Module 1. Strength: The Core Physical Ability for Movement in the Complexity of the Game

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References

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Strength training in team sports has traditionally been done in an analytical, isolated way at the gym, using external loads like free weights, such as barbells and dumbbells, or machines. The main goal of this type of training is to improve muscle strength, which is then expected to lead to better performance during gameplay.

However, when we consider the complexity of the game, it becomes clear that traditional strength training falls far short of meeting the real needs of indoor team sports, where explosive, specific movements happen constantly in confined spaces and time frames. Additionally, players continuously face complex situations of cooperation and opposition among teammates and opponents.

Misinterpreting this reality could lead to the misconception that applying training loads specified solely by coaches and physical trainers would be enough to optimize a player's performance throughout their career. Yet it's clear that the high specificity of training and competition (especially with today's busy match schedules) correlates with a higher risk of injury due to the increased demands placed on the musculoskeletal system. For example, in indoor team sports like basketball, injury rates have been reported at 12.59 injuries per 1,000 hours of play (Moreno-Pérez et al., 2021). Similar figures have been found in handball, with 12 to 14 injuries per 1,000 hours of play (Nielsen and Yde, 1988; Wedderkopp et al., 1997). In both cases, the injury incidence during competition is significantly higher than during training sessions.

Conversely, injury rates in weight training or in activities involving high-resistance mobilization (Figure 1) are much lower than those reported in many indoor team sports. In fact, injury rates caused by low-specificity training, such as weight training sessions, are as low as 0.035/1,000 hours or 0.017/1,000 hours in Olympic lifting sessions (Hamill, 1994). These figures are considerably lower compared to the injury rates mentioned earlier in indoor team sports.

Therefore, it's evident that strength training in the gym does not pose a high risk of injury. However, this also leads us to question whether this approach is sufficient both to reduce injury risk and to optimize performance.

Figure 1. Illustration of various events/postures in weight training for sports: a) weightlifting (Carl Pilon), b) powerlifting (Mitya Galiano), c) bodybuilding (Amanda Richards), d) CrossFit (CrossFit

Auckland), e) strongman (Shaun Ellis), and f) Highland Games (Alain Cadu).

Source: Keogh and Winwood, 2017, https://goo.su/UFo7F

The movements or gestures that constantly occur during indoor team sports, such as shots on goal in futsal, jump shots in handball, or basketball shots, all depend on the strength generated by the player. This is because any human movement results from joint torque or the force produced by muscle activation (Oshita and Yano, 2012).

Traditionally, strength training in team sports, and more specifically in indoor sports like futsal, handball, basketball, or rink hockey, has been based on theoretical approaches and methodologies borrowed from individual sports, like athletics. These approaches mainly derive from a definition that views strength as the maximum tension that a muscle or group of muscles can produce (Wilmore and Costill, 1999).

As a result, strength training has been presented and sustained as a muscle-focused method (for example, type of muscle action, anatomical area involved, and muscle adaptations) aimed at enhancing the locomotor system responsible for movement. However, this strength training approach is clearly decontextualized and lacks specificity.

The need for muscular adaptations through strength training to generate certain internal responses, such as maximizing hypertrophy (Williams et al., 2017), has led to the use of certain training principles like the progressive overload principle, as defined in general training theory.

Numerous publications on strength training suggest progressively increasing the magnitude of training loads by varying parameters such as intensity, volume, density, and frequency (Verkhoshansky and Siff, 2000) to improve performance. To achieve this, they propose a limited number of exercises with the primary goal of maximizing the amount of newtons or watts, i.e., the force or power generated when moving a specific load (Loturco et al., 2017).

However, producing force or power alone, without considering other factors, will not optimize performance or reduce injury risk. Therefore, it seems logical to understand that force production must be accompanied by coordination (motor control), as well as other necessary elements to enable effective actions during gameplay. This creates the need to propose a new strength training approach, which includes tasks that challenge coordination more, and are more specific, variable, and complex, to optimize performance in the game.

This is because a player's performance in competition is more influenced by qualitative factors than by quantitative ones (Methenitis et al., 2016). This perspective leads us to another definition of strength, seeing it as the ability of a muscle or group of muscles to generate tension under specific conditions (Verkhoshansky and Siff, 2000). Without a doubt, this definition better aligns with the demands of indoor team sports.

In this regard, some recent studies have proposed alternative strategies to promote players' adaptability in competition. Essentially, these studies suggest approaching strength training from a holistic, synergistic, integrated, and balanced perspective alongside other physical abilities, encouraging the interaction with other systems and structures within the player from a complexity-based approach.

In summary, it is crucial to propose training stimuli that generate multisystem adaptations, providing a range of benefits. To achieve this, it is necessary to adjust the level of stress imposed on the athlete during training, without necessarily increasing the quantitative variables related to load magnitude, as previously mentioned.

This stress can be induced by modifying any of the three elements of Newell's model (Newell, 1986) — environment, task, or player — and the specificity of the tasks. The next module will show how to design training tasks considering these factors.

When we consider strength training periodization in team sports, there is a significant challenge regarding the time available to train this physical capacity during the competitive season, which is much less compared to individual sports due to the large number of games, particularly in elite team sports. Moreover, in high-level team sports, the period between the end of the competitive season and the preseason (transition phase) is relatively short.

Therefore, trying to apply periodization based on the proposals of authors like Bompa (1993), which include phases like anatomical adaptation, hypertrophy, maximum strength, conversion to power, or power endurance (Tous, 2017), becomes a difficult task in these sports. Alternatively, periodization in indoor team sports should primarily focus on the complexity and specificity of tasks throughout this process.

In this course, we share our approach to strength training, which is rooted in the complexity paradigm, supported by both available scientific evidence and the empirical knowledge gained from the experience of a wide group of professionals.

In this first module, we cover various concepts and elements from which this proposal stems. First, we'll introduce strength as the core physical ability.

What does it mean to say that strength is the core physical ability? Essentially, it means that every movement happens because of strength, so it can be considered a core ability. So, does this mean that endurance is not a physical ability? And what about speed? We will address these questions next.

When we analyze strength through the contributions of various authors, we can say that, from a mechanical standpoint, strength manifests as an action that produces changes in the state of an object, either by altering its position, stopping its movement, initiating movement from a static position, or deforming it (González Badillo, 2017).

From a physiological perspective, strength is defined as a motor ability that is expressed through the coordinated action of the nervous and muscular systems to produce force (Verkhoshansky and Siff, 2000). In this view, strength refers to the muscles' ability to alter an object's acceleration, deform it, start or stop its movement, and change its direction (González Badillo, 2017).

From a physical perspective, strength is calculated as mass multiplied by acceleration. When we talk about strength as the human ability to generate movement through the neuromuscular system and apply it to an object or person, how this strength is expressed can exhibit different characteristics depending on the object's magnitude (weight, size, shape), acceleration, and the rate at which the force is applied (Verkhoshansky and Siff, 2000). Therefore, strength through the neuromuscular system can manifest in different ways.

If the intensity of the effort is influenced by its magnitude and speed, and we relate intensity to time,

we can identify different expressions of muscle strength:

- Absolute Strength: the highest amount of tension the neuromuscular system can produce using its full potential. This potential can only be manifested in special or extreme situations and cannot be achieved through willpower

When taking a look at the successful and renowned professionals from the Barcelona school and their approach to strength training, it is important to note their belief that strength is the core physical ability from which all other physical abilities stem. Humans interact with various environments through movement, which results from neuromuscular activation. The outcomes of these activations can be measured by three key parameters of strength (De Hegedus, 1984; Tous Fajardo, 1999):

- The amount of force applied, i.e., the newtons of force a player exerts in a specific action.

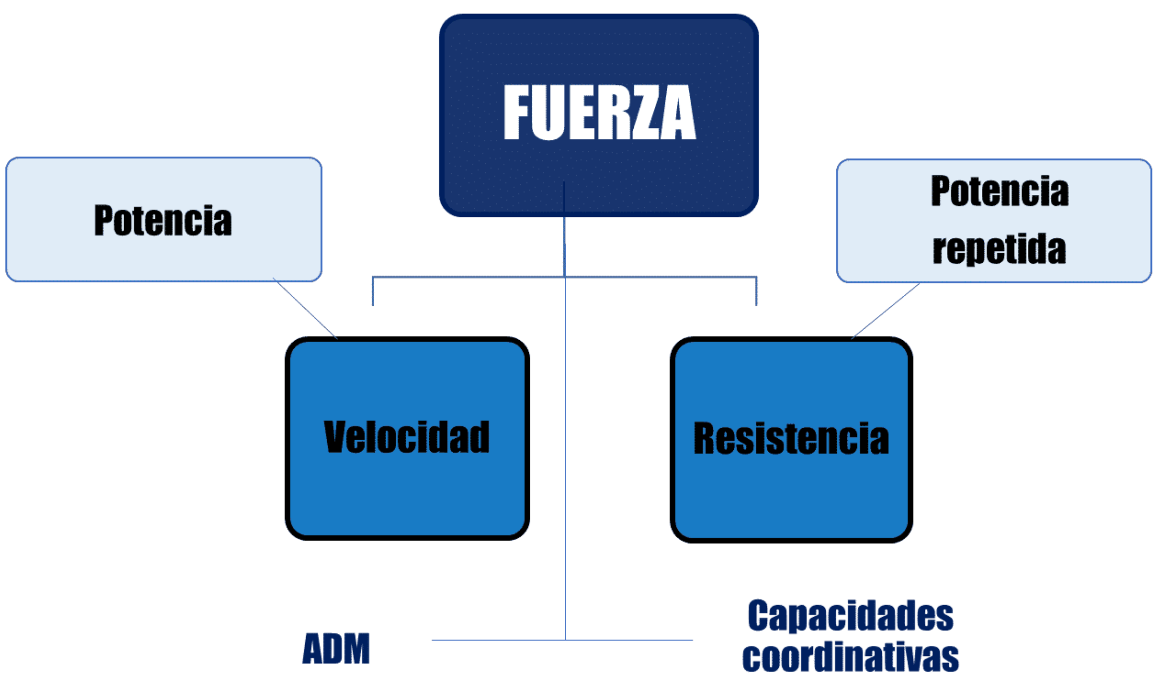
- The time needed to reach different levels of strength. This concept has to do with strength and its application over time, reflecting how speed manifests once a movement starts. Before the movement begins, speed can be considered independently of strength.

- The duration a player can maintain a certain level of strength.

Maintaining submaximal strength levels over time is traditionally referred to as endurance, one of the basic physical abilities. Although the metabolism required for sustained actions differs from that for a single muscular action, the goal remains the same: to supply the muscle with adequate fuel and energy to continue activation.

The following figure illustrates strength as the core physical ability (Tous, 2017).

Figure 2: Strength as the Core Physical Ability



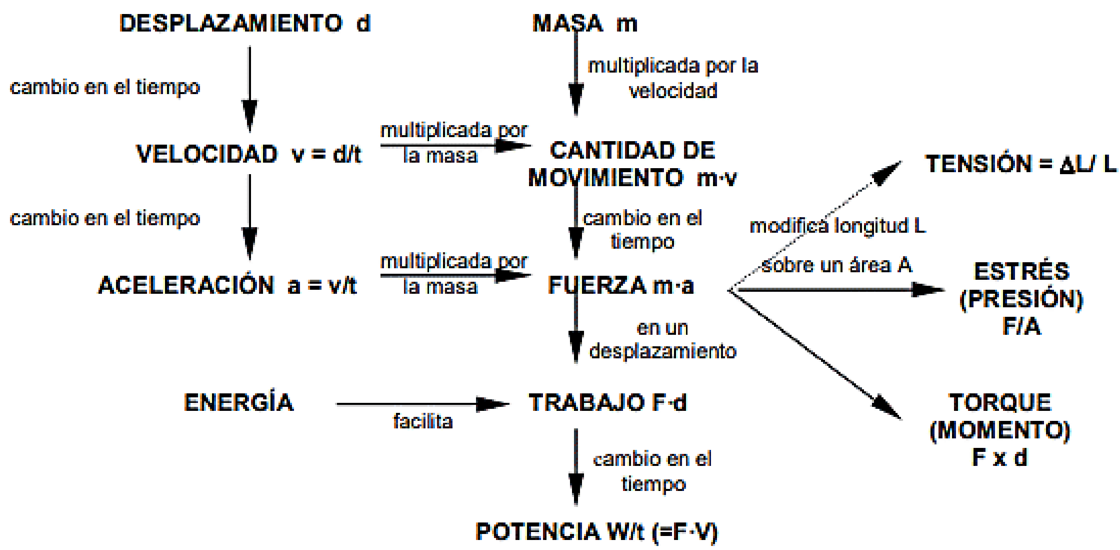
Source: Original work adapted from Tous, 2017

	STRENGTH		
Power			Repeated power
	Speed	Endurance	
	ADM	Coordinative Skills	

Source: Original work adapted from Tous, 2017

Additionally, there are related concepts such as acceleration, speed, and power (Figure 3), which are also important for performance in indoor team sports.

Figure 3: Relationships between different concepts related to strength



Source: Verkhoshansky and Siff, 2000, p. 83

Given that strength is the only physical ability included in the player's conditional structure, it makes sense to consider the potential benefits of strength training for team sports. Two main benefits are injury risk reduction and performance enhancement. These benefits align with the two main goals of training.

Muscle strength levels, along with the muscle's functional properties and its stabilizing role in various joints, are key factors in injury prevention (Thacker et al., 2003). We previously noted the high injury rates relative to the hours of practice in indoor team sports, particularly during competitions. Therefore, achieving certain strength levels in indoor team sports is essential for injury prevention. Beyond reaching these strength levels, it is crucial to balance agonist and antagonist muscle groups, as well as contralateral muscle groups (Croisier et al., 2008), and maintain specific coordination.

For instance, the risk of hamstring injury increases if the hamstring/quadriceps ratio drops to a speed of 180º per second. A ratio below 0.6 significantly raises the risk of injury, up to 17 times (Brockett et al., 2004).

When focusing on muscular strength training to reduce injuries, it is useful to train myometric (concentric) actions to address deficits or imbalances, and plyometric (eccentric) actions at high speeds and tensions (Hortobágyi et al., 1998), as these are closely related to game-related injuries.

Strength training, and especially the eccentric phase, is crucial for injury prevention as it increases the number of sarcomeres in series (Yeung et al., 2009) and enhances the muscle's ability to generate tension at greater elongations (Brockett et al., 2001). Thus, eccentric overload training will be, alongside other elements, a configuring component of strength training, as we will discuss later.

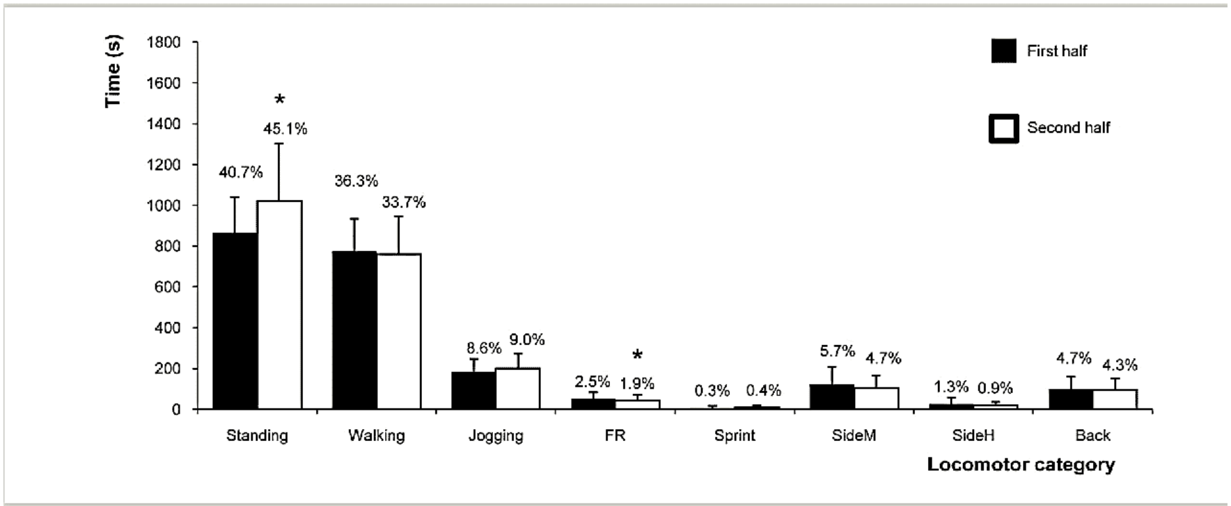
Although these observations and recommendations about strength training are somewhat analytical and reductionist, and thus somewhat detached from the main focus of this course, they are worth considering as options for minimizing injury risk.

The second benefit of strength training, performance optimization, has been supported by scientific research. Specifically, improvements in certain isolated movements in sports like basketball (Rodríguez-Rosell et al., 2017), futsal (Marqués et al., 2019), handball (Van Muijen et al., 1991), and volleyball (Newton et al., 1999) have been documented. However, it is important to interpret these results carefully, as they are partial and need to be nuanced since the improvements observed do not fully capture the complexity of these movements in team sports. These movements are often analyzed in isolate, analytical and decontextualized conditions, which do not fully reflect their occurrence in actual games.

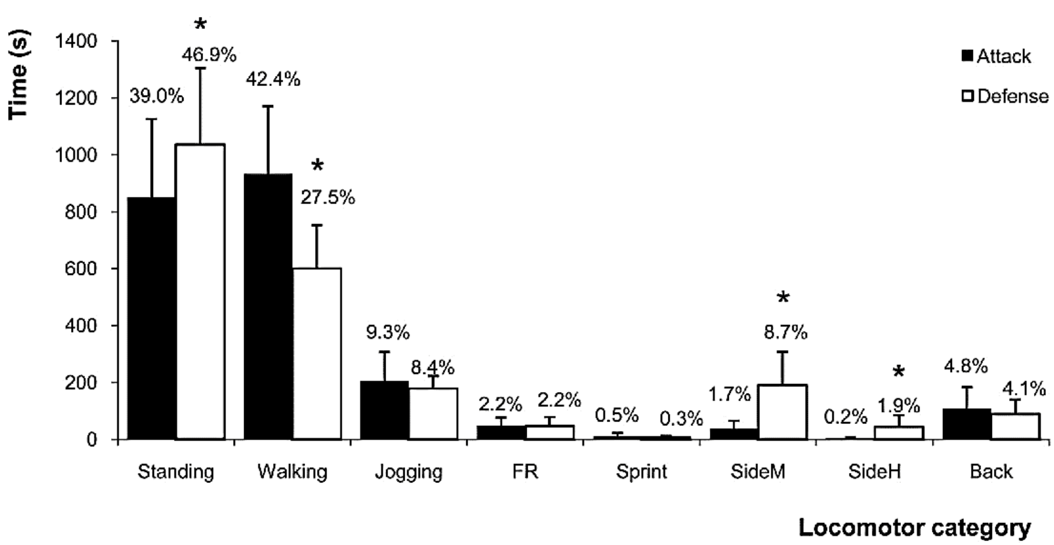
At this point, it is useful to consider how much strength is necessary for playing team sports effectively. Most actions in these sports require submaximal strength applied at submaximal speeds, emphasizing the precision and decision-making required in game situations. Additionally, the way strength is applied during a match is highly variable.

To understand this better, it is helpful to examine the types of movements (locomotor categories) performed during attack and defense phases, and their frequency during competition (Figure 4).

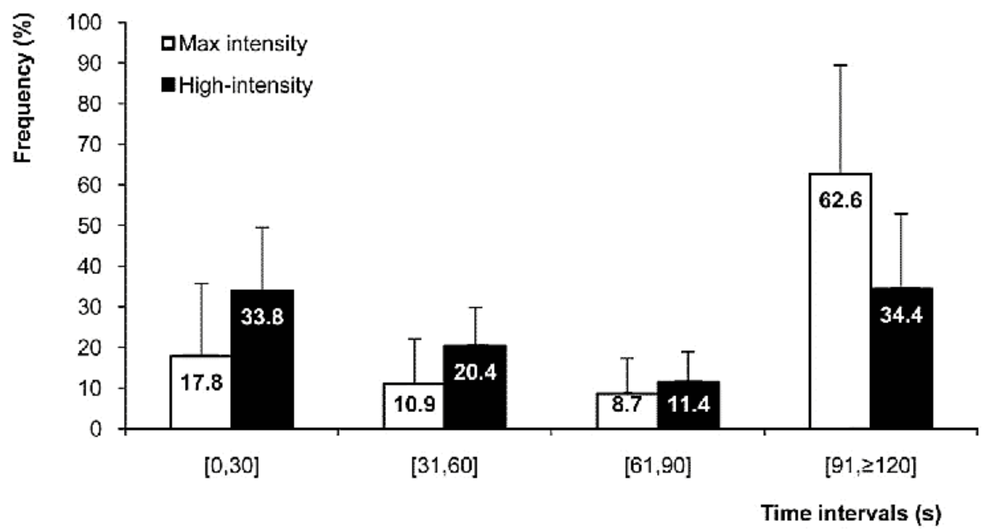
Figure 4: Absolute and relative time spent on each locomotor category in the first and second half of an elite handball match



Source: Póvoas et al., 2012, https://goo.su/diecUC



Source: Póvoas et al., 2012, https://goo.su/diecUC



Source: Póvoas et al., 2012, https://goo.su/diecUC

References in Figure 4:

FR = Fast Run; Back = Backward Movement; SideM = Medium-Intensity Side Movement; SideH = High-Intensity Side Movement; *p # 0.05, significantly different from the first half of the match (above); absolute and relative time spent in each locomotor category during the attacking and defensive phases of the match. FR = Fast Run; Back = Backward Movement; SideM = Medium-Intensity Side Movement; SideH = High-Intensity Side Movement;* p#0.01, significantly different from the first half of the match in the attacking phase (middle); and frequency distribution of time intervals between maximal-intensity activities and high-intensity activities (below).

These data can be obtained through various systems and technologies, which will be covered in the final course of this certification, or they can be found in the published scientific literature, as shown in the previous figures.

A key insight in strength training is that players rarely need to apply their maximum strength. This is partly because they do not have enough time to achieve it—about 300 milliseconds—and partly because such high levels are seldom required in game situations.

Combative actions in these sports often demand higher strength levels, closer to maximum static or isometric strength, as they occur over longer periods. Examples include battles for position in handball or basketball (Figure 5).

Figure 5: Strength combat action in handball

Source: Sport, 2022, https://goo.su/zXje6

Strength training, particularly in the eccentric phase, is essential for:

- ◯ Generating hypertrophy during the competitive season
- ◯ Reducing injury risk
- ◯ Altering the athlete's anthropometric values
- ◯ Compensating for cognitive structures

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Some of the clearest examples of the high levels of mechanical forces involved in indoor team sports, especially in basketball, are the movements and jumps performed during the game. These movements generate high ground reaction forces that athletes must withstand during both training sessions and matches. For instance, the forces experienced during landing after a layup or a shot in basketball range from 6 to 9 times the body weight (McClay et al., 1994).

How do these actions manifest in the game? While each team sport has its unique features, we can provide a general explanation of how these movements take place across all of them.

Players' behavior during competition results from a process of self-organization and interpersonal coordination that emerges through constant interaction between the player and the specific game environment. This interaction creates a series of opportunities, or affordances (Gibson, 2014; Stoffregen, 2003), as we explained in the first course of the certificate. These relationships and opportunities are made possible by the specific movements that emerge in each situation during the competition. Thus, a more comprehensive approach should be adopted when designing strength training.

The neuromuscular system works in harmony to create complex, multi-joint movements during these motor actions (Kelso, 1992, 1995). As the player's neuromuscular system interacts with other bodily systems and the game environment, it enables these movements and fosters self-organized, interpersonal coordination (Kelso, 1981). These coordinated efforts and synergies allow players to adapt effectively to the game's ever-changing and unpredictable situations (Araujo et al., 2006; Warren, 2006).

Traditional strength trainers usually focus on three key variables to improve strength:

- They increase volume by adding more sets, repetitions, or exercises to training sessions. Increasing these parameters, which are directly related to volume, is a strategy used to advance the load for athletes aiming

1 of 1

These strategies and their progressions share a common thread: they rely on quantitative elements, centering on the repeated, analytical performance of exercises. However, this approach doesn't align well with the game characteristics of team sports as described in the first course of this certificate. Moreover, it fails to reflect how actions naturally unfold during actual gameplay, which is central to our strength training philosophy. As a result, these traditional methods rarely address the specific needs of team sport athletes. This becomes evident when we observe how each throw or jump action emerges uniquely, despite occurring under similar conditions – a phenomenon known as variability.

The conventional approach, which relies on a limited set of exercises performed in isolation and the three strategies mentioned earlier, might actually hinder a player's ability to adapt to various competitive scenarios. This is because training in this way doesn't account for the perceptual, coordinative, and social-emotional factors present in real game situations.

Therefore, we need to rethink our approach to strength training. We should develop a method that builds on sport-specific movements and embraces the complexity of each sport, aiming for qualitative and multi-system adaptations.

Consequently, strength training shouldn't be viewed merely as a way to maximize muscle tension in a non-specific manner. Instead, it should be seen as a specific physical ability that requires training based on complexity paradigm, respecting the intent behind each game action and the unique needs of individual players.

During gameplay, athletes exert varying degrees of force sporadically, in multiple directions, and in response to changing, unforeseen circumstances. This leads to diverse muscle recruitment patterns. Also, these patterns rarely repeat in the same sequence. Drawing from Soviet neurophysiologist Bernstein's movement principles, summarized in the phrase "repetition without repetition" (mentioned in the first course), we should consider this concept a cornerstone of strength training. This principle of variability is fundamental to the structured training methodology we've discussed, and it shapes our approach to strength development, which we'll explore further.

Our strength training model is rooted in game actions, categorizing them into basic motor skill or areas (Figure 6) and content (sport-specific motor skills). This framework can be applied broadly or tailored to suit various indoor team sports.

Figure 6: Areas (Basic Motor Skills) and Strength Manifestations

AREAS - Manifestaciones de fuerza		
Desplazamiento	Aceleración	Frontal Lateral
	Desaceleración	
	Cambio sentido	
	Cambio ritmo	
	Cambio dirección	
	Amplitud/frecuencia	
Salto	Batida	Bipodal/unipo Estática/dinán
	Aterrizaje	Bipodal/unipo Desequilibrio/equi
Lucha	Empuje	Extremidades/tr
	Tracción	Estática/dinán
Actuación sobre balón	Conducir	
	Lanzar	Estática/dinán
	Pasar/recibir	Bipodal/unipo

Source: Original work

AREAS – Strength Manifestations

Displacement	Acceleration	Frontal
	Deceleration	Side
	Change of directionality	
	Change of pace	
	Change of direction	
	Range/frequency	
Jump	Take-off	Bipedal/unipedal
	Landing	Static/dynamic
		Bipedal/unipedal
		Imbalance/balance

Combat	Push	Upper body/lower body
	Traction	Static/dynamic
Action on the ball	Lead	Static/dynamic
	Throw	Bipedal/unipedal
	Pass/receive	

Source: Original work

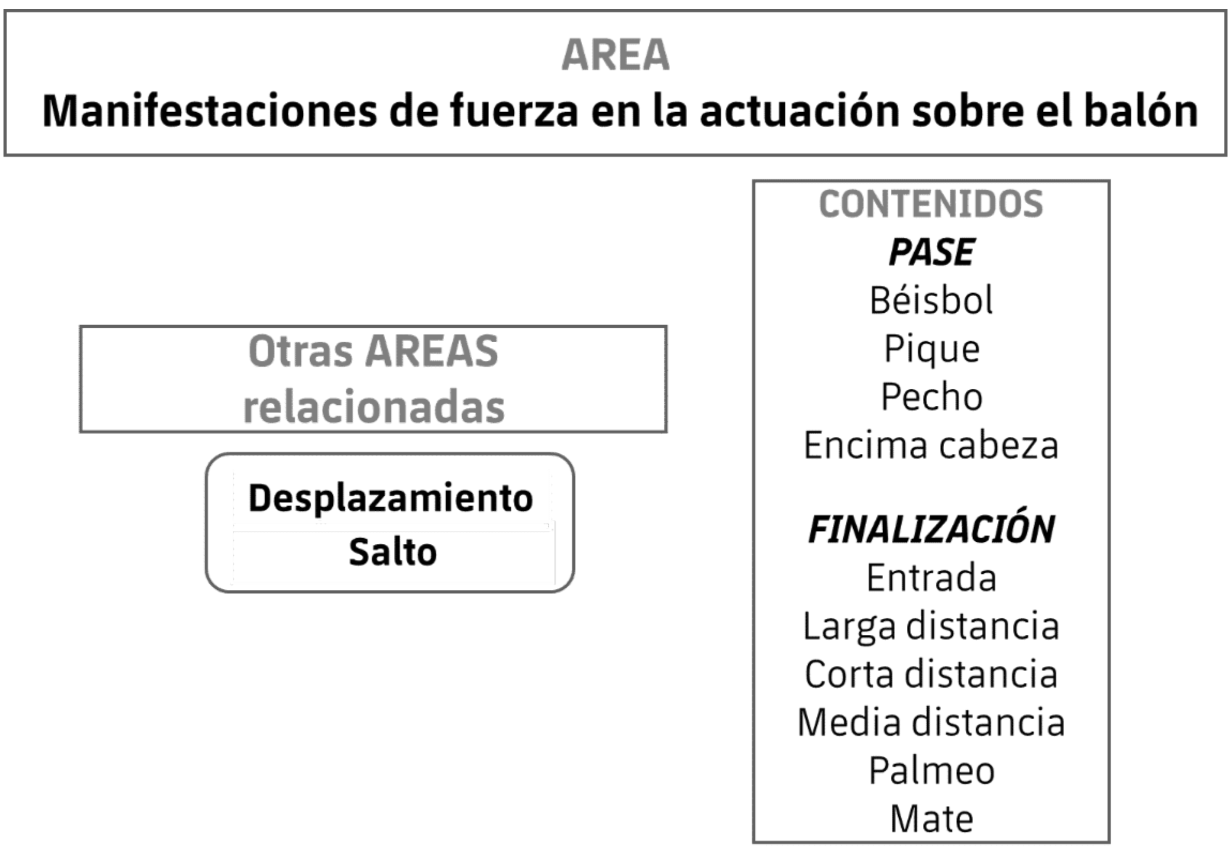
These areas correspond to four key strength types in team sports: displacement strength, jump strength, combat strength, and strength applied to the ball (Moras, 1994; Seirul-lo, 1998).

The content refers to sport-specific skills and their variations across different sports (e.g., jump shots, header goals, sprint starts, cutting movements). Each content element may relate to one or more areas.

This diverse content equips players with a wide array of movements to effectively handle real game demands.

Figure 7 illustrates the area and content elements enabling various technical and tactical actions in basketball, as an example of an indoor team sport. The in-game content thus dictates the specific strength requirements players must develop to enhance their performance.

Figure 7: Example of Area and Content in Basketball



Source: Original work

AREA
Manifestations of strength in the action on the ball

CONTENTS

PASSING

Baseball

Bounce

Chest

Overhead

FINISHING

Layup

Long-range

Short-range

Mid-range

Other related AREAS	Tip-in Dunk
Displacement Jump	

Source: Original work

Understanding these actions provides a foundation for developing a strength training model that, like structured training, encompasses two main fields: coadjuvant training and optimizing training.

In the context of Structured Training (ST), the AREAS correspond to:

- Metabolic capacity
- Evaluation of conditional structure
- Conditional abilities (strength, endurance, speed)
- Basic motor skills

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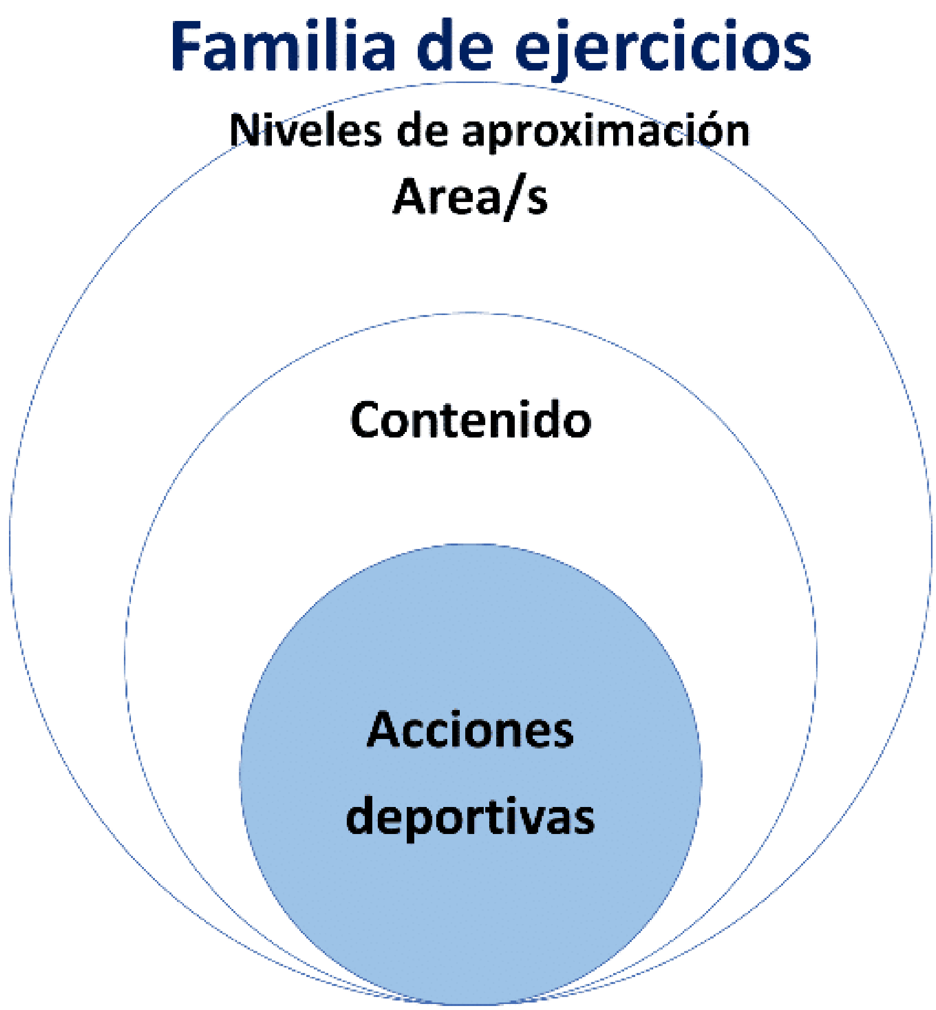
Given that similar content can manifest differently in games, the required strength expressions will also vary. To address this, we propose what Moras (2017) terms an "exercise family" or task group (Figure 8). This family represents a set of tasks with varying degrees of specificity, designed to optimize a particular content through strength training (Figure 8).

Figure 8: Exercise Family



Source: Original work adapted from Moras, 2017

Exercise Family
Approximation levels
Area/s
Content
Sports Actions

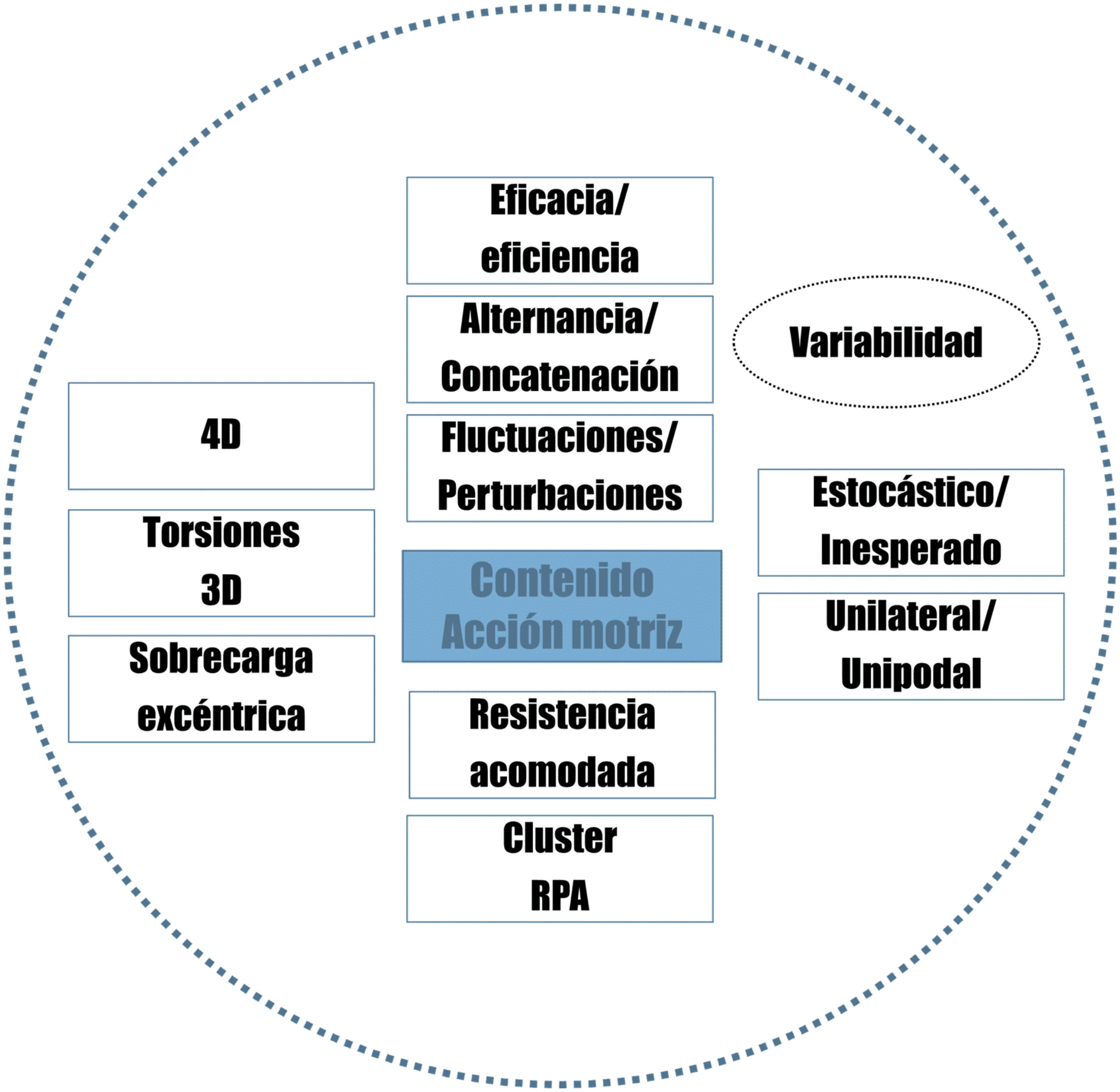
Source: Original work adapted from Moras, 2017

To handle the variety of actions that come up in competition, you need more than just one family. Using different types of families ensures that athletes can adapt to the specific demands they'll face during competition.

For instance, when training starting movements in handball or basketball, we should design tasks that develop coordinative strength using configuring elements (particularly 3D and 4D concepts). These tasks should vary in specificity and combine different strength structures and expressions under changing conditions. This approach encourages players to find creative solutions through motor actions, rather than simply repeating isolated, analytical exercises.

The following figure illustrates the configuring elements of strength training from a complexity perspective. These elements are crucial for optimizing performance, beyond just focusing on different exercise families.

Figure 9: Configuring Elements in Strength Training



Source: Original work adapted from Tous, 2017

	Efficacy/Efficiency	
4D	Alternation/Combination	Variability

3D Twists	Fluctuations/Perturbations	
Eccentric Overload	Content Motor action	Stochastic/Unexpected
	Accommodating Resistance	Unilateral/Unipedal
	Cluster RPA	

Source: Original work adapted from Tous, 2017

Configuring Elements in Strength Training

We define the elements in the previous figure as the configuring elements in strength training in our approach, as proposed by Tous (2017). These elements contrast, to some extent, with traditional strength training elements. This doesn't mean we should abandon traditional elements entirely, but rather that our proposed methodology can incorporate and build upon them. Let's briefly examine each of these configuring elements, as proposed by Julio Tous, a leading authority in team sports strength training.

Accommodating Resistance

Traditionally, strength training has been based on the one-repetition maximum (1RM), with different training zones established for various objectives. However, this approach has limitations for team sports. Accommodating resistance allows for constant variation in movements, enabling each repetition or phase (acceleration/deceleration) to be performed differently and offering greater flexibility. Flywheel devices, which provide rotational resistance, can be used to achieve accommodating resistance.

Stochastic and Unexpected Events

While predictability is common in traditional strength training, it's far removed from the reality of indoor team sports, where unexpected and uncertain conditions are the norm.

The concepts of unexpected and uncertain are closely linked. Research has shown that uncertainty in planned or unexpected movements and direction changes can lead to different physical loads. For instance, knee joint flexion/extension moments were similar in planned and unplanned actions, but varus/valgus and rotation moments during direction changes were up to twice as high in unexpected conditions.

Clusters and RPA (Repeated Power Ability)

Traditional strength training typically involves sets and repetitions with fixed rest periods, but this can lead to performance decline due to fatigue. It's beneficial to focus on clusters (groups of repetitions) and RPA, allowing players to maintain power output without losing performance over a series of repetitions.

Action Alternation and Combination

Unlike traditional strength training, which often isolates exercises, team indoor sports require alternating and combining different actions. For example, in handball, a player might move towards the goal and then perform a jump shot in quick succession.

Variability

Variability, a crucial configuring element in strength training, was discussed extensively in the previous module. Traditional strength training often relies on repeating a limited set of exercises, but real-game situations demand much more variety in movements. As we

Fluctuations and Perturbations

Given that unexpected and unpredictable movements are common in games, it's logical to incorporate perturbations into strength training tasks. Perturbation training has shown better results in injury rehabilitation programs, such as for anterior cruciate ligament injuries.

Unilateral Movements

Weightlifting, with its strong focus on strength, has had a somewhat negative influence on strength training for indoor team sports. Performing bilateral strength exercises that mimic weightlifting doesn't align well with the majority of actions seen in indoor team sports. We

Eccentric Overload

While free weight training remains the foundation of most strength programs, it tends to overemphasize concentric (miometric) over eccentric (plyometric) training. Given the known benefits of eccentric training for both performance and injury prevention, we recommend

Traditionally, movement speed and power have been considered the best indicators

Efficacy and Efficiency

for controlling movement in strength training. However, in

Rotations and Three-Dimensional (3D) and Four-Dimensional (4D) Movements

Traditional strength training often emphasizes vertical axis movements, influenced by weightlifting techniques. This approach typically includes vertical jumps, with or without assistance. However, lateral and horizontal jumps are often overlooked, resulting in a bias towards vertical over

Strength Manifestations in Competition

We've established that game movements rely on muscle tension and force application. As players can only express strength within the context of specific game situations, we need to understand how strength manifests and what physical demands arise during competition. Let's examine the

Figure 10 illustrates strength

Displacement Strength

ns

manifestations in various displacement actions in rink hockey and futsal. These and other displacement movements involve accelerations, decelerations, direction changes, and more.

Some training tasks should

Source: La Vanguardia, 2019, https://goo.su/UrRTS; Marca, 2018, https://goo.su/ReciQ; FCB, s.f., https://goo.su/tG1sSTi

Jump Strength

Jump strength becomes evident in various competitive actions, such as the jump shot in handball and basketball (see Figure 11). It also includes a player's header to score or a goalkeeper's jump to block a lofted ball in futsal, among other examples.

Figure 11: Examples of strength in different competitive jump actions

Source: Ojeda, 2023, https://goo.su/CRCn3Fv; TyC Sports, 2023, https://goo.su/KzMGG

If we analyze the game, we can identify different movements that require jump strength, depending on the sport. This reveals the varying conditions under which these jumps occur during a match, which should be considered in strength training.

Combat Strength

Combat strength is seen in situations like battling for position or overcoming an opponent during duels or conflicts (see Figure 12).

This strength aims to provide the stability needed to gain advantages (or avoid disadvantages) during the game and to respond effectively and swiftly to moments of imbalance.

Figure 12: Manifestations of strength in various combat actions in women's and men's handball during competition

Source: CNN, 2012, https://goo.su/ONrmkb; Harpastum Hanball, 2019, https://goo.su/m1ERl

Action Strength on the Ball

The strength applied to the ball (see Figure 13) enables actions such as passing, receiving, shooting, and ball recovery.

Figure 13: Manifestations of strength in different actions of application to the ball

Source: Campos, 2022, https://goo.su/erddC; LNRS, 2022, https://goo.su/dHVBX5L; García, 2022, https://goo.su/vzSfM

In summary, this methodology suggests designing task families to address the strength needs of the game, based on factors like complexity, specificity, the perception-action cycle, variability, and earlier described configuring elements of strength training.

Additionally, when designing strength training programs, it's crucial to consider the physical demands during competition. These demands can be measured using various technological systems that provide data on players and teams or through scientific literature reviews.

Analyzing the game density (the ratio of playing time to pause time) for each indoor sport is another important factor for optimizing performance through strength training.

Moreover, the tactical actions proposed by coaches during competition also influence player movements. Research has demonstrated how tactical behavior can affect motor behavior in team sports (Martín-Acero and Lago, 2005). Similarly, these movements will impact tactical actions, as different levels or hierarchies within the game are interconnected (circular causality). Therefore, besides the physical demands of competition, it's essential to understand the environment and intentionality behind these demands, which includes the technical-tactical needs of the game.

In the next module, the theoretical and practical concepts from this module will be applied to design specific preferential simulation situations based on levels of approximation, specificity, and other previously discussed elements.

Which of the following are part of the configuring elements in strength training?

- [ ] Efficiency and effectiveness
- [ ] Unilateral Movements
- [ ] Fluctuations and Perturbations
- [ ] Repetition

SUBMIT

CONTINUE

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