

The 360° performance system in team sports: time to design a “personalised jacket” for team sports players?

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Abstract

Top performance in team sports attracts the attention from the general public. In particular, the best players became incredibly skilled and physically powerful, a fact that potentiates to deliver a product considered attractive, exciting and competitive. Not surprisingly, this is a very valuable product from an economic and social standpoint, thus, all sports professionals are extremely interested in developing new procedures to improve sports performance. Besides, the great interests of the various stakeholders (owners, CEO-s, agents, fans, media, coaches, players, families and friends) are one of the main reasons for this development of sports science umbrella and the accompanying sports industry. all their personal performances should be coordinated and put into function by the sports team. In this scientific and applied manuscript, we will deal primarily with the individual treatment of players in order to improve their personal performance and, consequently, team sport performance.

Key words: team sports, performance, players

1.Introduction

Top performance in team sports attracts the attention from the general public [1,2]. In particular, the best players became incredibly skilled and physically powerful, a fact that potentiates to deliver a product considered attractive, exciting and competitive. Not surprisingly, this is a very valuable product from an economic and social standpoint, thus, all sports professionals are extremely interested in developing new procedures to improve sports performance. Besides, the great interests of the various stakeholders (owners, CEO-s, agents, fans, media, coaches, players, families and friends) are one of the main reasons for this development of sports science umbrella and the accompanying sports industry. In this sense, sport sciences can greatly help to improve athletic performance [3]. This could be particularly noticeable at a time of major changes in the regular training and competition regime that occurred during the COVID-19 pandemic [4].

A top player in team sports has a large number of characteristics that are in synergy with each other. Optimal levels of development of individual characteristics, as well as their mutual harmonization are achieved by an integrated and personalized system of sports preparation [5]. The basic task of sports preparation enables players and teams to achieve the best sports performance in the competition. Top sport achievements are reached through long-term, systematic and hard work of a large number of people who service athletes [6]. Sports coaches, strength and conditioning coaches, psychologists, medical doctors, physiotherapists, nutritionists, sports analysts form multidisciplinary teams that base their work on interdisciplinary synchronization [7]. All these experts give their coordinated contribution to better optimise the sports teams' system, but also to the quality performance of each individual [8]. The contributions of each player to team performance occur based on the wise leadership, management and regulation of the head coach. The head coach, together with general manager or sports director selects the players, assigns them roles and responsibilities, determines the rules of conduct and action and, coordinate the professional staff members. At the same time, at the level of sports organization management (club or federation), an interdisciplinary team of experts (ticket sales and sales manager, lawyer, accountant, community manager, marketing manager, graphic designer, administrators, insurance officer...), led by the general manager and sports director, harmoniously provide optimal conditions for sports preparation for teams, players and staff members [9]. In this way, at the same time, different but interconnected processes occur with the unique goal of achieving the best possible sports outcome (Figure 1).

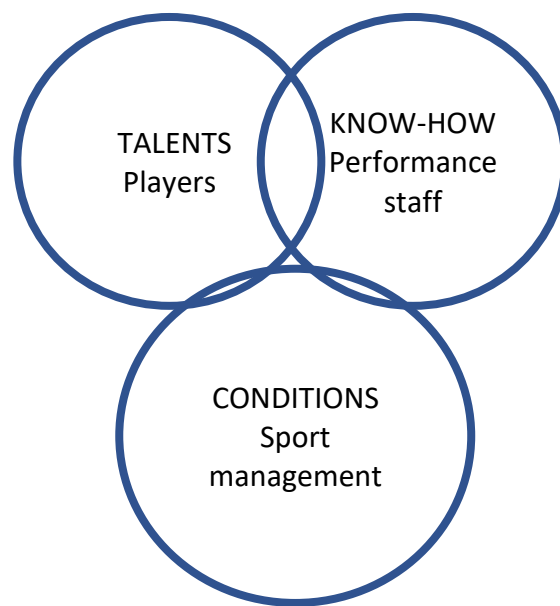


Figure 1: Structure and interrelationships of the main stakeholders in sporting organizations

One of the most important tasks of a professional staff is to bring each player into the zone of his personal best performance. After that, all their personal performances should be coordinated and put into function by the sports team. In this scientific and applied manuscript, we will deal primarily with the individual treatment of players in order to improve their personal performance and, consequently, team sport performance.

2. Individual characteristics of the player

The individual characteristics of the players need to be identified multidimensionally, but in an integrated way [4]. In this sense, sports performance arises as a result of integrative procedures of competition, training and recovery of an athlete through his sports development cycle (career) [10,11]. In order to embark on a synergistic process of integrating all athlete characteristics, it is important to understand which characteristics describe an individual athlete profile (Figure 2).

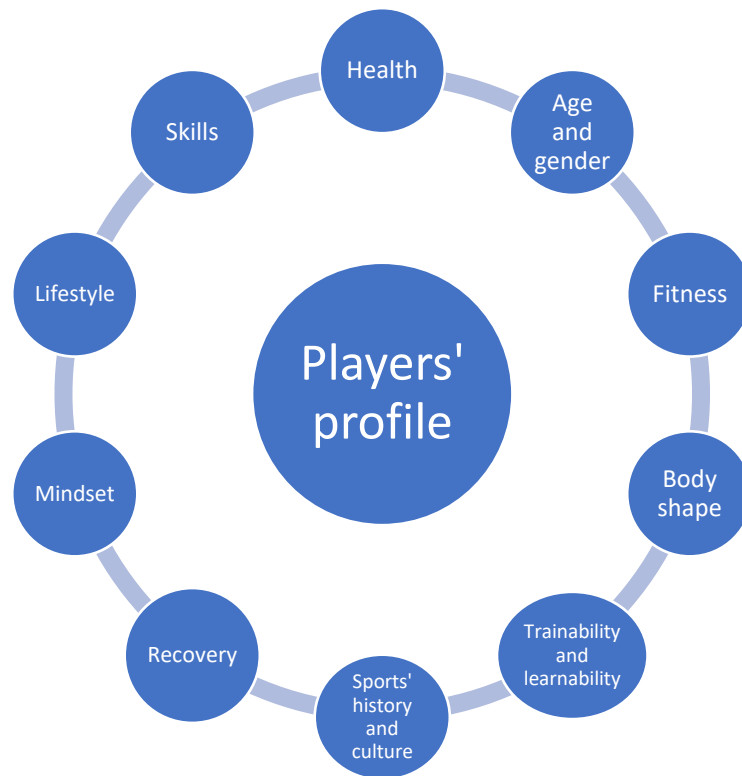


Figure 2: Individual profile of player in team sport

2.1 Health

The fundamental value of human life is health. In top sports, health is mainly observed through the availability of players for training and competition [2]. Absence of players due to injuries or disease seriously affects competitive results [12]. Availability is ensured primarily by injury prevention [13,14] and then by the rapid and safe return of players to the regular training and competition [15,16]. At the same time, locomotor health has a high priority. Namely, the most common cause of player absences are injuries in muscles, bones, tendons, fascias and joints [17,18]. Also, it is very important to take care of the player's immunity, respiratory and metabolic health. High levels of competitive stress, demanding continuous travel fatigue, and significant exhaustion compromise a player's immune system, which can lead to a variety of diseases [19]. Due to all of the above, it is necessary to create a health profile of the player, which contains:

- History of injuries and illnesses
- Locomotor deficits
- Immune and metabolic deficits
- Personalized protocols/guidelines to minimize injury risk
- Medical interventions
- Surgical and conservative treatments
- Rehabilitation processes

Every team sport has its typical health threats, so it is important to take into account information about the frequency, risks and mechanisms of injury and disease in a particular sport. Athletes are supervised by a medical team [20], which consists of a team physician staff of various specialties (orthopaedists/traumatologists, sports medicine specialists, dentists, ophthalmologists, internists...) and physiotherapists, osteopaths, kinesitherapies, laboratory technicians, nurses, among others. In this regard, the club usually employs multiple doctors who have their own medical team leader, sometimes under a referent hospital in the same city.

2.2 Age and gender

Age and gender are given and (mostly) unchanging characteristics of athletes. Nevertheless, respect for age characteristics and gender specificities can to a large extent make the process of sports preparation safer and more efficient [6,21,22]. When registering and monitoring the age of athletes, it is important to establish:

- Chronological age
- Biological age (especially in young athletes)
- Metabolic age
- Sports age (years spent in organized sport)

It is also important to link health, training and competition events in an athlete's previous career with the current situation. The sporting longevity of top athletes is strongly related to current habits, behaviours and social environment, but also to previous experiences and events throughout a sports career. We are witnessing that sports careers are lasting longer (up to 35-40 years) [23], probably due to the improved system of personalized preparation and the behaviour of athletes, based on epigenetic pathway [24].

Information on the age and gender of athletes is respected and used by all members of the professional team to organize personalized training, medical, nutritional and psychological care.

2.3 Fitness

An adequate fitness profile is a key contribution for the optimal expression of sports skills [4]. In fact, players with a solid athleticism have available a much wider spectrum of possibilities to develop and fine-tune their technical and tactical skills [1]. Also, well-trained athletes are less prone to injuries and recover much quickly after intense training and competitive loads [25], likely being available to play a lot of matches throughout the season. In fitness profiling of players, it is important to recognize:

- Mobility and stability of the locomotor system
- Synergy/balance of agonist/antagonist muscles and muscle chains
- Energy systems
- Neuro-muscular abilities

Based on the profile and identified deficits, preventive-corrective, energy and neuro-muscular programs can be created to overcome the needs identified. All capacities need to be optimized, not necessarily maximized, because fitness qualities are a function of sport skills. Therefore, it is important to align fitness programs with the player's health status, age, gender, training history and culture, sports characteristics and position in the game, and the current level of training.

Fitness training of players is planned, programmed and carried out by fitness strength and conditioning specialists, but in one part also by sports coaches, kinesitherapies, osteopathist and physiotherapists.

2.4 Body shape

The shape and structure of the player's body should be in line with the needs and requirements of the sport and with the individual athlete's needs [26]. This applies in particular to:

- The size of the body and its parts
- Proportions among body parts
- Body composition
 - o Muscles, subcutaneous fat, bones
 - o Internal muscle structure (type of muscle fibres, muscle architecture)
- Somatotype

The shape and structure of a player's body can be changed by training, diet and external stimulus [27,28,29]. Depending on the goal, training and nutrition programs are created that are aimed at optimizing the shape and structure of the body in accordance with the requirements of the sport and the individual characteristics of the players. Strength and conditioning coaches and nutritionists take care of the shape and structure of the body.

2.5 Trainability and learnability

The same training program can result in different responses from different players [30,31]. The ability of an athlete to learn different movement structures and to apply them in training and competitive situations is called learnability. The player's technical and tactical performance depends on this ability. On the other hand, the enhancement of a player's abilities (energetic and neuro-muscular) based on applied training programs is called trainability [32]. Different players need a different combination of content and load for the same or targeted performance [33]. The player's physical development and form depend on this ability. These two abilities are essential for the work of primarily sports coaches and strength and conditioning coaches.

2.6 Sports history and culture

In order to be able to conclude about the athlete's current condition that we have reached by diagnostic procedures, it is important to know:

- what kind of sports environment and culture the player comes from
- what training process the player has gone through during his career so far
- what kind of training process the player has had in the last few months
- what is the competitive history of the players

The information obtained from the sports profile of athletes serves as a prerequisite for designing individual and team sports preparation programs prepared and implemented by sports and strength and conditioning coaches [4].

2.7 Recovery

Player tolerance to different types of fatigue during and after exercise and the ability to recover within and after exercise are the basis for creating a recovery profile [34,35].

The recovery profile includes:

- individual tolerance to different types of fatigue
- dynamics of recovery during training and competition
- dynamics of recovery after training and competition
- the most appropriate means and methods of recovery during and after training and competition
- optimal doses of selected agents and methods of recovery

Each player should have their own recovery profile that serves as the basis for creating personalized recovery protocols [36]. The development of recovery profiles and the implementation of the recovery process are carried out by physicians, sport scientists, strength and conditioning coaches, nutritionists, psychologists, and physiotherapists [8,37].

2.8 Mindset

The mental characteristics of a player determine his behaviour in life, in training and in competition. If a player's way of thinking and behaving is in line with the requirements of a top sport, the likelihood of his success increases [38]. Since top sports often place extreme demands on the player, the player's mindset must be adapted to such conditions. The following characteristics are especially important in top team sports:

- appropriate motivation
- emotion control
- cognitive mobility
- high focus
- communication skills
- self-discipline

Sports psychology has effective tools and methods in its portfolio to improve all of these characteristics [39]. In addition to psychologists, sports coaches are involved in the work on improving the player's psychological characteristics. Psychological and psychosocial interventions have a moderate positive effect on sport performance [40].

2.9 Lifestyle

Since the player spends most of the daytime in their own environment and organization, the control and interventions in the player's lifestyle occupy an increasingly important place [41]. Lifestyle segments that are especially important for the integral readiness of athletes are:

- duration and quality of sleep
- adequate nutrition
- quality hygiene habits
- family life
- social life
- hobbies
- rest
- housework and procurement
- fun and entertainment
- intimate life
- consumption of harmful substances

Coaches, a psychologist, a nutritionist, a doctor, but also close family members or friends can take part in controlling a player's lifestyle.

2.10 Skills

The player's competitive success depends upon their technical and tactical skills [6, 42,43], so there is no surprise that the largest proportion of training work is allocated to technical and tactical training (6). The player's decisions in competitive conditions are the result of a whole conglomeration of influences taking place within the system of sports preparation. Therefore, it is important to take into account the personalization of different aspects of sports preparation, including:

- position in the game/team
- retrospective and prospective analysis of competitive performance
- the process of learning individually and collectively
- the expertise in tactical training

In the last years, there has been a substantial increase in popularity from the skill acquisition perspectives sustained by the ecological dynamics approach [44] and, there are already several examples of successful practical applications [45,46]. This needed update might be of precious help to reach the individual needs of each player [4].

Therefore, it is important to dedicate a certain amount of total training time to improving individual sports technique and skills and, to provide individual analysis of competitive performance. Sports coaches are responsible for planning, programming and controlling technical-tactical preparation, however, skill acquisition specialists are integrating more frequently the coaching staffs, in order to provide new expertise on developmental pathways for players, and optimization of short, mid and long-term learning in training sessions.

3. Creating the 360° Personal Jacket Performance System

The complexity of a personalized system of sports preparation in team sports lies in the synchronization of work and synergistic action of all experts in the sports organization, who gathers a larger number of players [47,48]. Also, each player has a number of characteristics to identify, analyse and monitor. Some characteristics are in deficit, so they should be brought to an acceptable and optimal state. However, other characteristics are at an acceptable or above average level and should be further improved and their comparative value emphasized. In addition, all individuals (players and experts) need to be teamed up in order for the final result of the sports team to be successful. It is therefore important to implement a clear structure and hierarchized network within the expert team and to define roles, rules and responsibilities for each member of the expert team/staff (Figure 3).

It is especially important to determine the method of communication within the expert team, i.e., the communication algorithms and procedures [49]. This is important because of the need to rationalize data collections, processing and communication of large amounts of information that daily describe the state of readiness and activities of each athlete. Therefore, there is a clear need to have optimized solutions designed by data architects, data engineers and data analysts in a way to centralize all data to be processed to later be available according to the personal needs of each expert from the staff, or even the players.

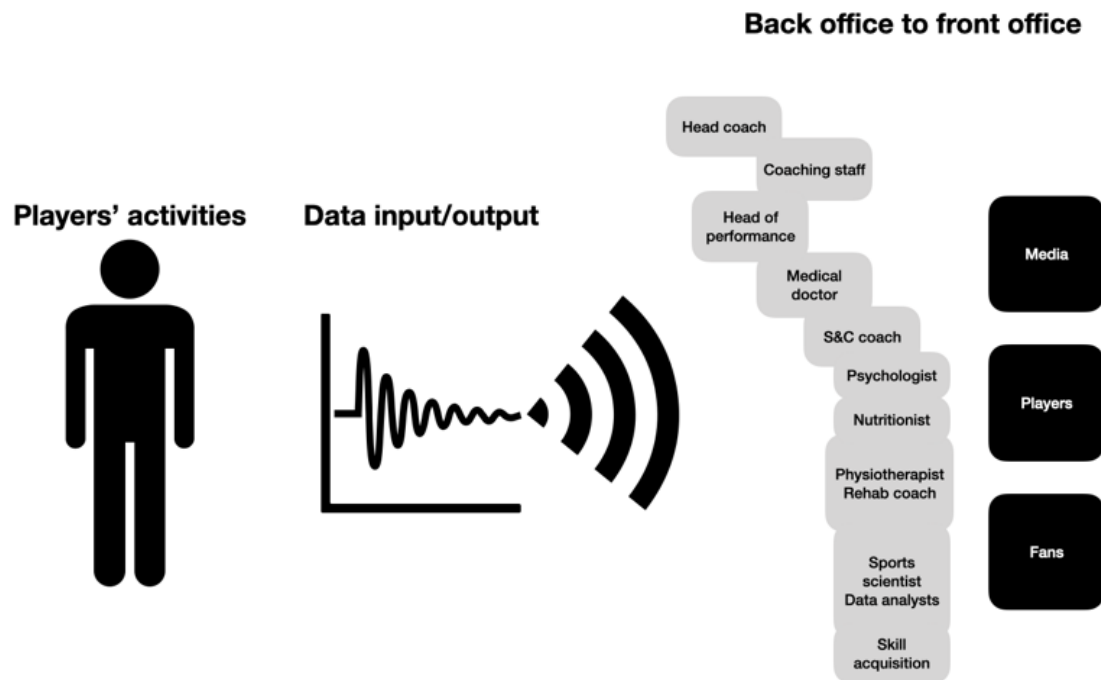


Figure 3: Structure and hierarchy of coaching and performance staff in sporting organization

Creating a *360° Personal Jacket Performance System* has its predefined phases, which can be presented in four major steps:

- Personalized history
- Personalized diagnostics
- Personalized goals
- Personalized 360° programs
- Personalized monitoring

All phases of the system are implemented in each of the system performance sectors. The general performance system (Strength and Conditioning, Sports Medicine, Nutrition, Psychology, Recovery, Lifestyle interventions, Performance analytics) has the role of supporting the system of specific preparation (technical-tactical preparation).

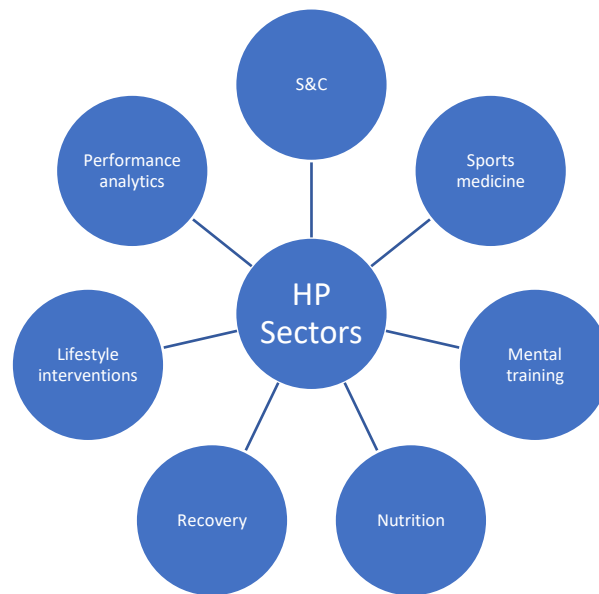


Figure 4: High performance sectors in sports' organization

One possible approach in collecting, processing and using player data is the matrix approach. All personalization steps in the system are carried out in each of the sectors of operation and are presented in an integral matrix (Table 1). The matrix for each player contains the basic characteristics of the athlete (figure 2), basic areas of work (figure 4) and basic operational procedures (history, assessment, goals, programs, monitoring). The matrix is available to all team members, and the final appearance of the matrix and all interventions according to the individual player needs are finally approved by the head coach with the suggestion of the head of sports preparation (head of performance). Communication containing proposals and approvals takes place in the main (all sector leaders present), coordination (head coach with head of performance or head of performance with sector leaders) and / or sectoral meetings (members of one sector present).

Table 1: 360° Personal Jacket matrix (player x)

	Performance analysis	Health	Strength and conditioning	Mental training	Nutrition	Recovery	Life style
History	12y in sport, 4y in top level	ACL – L 6 years ago	WL - 4 RT - 8 SAQ - 6	3	5	5	4
Assessment	D – 6 O - 8 T - 7	RLM -4 RLJ -7 RLI - 3	MS – 7 EN – 6 NMS&P - 7 NMSAQ - 5	M – 9 EC - 4 F - 5 CM - 6	DNI – 5 SS – 62 Tanita BF – 15%	HRR - 7 HRV - 6	S – 6 NH - 5
Goals	D – 7 O - 8 T - 8	RLM -2 RLJ -6 RLI - 2	MS – 8 EN – 8 NMS&P - 8 NMSAQ - 7	M – 9 EC - 6 F - 7 CM - 7	DNI – 6 SS – 58 Tanita BF – 13%	HRR - 8 HRV - 7	S – 7 NH - 7
Programs	TeTa team and personal training	PRECOR	PRECOR PENT PNMS&PT PNMSAQ T	PMT	PNP	PRP	SII NHII
Monitoring	GPS TT GPS TR	IIOF	MS – FMS EN – GPS NMS&P – CMJ, TDL NMSAQ, 20mS, TT	PTO	SS Tanita BF	HRR HRV	WQ

LEGEND: Grades 1-10, D – defence, O – Offence, T – Transition, RLM – risk level (muscles), RLJ – risk level (joints), RLI – risk level immunity, MM – movement mechanics, WL – weight lifting, RT – resistance training, SAQ – speed, agility, quickness technique, MS – mobility/stability, EN – bioenergetic capacities, NMS&P – neuro-muscular strength and power abilities, NMSAQ – neuro muscular speed, agility, quickness abilities, M – motivation, EC – emotional control, F – focus, CM - cognitive mobility, GPSTT – technical-tactical GPS data, GPS TR – GPS tracking data, DNI – deep nutritional interview, SS – skinfold sum, Tanita BF – Tanita bio electric impedance scale body fat assessment, HRR – heart rate recovery test, HRV – heart rate variability test, S – sleep, NH – nutrition habits, IIOF – injuries and illnesses occurrence form, MS-FMS – Mobility/Stability - Functional Movement Screening, ENGPs – Energetics – GPS tracking data, CMJ – counter movement jump, TDL – trap dead lift, 20mS – 20 meters sprint, TT – T-test, PTO – psychological training observation, PRECOR – preventive-corrective program, PENT – personalized energetic training, PNMS&PT – personalized neuro-muscular strength and power training, PNMSAQ – personalized neuro muscular speed, agility, quickness training, PMT – personalized mental training, PNP – personalized nutrition program, PRP – personalize recovery protocols, SII – sleep improvement intervention, NHII – nutrition habits improvement intervention

Each segment of the model has additional detailed elaboration created by an expert for a particular area. All information about each player is stored in a web cloud database. At the beginning of each season and at the end of each cycle of preparation or competition, the expert team led by the head of performance, presents to the head coach current status, goals and interventions. Also, the performance team in the daily meetings discusses all topics and issues related to acute interventions. The head of performance then presents the most important operational details to the head coach. At the same time, members of the performance team are in contact with the players with whom they carry out interventions on a daily basis.

One of the possible models of daily work organization is presented in Table 2.

Training and recovery interventions are personalized in following forms of daily work:

1. Pre-formance - programs of individual preparation for training that precedes the team warm-up. This preparation is based on the individual needs of the athletes, but also on the requirements of the upcoming training / match. Such programs can last from 10-60 ', and can be conducted by sports coaches, analysts, strength and conditioning coaches, medical doctors, nutritionists, physiotherapists and sports psychologists.
2. In-formance - individual programs that are implemented during training sessions. These programs can be conducted during special training periods provided for individual stimuli or with players not involved in team programs. The total duration of the in-formance program occupies 5-20% of the total duration of the training, and it is mainly conducted by sports and strength and conditioning coaches, skill acquisition experts and physiotherapists.
3. Post-formance - individual programs that are conducted after training, between the end of team training and recovery and regeneration protocol. The total duration of these programs is between 10 and 45 ', and it is conducted by sports coaches, analysts, strength and conditioning coaches, medical doctors, nutritionists, physiotherapists and sports psychologists.
4. Extra-formance - programs that are conducted outside of regular team training, usually in the second part of the day in relation to team training. These programs can take place under the guidance of club experts (sports coaches, analysts, skill acquisition, strength and conditioning coaches, medical doctors, nutritionists, physiotherapists and sports psychologists) or in the private arrangement of the players, with their personal experts. The total duration of these programs is between 30 and 90 '.

Table 2: Model of daily schedule (players) that includes personalized programs (red color)

Time	Activity
-90'	Arrival to training
-85'	Wellness questionnaire and weighing
-75'	Breakfast
-60'	Team's meeting with coaching team
-50'	Personalized assessment
-45'	Individual meetings with staff members, Physiotherapist
-30'	Pre-formance
-5'	Arrival to pitch/court
0'	Team's training kicks off
0'-90'	In-formance (personalized part of team's training)
90'	End of team's training
+1'	Post-formance
+20'	Recovery
+45'	RPE
+50'	Shower
+75'	Meal
30-60'	Extra-formance

Table 3: Model of daily schedule (staff) that includes personalized programs

Time	Activity
-120'	Arrival to training
-110'	Personal preparation for training
-100'	Staff meeting
-90'	Breakfast
-75'	Preparation of work space
-60'	Team's meeting with players
-50'	Personalized assessment
-45'	Individual meetings with players
-30'	Pre-formance
-5'	Arrival to pitch/court
0'	Team's training kicks off
90'	End of training
+1'	Post-formance
+20'	Recovery
+45'	Cleaning the work space
+60'	Data management
+90'	Staff meeting
+120'	Shower
+135'	Meal

A personalized approach to prepare athletes for top performance is a complex and demanding job. Such work takes place daily and continuously throughout the competition season. Daily organization of work in which special attention is paid to the individual needs of athletes requires quality synchronization of all members of the professional team. Such a daily program is planned in advance and is based on both acute (based on daily parameters) and chronic (based on the parameters of periodic testing) status of the players. In doing so, chronic status and goals are the basis for the development of daily training programs, and acute status determine the need for current corrections of training programs. For each of the parts of the daily program (Pre-formance, Team training, In-formance, Post-formance, Extra-formance) protocols of individual interventions are made by different members of the professional team/staff. One of the examples of personalization within the complete daily program is seen in Table 4.

Table 4: Implementation of the training day - simulation of individual approach in team sports

	Pre-formance	Tactical training	In-formance	Post-Formance	Extra-formance
Player 1	Hip mobility	100%		Bicycle capillarization	Power - resistance
Player 2	Manual therapy	100%		HIIT short	Lower body strength
Player 3	Glute activation	80%	Dynamic hip stretching	Upper body strength	HIIT short
Player 4	Ankle mobility	100%		Core stability	Power-Body mass
Player 5	Dynamic core stability	100%		HIIT short	
Player 6	Glute strength	100%		Upper body strength	
Player 7	Upper-body strength	100%		Core stability	
Player 8	Trap dead - lift	100%		Bicycle capillarization	
Player 9	Bicycle capillarization	60%	Bicycle capillarization	HIIT long	Lower body strength
Player 10	Ankle mobility	20%	Ankle rehab- Manual therapy	Upper body strength	Physiotherapy
Player 11	Shoulder mobility	100%		Core stability	Lower body strength
Player 12	Electro-stimulation	0%	ACL rehab Knee-mobility	Upper body strength	Physiotherapy
Player 13	Knee stability	100%		Hip mobility	
Player 14	Lower back stability	0%	Lower back rehab – physio therapy	Bicycle capillarization	Manual therapy

4. Conclusion

The *360° Personal Jacket Performance System* aims to enable the maximal use of all personal potentials of players in team sports in order to improve the performance of the team. The implementation of this system includes a multidisciplinary team of experts that is synchronized and led by a leader (director of performance) with the purpose of optimizing the process of team and individual sports preparation of players. The synergistic action of all experts enables the team and each individual player to improve their sports performance.

With the whole structure and organization of a personalized approach to improving player performance, the main protagonist of this system of work (*360° The Personal Jacket Performance System*) is the player himself. His understanding of the need for such a system, strong motivation, self-discipline and commitment are key prerequisites for the success of this system. Also, every player should think about this system 24/7/365. This way of thinking and behaving gives the player the opportunity to stay healthy, improve their competitive performance and prolong their career.

5. Practical Applications

This scientific document provides an important first approach toward the progress of knowledge performance for team sports athletes. This first approach can be useful for practitioners in order to improve the performance in these sports.

6. Future Lines

This particular sport needs more research in order to understand better the holistic performance.

7. Author Contributions

I.J; J.C-G. and F.C were involved in conceptualizing this research study. J.S; F.C; L.M, I.K, S.O, J.O, B.R, N.N. All authors were involved in study design and methodology development. All authors were involved in manuscript writing (review and editing). R.S, M.R, B.K supervised this research study. All authors have read and agreed to the published version of the manuscript.

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9.Data Availability Statement

No new data were created or analyzed in this study. Data sharing is not applicable to this article.

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11.Conflicts of Interest

The authors declare no conflict of interest.

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