as a physical exercise program that incorporates general strength, resistance, and fitness tasks (e.g., basic motor skills) and specific tasks (e.g., agility, dynamic stabilisation, coordination, plyometrics) with the aim of improving health (e.g., reducing injury incidence, increasing cardiorespiratory capacity, reducing obesity), and performance in basic motor skills (BMS) and specific motor skills (SMS). (Fort Vanmeerhaeghe et al., 2017, p. 108). (Fort Vanmeerhaeghe et al., 2017, p. 108).

In this article by Fort Vanmeerhaeghe et al. (2016), the effects of INT programs described in the scientific literature are shown, highlighting the following for the sports field:

1. Optimises and facilitates growth and development.
2. Facilitates the acquisition of competence in basic motor skills...
3. Improves movement patterns, neuromuscular recruitment, balance, proprioception, and agility.
4. Reduces injury risk factors and influences injury prevention.
5. Improves the physical condition of young people in sports...
6. Maximises sporting success in adulthood. (Fort Vanmeerhaeghe et al., 2017, p. 109).

"The TNI should initially focus on creating a broad base of BMS (e.g., jumping, turning, passing) to progress later on to the SMS of each sport" (Fort Vanmeerhaeghe et al., 2017, p. 109), such as dribbling to attract an opponent, changes of direction and feints against opponents, fighting to protect the ball, accurate shooting and passing, etc.

For strength training in formative stages, we understand:

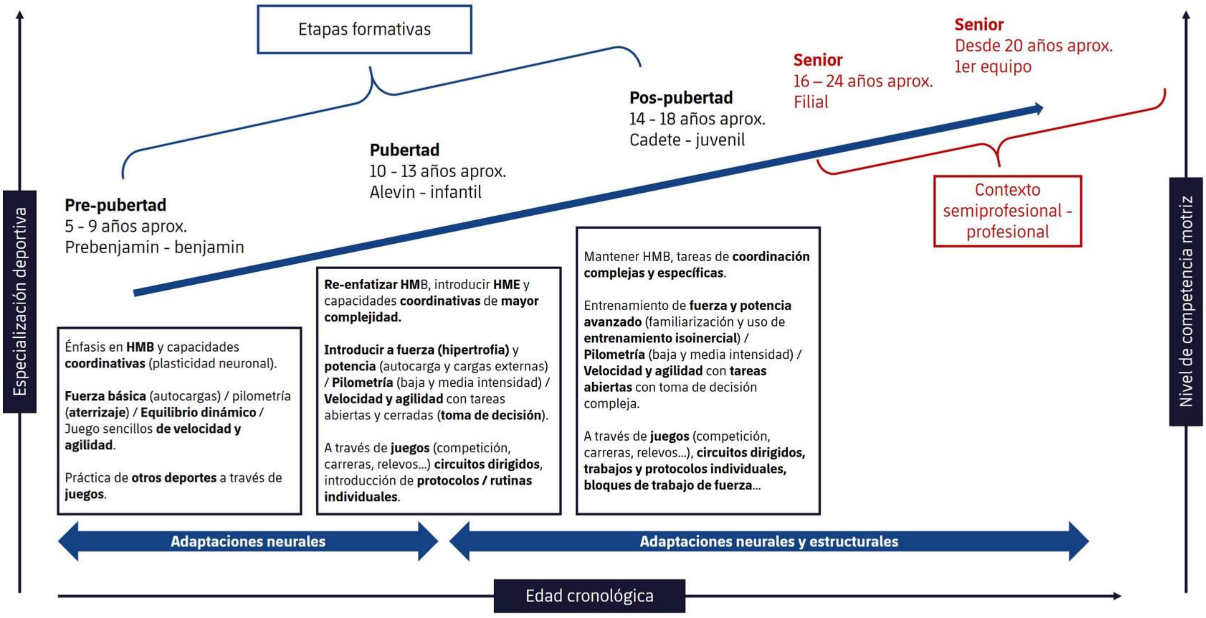
> A training model with progressive and systematic variety in exercise selection, intensity, volume, frequency, speed, and complexity of movements to improve training adaptations, reduce monotony, and

decrease the risk of overload injuries should be followed. (Lloyd et al., 2014, p. 117). (Lloyd et al., 2014, p. 117).

We choose to work on all capacities/skills to optimise motor competence at any age, knowing that benefits can be obtained at all ages and that they all interrelate with each other, so improving one of them will influence the others, although we focus or prioritise work on some of them based on the stage and on what we know about the development of different systems.

Next, we present a summarised diagram (Fort Vanmeerhaeghe and Romero Rodriguez, 2013) of the coadjutant training contents that are worked on at each stage:

Image 16:



Source: Adapted from Fort Vanmeerhaeghe and Romero Rodríguez (2013).

Etapas formativas	Formative stages
Pre-pubertad	Prepuberty
5-9 años aprox. Prebenjamín – benjamín	5-9 years approx. U5 - U9
Pubertad	Puberty

10-13 años aprox	10-13 years approx.
Alevin – infantile	U-11 – Children
Pos-pubertad	Postpuberty
14 – 18 años aprox. Cadete - juvenil	14-18 years approx. U-14 - U-18
Especialidad deportiva	Sports specialisation
Énfasis en HMB y capacidades coordinativas (plasticidad neuronal)	Emphasis on BMS and coordinative skills (neuronal plasticity)
Fuerza básica (autocargas) / pilometría (aterrizaje) / Equilibrio dinámico / Juegos sencillos de velocidad y agilidad	Basic strength (self-loading) / plyometrics (landing)/ Dynamic balance / Simple speed and agility games
Práctica de otros deportes a través de juegos	Practising other sport through games
Re-enfatizar HMB, introducir HME y capacidades coordinativas de mayor complejidad.	Re-emphasise BMS, and introduce SMS and more complex coordinative abilities
Introducir a fuerza (hipertrofia) y potencia (autocargas y cargas externas) / Pilometría (baja y mediana intensidad) / Velocidad y agilidad con tareas abiertas y cerradas (toma de decisión)	Introduce strength (hypertrophy) and power (self-loadings and external loads) / Plyometrics (low and mid intensity) / Speed and agility with open and close tasks (decision making)
A través de juegos (competición, carreras, relevos…), circuitos dirigidos, introducción de protocolos / rutinas individuales	Through games (competition, races, relays,...) directed circuits, introduction of protocols / individual routines

Mantener HMB, tareas de coordinación complejas y específicas	Maintain BMS, complex and specific coordinative tasks
Entrenamiento de fuerza y potencia avanzado (familiarización y uso de entrenamiento isoinercial) / Pilometría (baja y mediana intensidad) / Velocidad y agilidad con tareas abiertas con toma de decisión compleja	Advanced strength and power training (familiarisation and use of isoinertial training) / Plyometrics (low and mid intensity) / Speed and agility with open tasks with complex decision making
A través de juegos (competición, carreras, relevos…) circuitos dirigidos, trabajos y protocolos individuales, bloques de trabajo de fuerza…	Through games (competition, races, relays...), directed circuits, individual work and protocols, strength work blocks…
Senior	Senior
16 – 24 años aprox. Filial	16-24 years approx. Reserve
Senior	Senior
Desde 20 años aprox. 1er equipo	From 20 years approx. 1st team
Contexto semi-professional – professional	Semi-professional - professional context
Nivel de competencia motriz	Level of motor competence
Adaptaciones neuronales	Neural adaptations
Adaptaciones neuronales y estructurales	Neural and structural adaptations
Edad cronológica	Chronological age

The diagram shows a simple progression of training contents based on different stages, although we know that each player's progress is different. Therefore, it is important to consider the level of motor competence to progress in training contents from lower to higher complexity and specificity. In addition, as we mentioned earlier, knowing when the PHV occurs is important to adapt, if necessary, to the needs of each player.

In the structure of the FC Barcelona women's team, there are no U-5 or U9 teams, but many of the girls who start in the U-11 stage are still U-9 age or perhaps, even being U-11, they have not had enough stimuli during previous stages, and it is necessary to continue with the contents that would correspond to the previous stage.

During the U-9-U-11 stage, we should emphasise on BMS and coordinative abilities (movement control), taking advantage of this moment of development, in which we know that there is greater neuronal plasticity. Mainly, the following contents should be introduced for optimising movement:

- Different movements introducing the technique of changes of direction, brakings and accelerations.

- Introduction of running technique elements (frequency and stride length, efficiency, and reactivity).

- Jump actions and activities with impact, introducing technical aspects of landing.

- Proprioceptive work, kinaesthetic discrimination, and segmental differentiation.

It is important to provide variability so that players can practise and experience all types of situations and combined movements, trying to practise with speed and agility as long as they are progressing, and the technique is correct.

Regarding strength training, we should introduce:

- Basic strength exercises using mainly body weight to work on technique, such as:

    - simple upper body rowing and pushing exercises;

    - dominant knee lower body exercises (squats, lunges);

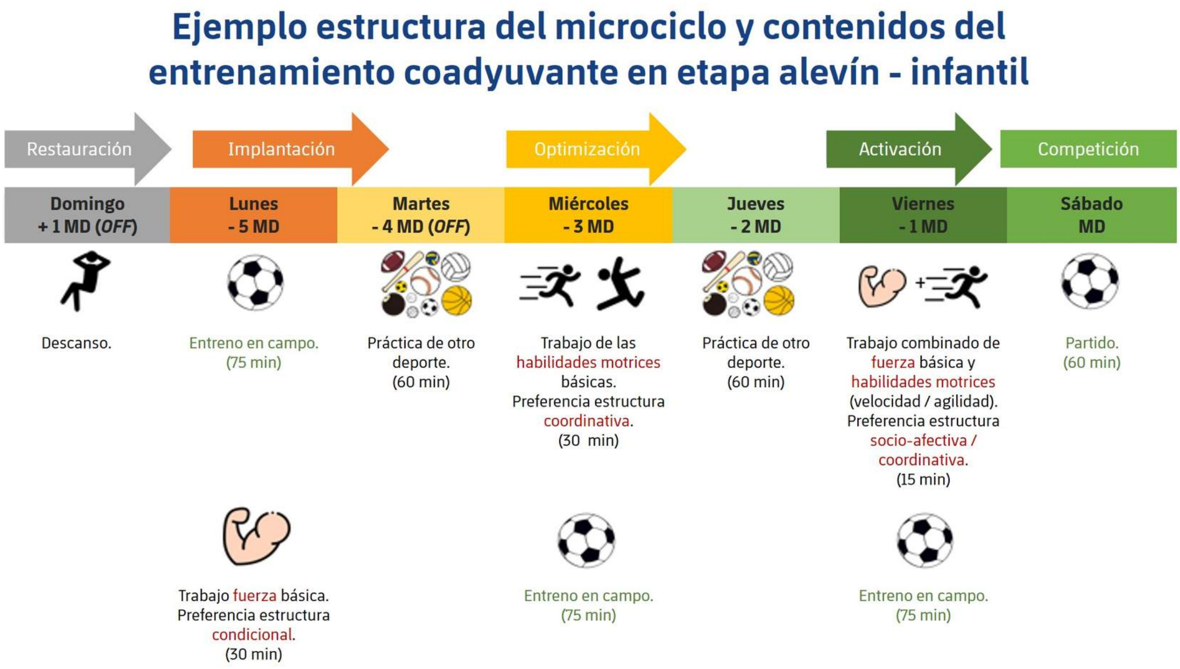
- core exercises such as planks, bridges, anti-rotations, etc. focusing on stability and postural correction/education.

On the other hand, knowing that it is possible to stimulate bone growth and influence bone density, we will try to ensure that all exercises can be performed at a high intensity or adding impact.

We know that during this stage it is interesting for girls to experience a wide variety of motor experiences so that the system is stimulated to be able to adapt to all types of challenges and different situations more easily. After all, in football, no situation or play is the same as the previous one, so having this ability to adapt or this motor "intelligence" will make them more competent in their sport. Thus, a good proposal would be to encourage girls to practise other sports on days when they do not have football training.

Regarding the distribution of contents throughout the microcycle and since they have three training days per week, we could carry out two coadjutant work sessions per week, giving each session a different priority, and adding an activation session on the days before the match. Image 17 shows an example of how a microcycle could be structured (based on the structured microcycle) for a U-11 team in terms of volume and coadjutant training contents, as well as the preferentially stimulated structure in each type of session.

Image 17: Example of the structure of the microcycle and coadjuvant training content in U-11- children stage



Source: own creation

Ejemplo estructura del microciclo y contenidos del entrenamiento coadyuvante en etapa alevín – infantil	Example of the structure of the microcycle and coadjuvant training content in U-11– children stage
Restauración	Restoration
Implantación	Implementation
Optimización	Optimisation
Activación	Activation
Competición	Competition
Domingo + 1MD (OFF)	Sunday + 1MD (OFF)
Lunes -5 MD	Monday -5MD
Martes -4 MD (OFF)	Tuesday -4 MD (OFF)

Miércoles -3MD	Wednesday -3md
Jueves -2MD	Thursday -2MD
Viernes -1MD	Friday -1MD
Sábado MD	Saturday MD
Descanso	Rest
Entreno en campo (75 min)	Field training (75 min)
Práctica de otro deporte (60 min)	Practising other sport (60 min)
Trabajo de habilidades motrices básicas. Preferencia estructura coordinativa (30 min)	Working on basic motor skills. Coordinative structure preference (30 min)
Práctica de otro deporte (60 min)	Practising other sport (60 min)
Trabajo combina de fuerza básica y habilidades motrices (velocidad / agilidad). Preferencia estructurasocio-afectiva / coordinativa (15 min)	Combined work of basic strength and motor abilities (speed/agility). Socio-affective/coordinative structure preference (15 min)
Partido (60 min)	Match (60 min)
Trabajo fuerza básica. Preferencia estructura condicional (30 min)	Basic strength work. Conditional structure preference (30 min)
Enteno en campo (75 min)	Field training (75 min)
Entreno en campo (75 min)	Field training (75 min)

In the children stage, we are facing the moment when many girls will reach PHV. It is important to reemphasise and consolidate the motor skills acquired in the previous stage since, with the abrupt change that occurs in such a short time, as we have already seen, coordinative skills can be affected.

As players progress in the acquisition and mastery of these basic skills, we will introduce more specific skills of the sport in contexts of greater complexity. On the other hand, regarding strength training, we will introduce contents more oriented to work the different manifestations with a primarily structural objective, which will allow creating adaptations that can protect players against the demands of competition and training, where actions are increasingly intense and with a body that, as we saw in the case of girls, does not have as many hormonal advantages after the growth peak but rather the opposite. To work on strength, we will introduce external resistances and overload, progressing in volume, intensity, and complexity as players adapt to the exercises. We can already introduce some simple work with isoinertial resistance if the player's level and competence are adequate.

In addition, we will continue with plyometric exercises, focusing on landing and propulsion technique, with the objective of continuing to stimulate bone density growth without risks associated with poorly coordinated or controlled movements that can increase the risk of certain injuries.

Regarding the methods used, we will continue with game-like forms, as well as adding directed circuits, and starting to introduce simple individual protocols or routines. We will do this in those cases where it is more necessary for the players to be able to do them autonomously according to their needs, with the aim of creating habits and adherence to more preventive work as part of their daily routine. Regarding this, considering the weekly training sessions (3 per week, with 3 rest days), it would be interesting to introduce some work with a more preventive or restoration/active rest character that the players could do autonomously at home.

Below is an example of a microcycle structure with volume and type of coadjuvant work contents for a children team:

Image 18: Example of a microcycle structure with volume and type of coadjuvant work contents for a child

Source: own creation

Ejemplo estructura del microciclo y contenidos del entrenamiento coadyuvante en etapa infantil – cadete	Example of the structure of the microcycle and coadjuvant training content in children – U-15 stage
Restauración	Restoration
Implantación	Implementation
Optimisación	Optimisation
Activación	Activation
Competición	Competition
Domingo + 1MD (OFF)	Sunday + 1MD (OFF)
Lunes -5 MD	Monday -5MD
Martes -4 MD (OFF)	Tuesday -4 MD (OFF)

Miércoles -3MD	Wednesday -3md
Jueves -2MD (OFF)	Thursday -2MD (OFF)
Viernes -1MD	Friday -1MD
Sábado MD	Saturday MD
Descanso	Rest
Entreno en campo (90 min)	Field training (90 min)
Día de Descanso “activo”. Rutinas de movilidad, ADM, estiramiento, fuerza musculatura compensatoria…	‘Active’ rest day. Mobility routines, ROM, stretching, compensatory muscle strength...
Trabajo de las habilidades motrices específicas (mayor complejidad, introducir resistencias externas). Preferencia estructura coordinativa (30-40 min)	Work of specific motor skills (greater complexity, introduce external resistance). Coordinative structure preference (30- 40 min)
Descanso	Rest
Trabajo combinado de fuerza, habilidades motoras y pilometría. Preferencia estructura socio-afectiva / coordinativa (30 min)	Combined work of strength, motor skills and plyometrics. Socio-affective/coordinative structure preference (30 min)
Partido (80 min)	Match (80 min)
Trabajo de fuerza estructural. Preferencia estructura condicional (30 min)	Structural strength work. Conditional structure preference (30 min)

Entreno de campo (90 min)	Field training (90 min)
Entreno de campo (90 min)	Field training (90 min)

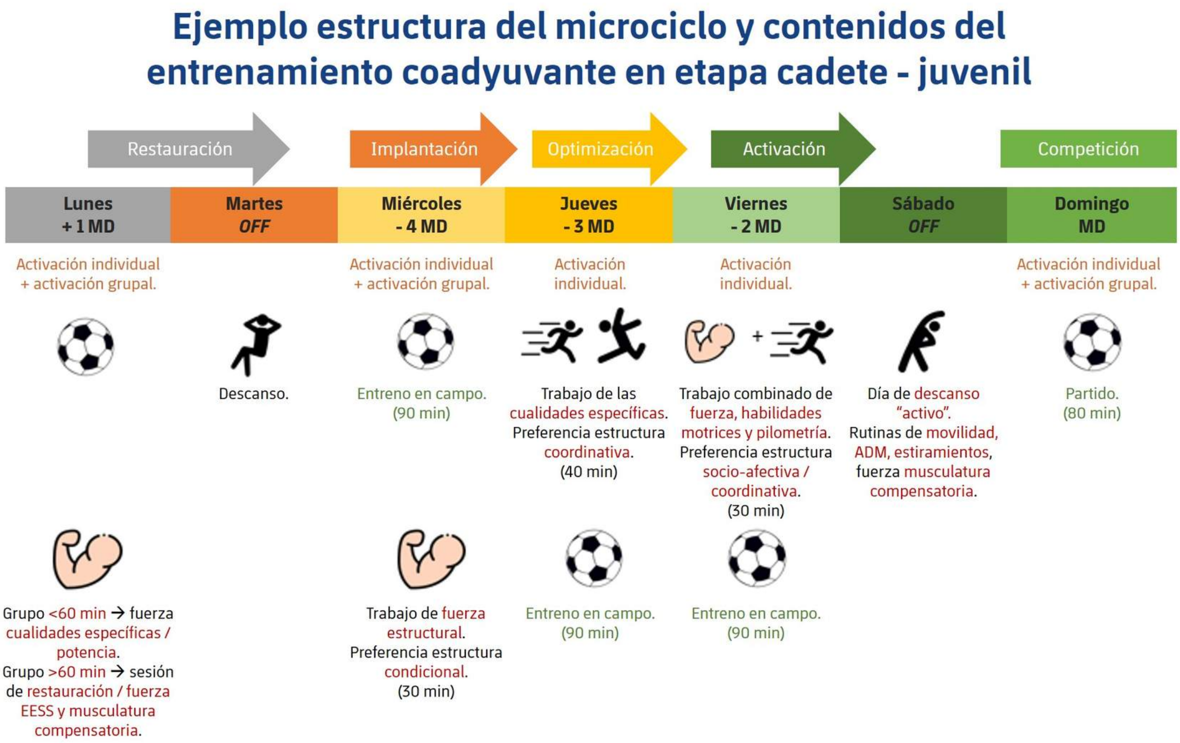
Once the children-U-15 stage has passed, we find ourselves at a moment where it is assumed that all or almost all players have already passed PHV, ages of the U-15 and youth categories. In this stage, we will try to gradually approach the methodology and work volumes that are given in the reserve team, which would be the next step before reaching the first team.

We will continue working on specific motor skills, but increasingly complex and specific to the sport and even to the player's position. We will carry out strength training in its different manifestations (hypertrophy, power, speed, resistance, etc.) with orientations towards preventive, metabolic and structural work of specific qualities or areas of strength (jumping, fighting, movement and ball actions) and restoration.

The methodology used will depend on the type of session, using strength work in blocks, directed circuits, protocols or individualised routines depending on performance objectives or objectives more preventive or related to previous injuries or predisposition to injuries.

As for the microcycle structure, in the following image we see that the volume of specific training on the field is increased and, therefore, also the volume of coadjutant training.

Image 19: Example of the structure of the microcycle and coadjuvant training content in U-15- youth stage



Source: Source: own creation

Ejemplo estructura del microciclo y contenido del entrenamiento coadyuvante en etapa cadete – juvenil	Example of the structure of the microcycle and coadjuvant training content in U-15-youth stage
Restauración	Restoration
Implantación	Implementation
Optimisación	Optimisation
Activación	Activation
Competición	Competition
Lunes +1MD	Monday +1MD
Martes OFF	Tuesday OFF

Miércoles -4MD	Wednesday -4MD
Jueves -3MD	Thursday -3MD
Viernes -2MD	Friday -2MD
Sábado OFF	Saturday OFF
Domingo MD	Sunday MD
Activación individual + activación grupal	Individual activation + group activation
Descanso	Rest
Activación individual + activación grupal	Individual activation + group activation
Entreno de campo (90 min)	Field training (90 min)
Activación individual	Individual activation
Trabajo de las cualidades específicas. Preferencia estructura coordinativa (40 min)	Specific skills work. Coordinative structure preference (40 min)
Activación individual	Individual activation
Trabajo combinado de fuerza, habilidades motrices y pilometría. Prefencia estructura socio-afectiva / coordinativa (30 min)	Combined work of strength, motor skills and plyometrics. Socio-affective/coordinative structure preference (30 min)

Día de Descanso “activo”. Rutinas de movilidad, ADM, estiramientos, fuerza musculatura compensatoria.	“Active” rest day. Mobility routines, ROM, stretching, compensatory muscle strength
Activación individual + activación grupal	Individual activation + group activation
Partido (80 min)	Match (80 min)
Grupo < 60 min fuerza cualidades específicas / potencia. Grupo > 60 min sesión de restauración / fuerza EESS y musculatura compensatoria	Group <60 min specific strength skills/power. Group > 60 min restoration session/upper extremities strength and compensatory muscle
Trabajo de fuerza estructural. Preferencia estructura condicional (30 min)	Structural strength work. Conditional structure preference (30 min)
Entreno de campo (90 min)	Field training (90 min)
Entreno de campo (90 min)	Field training (90 min)
Activación individual + activación grupal	Individual activation + group activation
Activación individual	Individual activation

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