"ALEXANDRU IOAN CUZA" UNIVERSITY OF IAȘI
FACULTY OF PHYSICAL EDUCATION AND SPORT FROM IAȘI
DOCTORAL SCHOOL IN SPORTS SCIENCE AND PHYSICAL EDUCATION
SPORTS SCIENCE AND PHYSICAL EDUCATION

THE PSYCHOMOTRIC PROFILE OF THE HANDBALL PLAYER. FOCUSING ON THE PERFORMANCE MODEL OF JUNIORS III

THESIS SUMMARY

SCIENTIFIC LEADER:
PROF. UNIV. DR. ABLE. ABALAȘEI BEATRICE-AURELIA

DOCTORAL STUDENT:
MUNTIANU VLAD-ALEXANDRU

Table of contents

Keywords: *handball, junior III players, psychomotor abilities, motor and somatic evaluation, software creation, performance profile, psychological characteristics*

THEORETICAL BASIS OF HANDBALL PSYCHOMOTRICS RESEARCH

Chapter I. Reflecting the topic in the literature

1.1. Conceptual aspects in specialty literature

Specialists in the field of performance sports practice are becoming more and more interested in the study of specific sports characteristics and the requirements they need in the training process. However, previous studies tend to approach monodisciplinary with an emphasis on a single characteristic of the practice of sport, whether we are talking about the psychological, physiological, biological or specific skills.

The literature tends to focus on the morphological profile of the elite handball player, focusing on the differences between different groups of athletes in order to highlight how this aspect can influence players at different levels of performance and also , differences between athletes working in similar areas of the field.

Along with these morphological influences, the attention of specialists is also directed to the potential importance of accessing the muscle mass of athletes, precisely for their development in order toto achieve performance in a team sport.

It is well known that the game of modern handball involves short-term efforts but with increased intensity, along with a good development of aerobic capacity and motor skills represented by speed and strength. In fact, the ability to perform intermittent actions of great intensity during matches is an important feature in this sport.

The preoccupations of the specialists are directed towards the insufficiency of the aspects related to the attributes of handball players (morphological attributes and effort capacities), so from this perspective it seems to be relevant the influence of other factors such as specific skills profile, psychological profile and biosocial profile. decisive in predicting

success in sports activities. The level of experience in the game of handball is usually attributed to the technical and tactical skills analyzed during the matches.

Laguna (2003) reports that psychological attributes and mental abilities contribute to success. Motivation is one of the components of success most often studied in sports psychology for goal-oriented orientation, and specialists such as Nicholls (1989) highlight a number of measurements (the Task and Ego Orientation Questionnaire, the Success Perception Questionnaire), especially in support of the most popular and well-documented theory of motivation in sports psychology - the theory of goal achievement.

Gordon (2004) also addresses the study of the environment and living conditions on the success of athletes emphasizing that it is of particular importance. According to him, leisure activities can be influenced by socio-economic status, level of urbanization and occupation. It seems that a low socio-economic environment (especially at the level of the younger generation) can be a disadvantage in terms of the ability to participate in the organized framework of sports.

The authors Massuca (2011) and Fragoso (2011) observed that the socio-economic environment is significantly associated with the success of the game of handball (a high socio-economic environment is related to a high level of performance). It was also noted that elite handball players have a weekly energy consumption in organized activities specific to this sport compared to athletes who practice this sport at a low performance level. Elite handball players spend twice as much time in training compared to players who do not play handball at a similar level.

1.2. Psychomotor skills and its role in the game of handball

We can say that the completely defining notions of psychomotor skills are constantly evolving, so that the precise shaping of this field still follows its course. Psychomotor skills, in general terms, can be described as the continuous relationship between mental processes and human physical movements, these being correlated and dependent on the level of development of certain skills such as: static and dynamic balance, coordination, dexterity, speed, spatial-temporal organization and so on

In order to be able to reach an optimal level of understanding of this subject, we can present separately the two elements that form psychomotor skills. As I stated earlier, the psychic

components (thinking, attention, understanding, etc.) are the first to guide the activity of any individual. Any activity to be performed is analyzed, planned, and the execution command is transmitted to the effector organs following the optimal decision taken at the level of the cerebral cortex.

From the perspective of the notions of motor skills, they develop from birth, and their optimal level of manifestation is determined by the qualitative assimilation during life of the constituent elements of motor skills. The reaction of the skeletal muscles to the commands received generates an optimal response to the situations we encounter every day, throughout life, and certain gaps in the motor development of the individual may bring in the future inadequate motor responses to the present tasks.

Regarding the issue of handball, it is well known that this team sport involves a type of mixed effort (aerobic-anaerobic) depending on different moments of the game, so that we can say that a good development of the psychomotor behaviors of the players correlated with a good physical training specific to each position on the field can lead to optimal manifestations of the players' skills during the matches and implicitly to the desired performance results. The game of handball is characterized by a variety and complexity of technical and tactical situations in the presence of the opponent that forces the players to a permanent adaptation by streamlining the motor behavior. General dynamic coordination is a basic psychomotor behavior stolen from an extremely diverse and complex content, through the increased weight we find during the game and plays a key role in the voluntary adjustment of actions. “The 21st century is characterized by a continuous and rapid evolution. The speed of change has created unusual demands on individuals and the education system ”(Lohcab, 2014 p.40). Today's education must include both the volume of knowledge, one's own body, but also the general education and recreational methods governed by a perpetual vision of excellence and the passion to overcome our own limits.

In current sports practice, the best results in terms of performance can be obtained through a meticulously planned, executed and controlled training, a system separate from the theoretical and methodical foundations of sports training.

In terms of psychomotor behaviors, they influence the optimal manifestation of athletes during training and official matches, so we try to approach each behavior with applicability and area of influence in the practice of handball.

Basic motor behaviors are seen as more or less instinctive and are divided into:

Basic psychomotor behaviors

1. Sensory-motor coordination;
2. Static and dynamic balance;
3. General dynamic coordination.

The role of oculo-motor coordination in performing the procedures specific to the game of handball

Vision is one of the sensory elements of the body that receives information from the external environment, transmitting it to specialized nerve centers for information analysis and issuing an appropriate response to the present task. In terms of sports activity, it has been argued over time that most sports require the visual equipment or certain features and abilities of vision. Hitzeman (1993) states that the earliest proponent of this statement is Galen, a Roman physician who in the second century believed in a link between ball sports, bodybuilding, and visual status. Despite this early recognition of the visual importance of sports activities, it has been neglected over the years,

Visual ability includes specific determinants that accurately coordinate the activity of players during matches. Loran (2001) states that it has been successfully observed that successful athletes generally have better skills, accuracy and reduced spatial-temporal constraints when it comes to acquiring visual information.. Thus, in competitions, the distinction between two athletes can be easily made by manifesting at a high level from the point of view of the visual apparatus. (Loran & Griffiths, 2001).

Shim (2006) points out that sports activities often require the connection between perception and action, so sports with a certain time constraint require players to extract the most important information through the ability of the visual device and use it to anticipate the opponent's movements in order to counteract them and implicitly influence the end result.

There is evidence that this visual ability, during the game, has an important role in the perceptual ability of athletes being related in proportion to the appropriate motor response, through continuous and systematic training. The visual apparatus and its training at a higher level can be obtained by establishing a group of guided techniques, through a process that

directly influences the visual function and the specific influence of the aspects related to the sport in question.

The common opinion of the authors Starkes (1984), Abernethy (1987) and Williams (1999) shows that when it comes to handball, where players are exposed to a combination of multisensory stimuli and unforeseen situations from opponents, it is necessary to act at all times., here influencing the ability to anticipate possible manifestations from opponents. This prediction of actions can be seen as an interaction between two systems, "software" - the system of anticipated skills acquired and "hardware" - the intrinsic system of visual skills. Although “hardware” skills cannot be seen as adequate determinants of the superiority of one athlete over another, they can define the operating limit of “software” skills (Ferreira, 2003, p. 60).

The game of handball is characterized by perceptual insecurity and time pressure, precisely by its nature, being a dynamic sport in which the visual environment varies continuously throughout the match and the phases that follow one another rapidly. In order to respond to this variety of stimuli, the player must have a superior acquisition of visual information about the imminent moments presented by the player with the ball. The ability to throw the handball constantly requires the convergence of the visual apparatus, the appreciation of the speed of movement and the prediction of the direction of movement of the opponents without having extremely accurate spatial data, so the player is subjected to an avalanche of stimuli. adequate motor response.

Regarding the component of the individual technique in defense represented by the interception of the ball, the players must counteract the latency of time necessary to change the motor structure and choose the commands according to the information received by at the sensory level, thus due to the insufficiency of the development of the visual apparatus and implicitly of the psychomotor behavior, the sensory-motor coordination may suffer and will be transposed in the reaction mode of the player in question.

Coon (2011), according to studies conducted over the years, states that about 90% of the world's population is considered "right", the dominant brain being located in left hemisphere in terms of motor skills. People who use mostly the right hand often show differences in performance that were due to the specialization of the hemispheres. The right hemisphere is superior in terms of images and visual skills, so the "left-handed" are considered to be focused

on the field of view. In general, people who mostly use the left hand are more symmetrical in most actions and implicitly in behaviors, here we include visual dominance, fingerprints, etc.

studied The analysis reveals differences in laterality in terms of the individual's ability to manipulate the object of play (Kosinski, 2008), suggesting the likelihood that people with a dominant right brain have an intrinsic neurological advantage. Eckner (2010), through other studies, points out that left-handed athletes have a lower average reaction time than right-handed athletes. In the same sense, Dane (2003), through his research, reveals the superiority of the left-handed reaction time compared to the right-handed ones, an aspect measured by the use of specific tests.

Holtzen (2000) finds that athletes what use mostly the left hand have neuro-anatomical advantages in performing neurocognitive tasks as gross motor visual responsibility, and Loffing (2010, 2012) reports left-handed people are often more disproportionately motor disproportionate in interactive sports such as tennis, the performance advantages being persistent only at the level the amateur.

All these studies mentioned above aim to highlight the differences in eye-hand coordination in people with increased influences in the left or right cerebral hemisphere. A study by Awamleh (2013) on these issues shows that differences in clumsiness in the simple visual reaction test and eye-hand coordination do not exist and are inconsistent with previous research such as that of Dane (2003) and Holten (2000).) which highlighted the fact that left-handed people perform more efficiently tasks that include simple reaction time and visual motor tasks.

The importance of static and dynamic balance in actions with variations of the support base

Nowadays, due to professional advancement in any branch of society, people have less and less physical activity. One of the problems associated with improper movement and exercise is the lack of proper balance.

We can say that this state of balance, whether we are talking about the static or the dynamic one, is correlated with the level of development and involvement of the supporting muscles, which leads to the attempt to improve it. The waist, pelvis and thighs along with the adjacent skeletal muscles are considered to be the nuclei of body stability. Regarding this anatomical positioning, the center of gravity is located in this area, and the movements and

dispersion of forces from the upper extremity to the lower and vice versa, as chains of movement of the human body, mostly come from this area, through therefore good stability is required.

This "core" area of the body is a "box" with the abdominal muscles in the front, the muscles in the spine and large buttocks in the back, the diaphragm muscle in the upper part, and the pelvic muscles in the lower part. Reed (2012) notes that all of these muscle groups contribute to the stability of the spine, hips and functional kinematic chain. Weakness or lack of coordination can be correlated with the level of development within this musculature.

Another psychomotor behavior that requires a good education to obtain optimal manifestation indices is represented by the static and dynamic balance, present at all times of the game, being influenced by the presence of the opponent that forces players to use this behavior as effectively as possible. Basic.

Balance is generally defined as the ability to keep the body's center of gravity within the limits of the support base, and authors such as Miller (2001) consider that players' ability to balance is the result of their ability to pay attention to proprioceptive and visual cues.

A handball player is at the same time a jumper, a pitcher, a sprinter and must execute the elements quickly and accurately. Motor skills such as running, jumping, flexibility (scapulo-humeral joint) and throwing speed are some of the extremely important physical activities for this team sport.

General dynamic coordination and its influence in technical-tactical actions

All sports activities depend on the abilities of the athletes, but they must be oriented towards the interest of the entire sports group, which leads to positive results. Motor skills, sometimes superficially treated, are closely related to the ability to have a significant impact in terms of maturity in play and neuromuscular activity.

This dilemma represented by the training sides arouses the interest of specialists in the field to obtain adequate solutions to achieve the proposed goals but coaches in this sport face many problems in trying to decipher, develop and increase the level of achievement and achievement of competitive objectives.

Thus, in the current period we can see that training does not focus only on physical performance tasks with maximum and supramaximal intensity for the development of physical ability and tactical skills, but is aimed at sports that require capitalization efforts to achieve a

higher level of efficiency. of specific motor skills to achieve the desired ultimate goal of strategic planning.

In this era of evolution, the influence of coordination skills on the maximum extent of sports performance has been demonstrated. Coordinating skills were considered essential tools for assimilating specific techniques in sports.

Moreover, it is important to achieve the refinement and modification of these techniques in the long-term training process. The use of different parts of the body in a sequential order of movement to achieve the desired goal requires a high degree of neuromuscular coordination. Certain actions, acts of specific skill in sports require predominantly eye-foot-hand coordination, such as the transmission of the ball to the goal. Other skills require predominantly eye-hand coordination, such as the accuracy of the task of passing the ball to the goal in a well-established direction.

Coordination can be described as a specific integrated response of muscle groups for an agile demand for movement. Coordination is also critical to the effectiveness of movement in ways that can improve strength and endurance through controlled movements and reduced energy consumption.

In the field of exercise science, Prakash (2014) talks about coordination and the fact that it is recognized as the body's ability to organize two or more patterns to meet a specific goal related to movement. Coordination involves extremely complicated and complex sequences of activities. These activities contain the reaction to the sensory inputs (stimuli), choosing and processing the motor program from the previously assimilated skills (motor learning) and finally the execution of the action. The information is transmitted to the cerebral hemispheres for prediction, evaluation and, where appropriate, adjustment. The whole process takes place in fractions or milliseconds, and this ability allows the player to change and analyze the position of the body in time and space in accordance with the area of action or a moving object. It depends on the functioning of the visual apparatus at the highest possible level, the kinesthetic receptors and the vestibular apparatus alike.

The ability to coordinate is the ability to respond as quickly as possible to a stimulus resulting in the execution of well-guided actions. It is also conditioned by the acoustic, optical and tactile capacity of the organs.

The totality of the movements has its origin in the ability to balance. In any sport, players lose their center of gravity, and through compensatory movements they try to regain it countless times during training or competitions.

Kamlesh (2011) talks about another important role in sports, namely rhythm. A successful athlete must have strength, speed, agility, explosive strength and increased quality coordination along with a proper rhythm and sense of timing. All locomotor movements are sequences of rhythmic and repetitive movements such as running or body movement in swimming.

Coordination capabilities are understood to be relatively stabilized and generated by the pattern of motor control and regulators. These abilities allow the athlete to perform a range of movements with a better quality.

The level of performance in various sports is broadly dependent on the level of development of psychomotor behaviors, in some cases especially towards these coordination skills. These, in turn, depend on the processes of the central nervous system and the ability to analyze and transmit information by the sense organs. One of the advantages of a good development of these attributes is the economical and efficient use of the skills specific to a branch of sport.

The efficiency of the game-specific actions related to the body scheme and laterality

According to Kreindler (1972), the notion of body schema refers to the organization and perception of the location of stimuli, the mutual relations between body parts, the relations of these parts with the environment and the mental and spatial image that man has of himself.

The body scheme is the representation that the subject has about his body and which serves as a landmark to orient himself in space, manifesting itself constantly and being necessary for normal life.

From the perspective of the handball game, a good development of the body scheme from an early age can lead to a positive influence of the athlete's manifestation in the execution of individual or collective technical elements along with performing tactical tasks in the most efficient way for the whole team. . If the athlete has clear notions about his own body, the movement of his own segments in space both relative to each other and seen as a unitary whole in relation to the environment, then he can become aware of his own person in the continuous

movement of motor activity, along with effective observation. of the action around him, which leads to a high level of sporting manifestation regardless of the presence of the opponent and the influence he is trying to exert.

Laterality is closely linked to the dominant function of a cerebral hemisphere and the unequal influence they have on daily life or in sports.

"Laterality is defined as the functional inequality of a part of the body as a consequence of the difference in the development and distribution of functions in the cerebral hemispheres" (Lafon, 2015).

Data obtained by Faurie (2016) suggest that the rare preference of using the left hand may be a strategic advantage in daily interactions, especially in performance sports. The persistence of this poliformism can be maintained by the negative frequency of the selection. This hypothesis stated above applies only in situations where the fighting skills are directly related to success, in this case referring to situations in sports.

From the perspective of the predominant segment, the following types of laterality can be differentiated: manual, foot, eye, acoustic and different interdependencies between them. Looking at the characteristics of the prevalence of movement, individuals can be divided into "left-handed", "right-handed" and "ambidextrous".

Spatial-temporal orientation as an essential factor in performing motor acts and activities

A last perceptual motor behavior that is encountered in sports, and not only, gives the individual certain notions of size, shape, color, constancy, notions of direction and spatial orientation, just to be able to perform tasks as quickly as possible. and effective. The temporal characteristics present in this perceptual motor behavior provide us with information about order and succession, the duration of actions over time, notions of rhythm and the succession of motor structures.

1.2.1. Psychological characteristics in the game of handball

The importance of motivational persistence

Based on the theory of self-determination (Alesi et al., 2019 apud Deci, 1985) and the theory of self-determination (Alesi et al., 2019 apud Ames, 1992) many researches emphasize psychological components as representing the foundations that contribute to building performance. sports.

Success in sports is the result of a complex interaction between an athlete's technical skills, fitness and adaptive motivation. This disposition is composed of self-esteem and perception of competence, style of attribution of effort, realistic representation of one's abilities, tasks-based goals and persistence. All these factors increase the probability of achieving success in performance sports through the action of predisposing athletes to display their personal skills (Alesi et al., 2015).

Intrinsic motivation has as its main concern behaviors focused on fulfilling personal goals such as joy, curiosity, satisfaction and interest. All these are integrated with the inner self and correspond to the value system of the athlete (Alesi et. Al., 2019).

Another characteristic related to players' motivation is seen as their autonomy in skills and is designed as a psychological requirement that is conditioned by the support of the environment and interpersonal interactions (Alesi et al., 2019 by Ryan & Deci, 2000). As a whole, the forms of motivation are made from internal sources and behaviors perceived as self-authorized. These are correlated with a high psychological level of positivity and an increased persistence in practicing sports activities.

Regarding our research, we identified a number of psychological characteristics that can influence the performance of the game of handball. From the point of view of motivational persistence, it finds its applicability in this team sport through the ability of a player to maintain for a long time a high level of motivational factors in order to progress overall in the team.

Self-discipline and its role in achieving performance

We can say that a good part of the young people who have a series of physical endowments fail to practice a certain sport at a high level of performance. Identifying those participants with increased motor skills does not present a monumental problem in the case of world-renowned sports. The real difficulty is in identifying future practitioners who have self-discipline and the patience to evolve towards obtaining specific attributes for a team player (Stevens, 2002).

Most team sports require an extremely high amount of self-discipline. For the eyes of the spectators, the culmination is represented by the phases with a high degree of spectacularism. What athletes and coaches need to notice is the process behind the outcome of choosing the right timing of the game, handling the game object accurately, making the right decisions at critical times, all of which are directly related to the self-discipline that each player must own it.

Self-discipline is seen as similar to self-confidence. These psychological skills are rarely tested in low pressure situations because a player can easily seem confident when his team is at an advantage, but this feature is really most visible in critical situations where the pressure is extremely high. Self-discipline should not be seen as a rigid component in the practice of handball, where information and processing is a crucial skill and can always change.

The benefits of planning in the practice of handball at the junior level III

The competition season contains a series of divisions and subdivisions regarding the planning of structures according to the particularity of the objectives of each athlete (Dosil, 2003, p. 271) and the following aspects must be taken into account:

- Activity throughout the season;
- Training sessions;
- Micro cycles (5-10 days in which the training structures maintain a similar pattern);
- Monthly cycles (consisting of several micro cycles);
- Macro cycles (which take place over several months and coincide with the general objectives of the season.

According to sports psychologists such as Bruceta (1998), planning should be done in accordance with physical training. First of all, together with the athlete and the coaches, these sports psychologists study the main objectives of each training cycle, in order to be able to fulfill a series of mental objectives, they are established.

Secondly, it is imperative to highlight the difficulties that may arise in each period in order to prepare the appropriate answers in advance.

In order to fulfill their highest aspirations in sports, psychologists need to work in similar ways by applying motivational strategies to help athletes overcome the training load, components of mastery of thoughts to achieve a full state of focus. exclusively on the momentary task they have to perform (Dosil, 2004).

CHAPTER II. MOTOR AND PSYCHO-SOMATIC CHARACTERISTICS OF HANDBALL PLAYERS

2.1. Morphological characteristics of adult handball players

The general development of the sports world has guided the researchers in the Science of Sport to the study of excellence in sports performance, more precisely to the study of the characteristics and requirements specific to each sport. However, in order to meet these requirements, each individual must have a set of specific characteristics similar to those of the group to which he belongs. Along with this set of characteristics, a series of multivariables are needed (general and specific physical form, technical and tactical performance during the game), the most studied so far being, without a doubt, the somatic characteristics (Massuca, 2015).

Massuca (2015) states that in recent years, the study of performance in sports based on anthropometry has shown:

1. How morphological prototypes are important for success, within and among the sporting phenomenon;
2. Increased morphological variability in some sports compared to other disciplines or sports;
3. Athletes who own or who by specific means obtain an optimal somatic profile for a specific sporting event are more likely to be successful;
4. Morphological optimization is useful for assessing training status and talent selection at both female and male level.

In other words, the information gathered from a morphological point of view seems to have a certain degree of importance in improving the performance of athletes.

In addition to studies on the morphological differences between Olympic sports and the level of amateur and senior handball players, the literature also reports studies on:

1. Typical biological characteristics of handball players;
2. The body's adaptive response to the training process;
3. Morphological differences between players working in teams with different levels of performance;

4. Differences between positions in different positions;
5. Differences between players operating on the same position on the field, but at different performance levels.

It seems that the somatic profiles of elite athletes can provide a broader perspective on the requirements to compete at a higher level in handball.

2.2. The motor and psycho-somatic model of handball players

Table 1. The motor and psycho-somatic model of the goalkeeper

player	The pattern
Goalkeeper	**The somatic model**
	Waist 185 - 195 cm (B) and 170 - 180 cm (F) Weight: 80 - 88 kg B and 65 - 75 kg (F) Height to weight ratio: 1.05 to 1.06 (B) / 1.05 (F) Palm opening in cm - 24 cm (B) / 21 cm (F) Arm width in cm - 195 - 205 (B) / 180 - 190 (F)
	Psychological model - sensory
	-vision and perception of the game / peripheral vision - balance - the perception of one's own body - spatial-temporal orientation (appreciation of the flight trajectory of the ball)
	Neuro and psychomotor skills
	-specific coordination and concomitant operation of body segments -skill in keeping possession of the ball, precision in execution and putting the ball back into play -reaction speed
	Intellectual skills
	-intelligence rendered by clarity in the game -intelligence through fast analysis capacity and efficient decision-making impact

	-the potential to predict the opponent's action, the moment of its triggering and the place -emotional stability and the ability to take responsibility		
	Motor quality model		
	-good coordination ability, specific skill for rejecting or recovering the ball from the semicircle -soft at the joints (especially scapulo-humeral) -force in the upper and lower limbs -explosive force and flight balance -orientation of one's own body in relation to the ball and its trajectory -resistance specific to the job -speed developed at the same time as its forms of manifestation		
	Tests and control rules	**B**	**F**
	-speed running 50 m with top start	6 ”4/10	7 ”5/10
	-long jump from the spot	2.65 m	2.10 m
	- Cooper test	3000 m	2000 m
	-tractions with the arms at the fixed bar	X12	X4
	-coxo-femoral mobility (cm)	60	65
	-flections of the torso on the pelvis	X25	X23
	-throwing the ball with 3-step momentum		
	-speed running 5x30 m	4 ”4/10	4 ”8/10
	-move in a fundamental position in the triangle	21 ”	2. 3"

2.3. The model of the champion in the game of handball

The game of handball, due to its complexity, requires and is equally part of the improvements brought about by the improvement of the motor manifestation mode during the matches from the perspective of two components.

A first component is seen from the perspective of the whole group, the level of cohesion within it and at the same time the degree of efficiency with which it performs the elements of collective tactics in attack and defense (closing lanes, blocking balls thrown to the goal, etc.). Being a team sport, it is imperative that all the collective mechanisms and systems function properly in order to result in an increased level of efficiency and implicitly in obtaining positive results.

Regarding the second component, it is closely related to the particularities of each player viewed individually in relation to the team. We thus remind the specific training of each position in which each player performs motor tasks in order to improve the elements of individual technique with the ultimate goal of contributing positively in achieving the highest level of performance.

The game of modern handball involves the combination of these two components, and at the level of great teams the results do not cease to appear.

Regarding this individual component, we can talk about a model of the champion to which the sports activity should be directed in the training (physical, technical, tactical, mental, etc.) from the junior level. Thus, in this subchapter we present for each position on the field a specific of the player from the perspective of some constituent elements that we consider to have a high impact in the efficient manifestation of the players in the official competitions.

As we well know, the game of handball is practiced with 7 players (6 field players and a goalkeeper) each with well-defined tasks both during the attack phase and during the defense phases of the opponents' attacks.

A first player and probably one of the most important in defense is the goalkeeper who has to guide the players on the semicircle and at the same time move in a slight arc of a circle depending on the area where the ball is passed from one player to another. . We present below the champion model of the goalkeeper by accumulating official data from the International Handball Federation.

We can best appreciate this efficiency of the goalkeeper by the percentage of shots on goal rejected. In order to be able to cover as large an area of the goal as possible, it is preferable for the player in the goal area to have an above average waist and especially a wingspan that allows him to reject the balls easily, regardless of the degree of difficulty. of them, the speed with which they are transmitted or the throwing procedure used by the player who is in the attack phase.

2.4. Game model

Looking at the perspective of the game model during the attack phase, according to Sotiriu (1998) the goalkeeper follows several phases listed as follows:

Table 2. Model of the goalkeeper's game interpretation according to Sotiriu 1998

Player	Game model	Phases
Goalkeeper	**Attack**	**Phase I**
		-Recover the ball as soon as possible and launch the first phase of the attack (counterattack) - putting the ball back in play
		Phase II a
		Pass the ball to the nearest player
		Phase III and IV a
		-following the game from your own 9 m semicircle -participation in some attack phases
Goalkeeper	**Defense**	**phases**
		Phase I

		-folding to one's own gate -closing the aisle and intercepting (if caught in the fold towards the gate *)
		Phase II a
		- resuming the fundamental position in the central area of the gate
		Phase III a
		-Moving in a fundamental position -locating the defense in the system
		Phase IV a
		-speed quickly (sideways, forwards / backwards, obliquely) - rejecting the balls towards the goal

Looking at the table above we can see the importance and complex tasks of the goalkeeper both during the attack phase and at the time of initiating and conducting the moment of defense against opponents.

In addition to the main somatic characteristics mentioned above (waist and wingspan), the goalkeeper must develop his reaction speed as a priority in order to be able to reject the balls thrown towards the goal with extreme speed. Other features of great importance are good mobility, especially at the coxo-femoral joints along with a muscle elasticity that allows easy stretching without the risk of injury.

In terms of psychological characteristics, we list: a good concentration, resistance to stress, calm in situations that can make the difference between victory and defeat, all combining with the motor elements and allowing the goalkeeper to streamline his activity on the duration of the official matches or during the trainings.

2.5. News and perspectives in the evaluation of psychomotor behaviors

Computerized psychomotor tests in the Test2Drive system are a method of assessing the level of manifestation of psychomotor behaviors. The Test2Drive system has been the subject of numerous validations and standardizations between 2013-2016. The evaluation and characteristics of the tests performed confirm the validation of those used in the system and are described by a number of authors as Tarnowski (2016). The system meets all the requirements of the regulation of the Ministry of Health of July 8, 2014 on psychological tests and psychomotor skills. Within this program, 4 tests can be used to measure the indicators of psychomotor skills: the test for simple reaction time (SIRT), the test for the reaction time of choice (CHORT), the eye-hand coordination test (HECOR) and the spatial anticipation test (SPANT).). Reaction times and movement times are indicators of all tests, while the percentages of correct answers can be analyzed in the CHORT and SPANT tests. Each test can be performed from a sitting position, which facilitates access to the screen area. The test parameters are shown in the following table.

Table 3. Examples of test parameters

Test type	Sirte	CHORT	HECOR	Spanta
Number of stimuli	20	24	20	20
Stimulus exposure time	3s	3s	3s	3s
Intervals between stimuli	1s, 1.5s / 2s	1s, 1.5s / 2s	1s, 1.5s / 2s	1s, 1.5s 2s
Test time	3m	3m	3m	3m
indicator	TR, TM	TR, TM	TR, TM	TR, TM

At the beginning of the study the participant will receive detailed instructions for each test. Following the instructions, the practice stage will take place allowing the participants to adjust and learn the method of presenting the stimuli and to provide the appropriate answers.

Players will have to react as soon as possible to all the stimuli in the tests. The test may consist of the following tests:

a) SIRT (simple reaction time) - it evaluates the reaction speed and its stability. The stimulus signaling field changes color at the right time. Reaction to stimuli includes the movement of the finger from the START field to the response time field marked in blue;

b) CHORT (reaction time of choice) - assessing the speed of reaction and the adequacy of the reaction in a complex situation. Horizontal references (stimuli) and vertical stimuli that require a reaction, along with a reference standard (neutral stimuli) that do not require a reaction, will be placed above the signal line. Stimulus response includes the movement of a single finger from the START row to one of the two reaction fields (the horizontal or vertical reaction field). During neutral stimuli, the finger should be held on the START surface;

c) HECOR (hand-eye coordination) - the test requires careful observation of the test plate and a reaction as soon as possible to the appearance of the red signal field. The test participant will need to move his / her finger from the START field to the blue reaction time and then return to the starting point as soon as possible;

d) SPANT (assessment of eye-hand coordination using complex spatial information) - fields will be marked in the upper left and right corners of the test board, two of which (a row and a column) will turn red simultaneously. In response to stimuli, the participant will need to point to the light field in rows and columns and bring his or her finger back to the starting field.

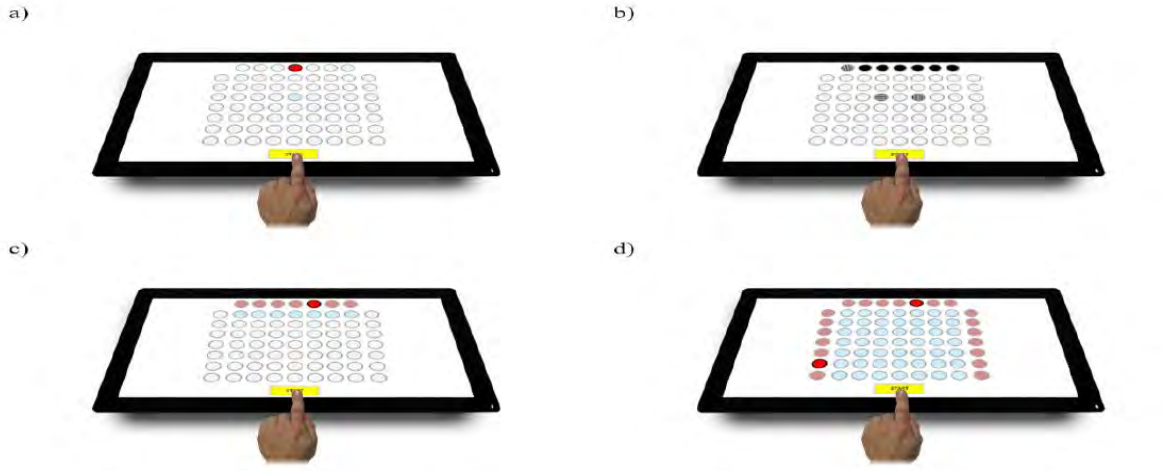

Figure 1. Tests within the Test2Drive platform

PART II

CHAPTER III. PRELIMINARY STUDY - COMPETITIONS AND DIFFERENCES IN THE PERFORMANCE PROFILE OF HANDBALL PLAYERS, JUNIORS III

3.1. The purpose, premises and objectives of the research

Goal. The main purpose of this preliminary research is to identify the optimal measurement method for meeting the objectives of sports training and achieving performance in handball, namely to identify the most effective tests to select the objective sports talents in order to form groups of handball players.

Premises which were based the research are determined by the opinions and results of research revealed by specialists who had as main concern the evaluation and creation of somatic and motor profiles of the junior handball player, which led to the desire to supplement this concern in relation to the requirements of handball. modern, current, scientific task that can come to support the shaping of this performance "portrait" of young athletes who strive for high performance.

Research objectives

The main objective of the research is to outline and achieve a performance profile of the handball player, junior III, and to highlight the competition and divergences by comparing it with those already existing in the literature, nationally and internationally.

In order to be able to confirm or refute the established hypotheses, a process of highlighting was necessary of several secondary objectives:

- achieving an updated performance profile based on a series of field tests and measurements on junior handball players III, from the area of Moldova;
- building connection points between the components that condition the performance capacity;
- highlighting the role of objective evaluation in the area of performance at the junior level.

3.2. Research hypotheses

Updated handball player profile III can be reproduced by motor, somatic and psychomotor characteristics, in the preliminary study, to highlight the factors that condition performance in the game of handball.

1. Psychomotor behaviors can become important components of the performance profile of the handball player, junior III.
2. We consider that by identifying, with the help of evaluation, some somatic elements important in the performance of handball players, we will complete the performance profile of junior III.
3. Through the motor evaluation of the players, we highlight a series of specific elements that can constitute the performance profile of a handball player.

3.3. Material and method

3.3.1. Research variables

Table 4. Independent variables of the preliminary research

Independent variable		Number	Percentages
High school profile	**Sport**	**11**	**24%**
	Humanistic	**35**	**76%**
Performance type	**National team**	**6**	**13%**
	Sports Club	**40**	**87%**

*** Caption: ED-far right; ID-inter right; C-game coordinator; IS-left inter; ES-extreme left; Pv-pivot; Po-Goalkeeper;**

For the preliminary study, the independent research variables were established for the analyzed group of players, elements such as the profile of the high school where the teaching process takes place and the type of performance divided into: members of the club teams and the representative team of Romania. Another independent variable is the specific area of the land on which they operate.

For the dependent variables of the research, I mention the psychomotor behaviors, the motor and somatic elements analyzed as well as the psychomotor behaviors, and the statistical calculations performed in the SPSS program were based on the relationships between them.

3.3.2.Statistical analyzes used

- Multifactorial ANOVA - to obtain a specific data set that renders the statistical significance of the information accumulated following the application of test batteries to the group of players;
- Independent sample T-test (for comparing averages and establishing significant differences) specifically referring to the comparison of sample averages with the averages of existing profiles in order to make a relevant comparison between the two elements;
- Descriptive analyzes - also performed in the SPSS 20.0 program, with the main purpose of outlining the performance profile of the evaluated handball players (juniors III);
- Fisher LSD post hoc analysis to accurately highlight the correlations between handball-specific positions;
- Shapiro-Wilk normality analysis;
- Distribution of positive or negative values compared to the mean in the Gaussian curve.

3.3.3. Research period, place and subjects

In this preliminary study we evaluated a group of 46 handball players, juniors III, members of the teams from the High School with Sports Program Vaslui, the High School with Sports Program Iași and the University Sports Club Suceava.

The application period of the tests took place over 30 days:

- **05.10.2020**- testing the first team of juniors from the High School with Sports Program Vaslui (Annex 1);
- **20.10.2020**- testing the second group of the junior team III from the High School with Sports Program Vaslui (Annex 1.1);

- **21.10.2020**- testing the junior team from the High School with Sports Program Iași (Annex 1.2);
- **28.10.2020**- evaluation of the handball team Club Sportiv Universitar Suceava (Annex 1.3).

The two tests at the High School with Sports Program in Vaslui took place within the sports base belonging to the institution, outside due to the limitations imposed by the context of the COVID pandemic 19.

The evaluation of the handball players from the High School with Sports Program from Iași was also carried out in outdoor conditions, inside the "Emil Alexandrescu" Stadium for the same reasons mentioned above.

The accumulation of data for the handball team from Suceava was carried out in the hall where they carry out their training regularly.

The whole evaluation process was carried out by using electronic measuring instruments and software programs in order to extract the information necessary to outline the performance profile of the junior III handball player in the most efficient way, to represent the starting point for the final study in within the doctoral thesis.

3.3.4. How to assess motor, somatic and psychomotor characteristics

A. Psychomotor characteristics

Sensory-motor coordination

Materials needed: bench, chair, laptop, TreactionCo program, keyboard.

Procedure: For the system setting, the upper limb option will be selected. The athlete sits on a chair and will position the keyboard resting on his thighs. The laptop is placed in front of it, at a distance that allows it to better observe the markings that appear on the screen. The evaluation begins when the athlete presses one of the three keys. A red dot will appear on the left or right side of the screen, the athlete having the task of pressing the key on the side where that mark appears as soon as possible after the appearance of the stimulus. Each subject will have to analyze 20 successive images, recording the averages of the reaction times at the level

of the upper limbs. It is considered a correct assessment if the athlete has more than 10 correct hits / touches. An average time, as short as possible,

Dynamic balance

Materials needed: Just Jump platform

Description: Depending on the type of jump to be performed, the player positions himself on the jumping platform, following the execution of the movement necessary to achieve the goal in order to record its best values. (SJ, FJ, CMJ, 4X).

Materials needed: photocell tripods, foreheads, roulette

Procedure: Depending on the distance to be covered, the distance is calculated with the help of the roulette wheel, with the sides of the running lane positioned on either side to position the gates with infrared photocells. The athlete will position himself at the starting line, and will start running at free speed and enter the deceleration process after passing the last area with the whole cell with photocells.

General dynamic coordination

Sample description: the distances of 5/10/15/20 meters are measured on a straight line, and the markings for the positioning of the tripods with photocells are positioned on either side of the corridor on which the athlete will run. At the beginning of the test, the athlete must run in high tempo without major deviations in the direction of travel in order to avoid inconsistencies in the values obtained.

Spatial-temporal orientation

Illinois test description: With the help of roulette, the distance of 5 meters in a straight line is measured. Heads will be positioned at point 0, measuring 2.5 meters and measuring 5 meters. From the level of the head from a distance of 2.5 m, 3 successive distances of 3.3 meters are measured with the help of the roulette wheel, at the level of which milestones will be placed.

At the start and finish point, two gates with infrared sensors will be positioned, which will start automatically after the athlete leaves and his final time will be recorded.

B. Somatic features

Height

For the correct measurement of the athlete's height, it is necessary for the athlete to be barefoot, in a standing position (orthostatism), touching a vertical wall with his back, head and heels; the head is facing forward. Using a rangefinder or a tape measure (a grid graduated in cm and at least 0.5 cm subdivisions can be glued to the wall) the distance from the ground level to the projection perpendicular to the wall of the vertex point level (the highest point of the skull), determined with an object that has an angle of 900 (e.g., a square with a right angle, with sides of 15-20 cm), placed with one of the sides on the vertex and one on the wall. It is recorded in centimeters and subdivisions of 0.5 cm. In the field tests performed to outline this profile, a GLM 80 bosch laser rangefinder was used,

Body composition

All these parameters were evaluated using Omron HBF-511B-E body composition scales (Lakshmi, 2021), which reproduce a series of somatic parameters using BIA (bioelectric impedance analysis) technology, based on 8 sensors that ensure accuracy in their determination.

Procedure: in the first part of the protocol, data on the age, height and gender of the athlete are entered, and the athlete will be positioned on the two lower limb sensors, simultaneously with the outstretched hands forward and holding the upper limb sensor in place, following that the athlete maintains the position until the analyzer evaluates all the data.

Wingspan

Materials needed: centimeter ribbon

The width of the arms is measured with a centimeter ribbon or a flexible roulette. The athlete is in a position facing a vertical wall, with a flat surface, with his arms extended and

raised sideways, in a horizontal position. The athlete touches the wall with both palms. The most recommended is to stick on the wall a horizontal grid, graduated in centimeters and subdivisions of 0.5 cm (grid length, about 2 m and width of about 40 - 50 cm, in order to measure students with different heights). The distance between the distal points of the middle fingers of the student's two hands is measured. It is recorded in centimeters and subdivisions of 0.5 cm. It can be related to body height.

Lower limb length

Procedure: it is measured between the iliospinal point and the tibial sphincter: the subject is positioned sitting or lying on his back, with the lower limbs in extension;

Materials needed: digital caliper, centimeter ribbon

Hand length

Procedure: measure between the middle of the distal envelope of the wrist (which will first be highlighted by flexing the hand on the forearm) and the fingertip;

Procedure: the athlete sits with his feet resting on the outer edge of the flexometer. He must bring his outstretched arms forward by bending his spine and slide the rangefinder positioned on the flexiometer support to the maximum point of his muscular and articular possibilities. The device records the distance that the athlete travels through the movements described above and is noted in centimeters.

B. Motor characteristics

The force of the palmar flexors

Materials needed: Camry EH101 digital dynamometer

Procedure: The athlete is in a standing position with his feet apart at shoulder level with his hands held in a supine position. The person coordinating the test will position the athlete, in his hands, the two dynamometers, with the task of putting a muscular effort of a few seconds on

the handles of the dynamometers that will record the muscular force at the level of his upper limbs.

Flexions of the torso on the thighs

Necessary materials: meters, stopwatch

Procedure: The athletes are grouped in pairs. One of them will lie on his back with his legs bent at the knee joints and his feet pressed to the ground, and his hands will be crossed at chest level. The non-executing subject will sit in front of the executing person, with the ball positioned over that of the executing colleague, holding the meter in one of the hands. At the signal, the athletes must touch their thighs with their elbows, each correct repetition being noted. The duration of the test is 30 seconds after which the athletes will change places.

Agility

Test description 505: The athlete must run up to the 15-meter marker in order to accumulate sufficient speed to move, after crossing the 5-meter mark and crossing the imaginary drawn line, he must run back the same distance of 5 meters. The recorded time is the time that the athlete travels on that distance of 5 meters (round trip). The twisting ability on each leg is tested, and the subjects were instructed that they should not exceed the 5-meter line by far so as not to waste too much time.

3.4. Results and discussions

3.4.1. Verification of hypotheses by performing statistical calculations

Updated handball player profile III can be reproduced by motor, somatic and psychomotor characteristics, in the preliminary study, to highlight the factors that condition performance in the game of handball.

First of all, a part of the descriptive statistics was made to highlight the basic elements regarding the evaluation protocol in relation to the research group in question, the means and standard deviations being useful for highlighting the differences in relation to the literature.

HYPOTHESIS 1

1. Psychomotor behaviors can become important components of the performance profile of the handball player, junior III.

For the first hypothesis, the multifactorial ANOVA statistical calculation and the Post Hoc analysis were used in order to have a clearer picture of the degree of development of psychomotor behaviors in relation to the specific areas of action for the game of handball. In order to perform the ANOVA analysis, the Shapiro-Wilk analysis was calculated at an early stage of the interpretation of the results to highlight the normal distribution of the values obtained following the application of the evaluation protocol.

Regarding psychomotor behaviors, the most notable values are directed towards sensorimotor coordination ($p = 0.02$), dynamic balance ($p = 0.02$), spatial-temporal orientation ($p = 0.00$) and general dynamic coordination. ($p = 0.00$). All these results support the hypothesis that the performance profile can be directed to the area of psychomotor skills in the context of playing handball at the current level.

The independent variables represented by the action areas, highlight after the Post Hoc analysis the differences between the positions and the component elements of the evaluation protocol.

Table 5. Multifactorial ANOVA on psychomotor behaviors

		F	P
Sensory-motor coordination	Between groups	0.52	, 02
	In group		
	Total		
Dynamic balance	Between groups	2.78	, 020
	In group		
	Total		
General dynamic coordination (s)	Between groups	0.55	0.00
	In group		
	Total		
Agility (s)	Between groups	0.13	, 992
	In group		
	Total		
Spatial-temporal orientation (s)	Between groups	4.99	, 000
	In group		
	Total		

Following the introduction of data into the SPSS 20 statistical analysis program, the values of each sample were defined for the final purpose of obtaining relevant details on the degree of significance within the group and between groups (posts).

Subsequently, a Post Hoc LSD analysis was performed in order to be able to observe the competitions for each sample between the positions. The table above highlighted the values of statistical significance ($p < 0.05$). Thus, we can observe for the dynamic equilibrium (CMJ) between groups a value $p = 0.05$, and in the case of the Illinois field test $p = 0.00$. From here we can draw the conclusion that these data presented are statistically different from those of other groups (positions) highlighting different weights of influence depending on the area of action.

Also, the value F can highlight the significance of the variables considered as a whole in this case between the evaluated groups.

- Oculo-motor coordination (left hand) - F value = 0.52;
- Oculo-motor coordination (right hand) - F value = 0.22;
- General dynamic coordination (s) - F value = 0.55
- Agility - F value = 0.13.

Table 6. Post hoc analysis on psychomotor behaviors

Variabile	Medie și abatere standard							Diferențe semnificative								
	E. D.	I. S.	P	C	I. S.	E S	Po	P I.S	**I.D. P.**	P I.S	**P E.S.**	**E.D I.D.**	**E.D C.**	ED E.S	C E.D	**I.S. E.D**	**E.S E.D**
Echilibrul dinamic (inch)	16,1 ± 0,9	18,5 ± 0,8	13,6 ± 0,6	18,4 ± 1,2	21,0 ± 0,9	18,6 ± 0,9	15,8 ± 0,8	**0,01**	**0,02**	**0,01**	**0,03**						
Orientare spațio-temporală (s)	19,7 ± 0,5	17,7 ± 0,4	19,2 ± 0,6	17,4 ± 0,5	17,7 ± 0,5	17,5 ± 0,3	19,2 ± 0,3					**0,04**	**0,02**	**0,00**	**0,02**	**0,00**	**0,00**
Coordonare dinamică generală (s)	2,8 ± 0,3	2,6 ± 0,1	2,6 ± 0,4	2,4 ± 0,5	2,4 ± 0,3	2,6 ± 0,2	2,4 ± 0,1						**0,04**				
Coordonare senzorio-motorie (ms)	389,4 ± 0,3	398,9 ± 0,2	428 ± 0,4	386,9 ± 0,2	420,2 ± 0,1	389,4 ± 0,2	365,4 ± 0,3						**0,01**				

An additional element of the ANOVA statistical analysis is that of the Post Hoc LSD analysis performed in order to highlight the significant correlations between the specific positions of the handball game and the tests used to assess psychomotor behaviors.

A first table of this additional analysis shows statistical significance ($p < 0.05$) for the players assigned to each specific position.

Dynamic balance, played by Countermovement jump, shows significant differences between the pivots and the extreme left. If we refer to the specific elements of the handball game, between the two positions, the extremes are the ones that throw from the jump with a considerably higher frequency compared to the pivots. This significant difference can be interpreted from the perspective of the pivot by the numerous movements on the surface of the semicircle with rapidity, sudden turns (pivoting) in the presence of the opponent, which is why an increased dynamic balance can positively influence the evolution in this position.

For the spatial-temporal orientation, the groups of positions between which there are significant differences are highlighted as follows: extreme right-intermediate right ($p = 0.04$), extreme right-center ($p = 0.02$), intermediate left-extreme right ($p = = 0.00$). The differences between these positions can be interpreted in terms of the technical elements and procedures that the players in each specific position perform. In terms of this psychomotor behavior, a high degree of its development can benefit players regardless of the area of the field in which they operate, and statistically significant differences reveal the share of influence they have on players' field actions.

One last test in which these significant data appeared is Illinois, a test of agility, coordination and spatial-temporal orientation. Thus, for the extreme right - inter right, extreme right - center, extreme right - extreme left, center - extreme right, inter left - extreme right, extreme left - extreme right groups, the P value is less than 0.05.

All these F values, as mentioned above, determine the significance of the variables within the groups, in this case they are represented by the measurements and field tests used during the data accumulation period.

HYPOTHESIS 2

2. We consider that by identifying, with the help of evaluation, some somatic elements important in the performance of handball players, we will complete the performance profile of junior III.

The second hypothesis was verified by T statistical tests, in which the differences regarding the elements related to the somatic area are obvious, and the opinion of achieving an updated profile of junior players III is once again highlighted. Analyzing the attached tables, we can see a p value (0.486) for somatic indices as the height that is not statistically significant, which attests to the probability that the indices of this element can be considered as current.

T-tests were performed in order to highlight the degree of statistical significance among the common samples identified in the literature. The term comparison was reproduced from information extracted from the book "Handball" published by Romeo Sotiriu in 1998 in which the author outlines the profiles of handball players both somatically and motorly through a series of measurements and tests.

Table 7. T-test for Goalkeepers on common evidence in the literature

Height (cm)	**Test value = 187**					
	t	**df**	**Sig. (2-tailed)**	**The difference in averages**	**95% Confidence interval difference**	
					Minimum	**Maximum**
	-1,682	**10**	**, 124**	**-4.27**	**-9,934**	**1.38**
Body mass (kg)	**Test value = 82**					
	t	**df**	**Sig. (2-tailed)**	**The difference in averages**	**95% Confidence interval difference**	
					Minimum	**Maximum**
	-, 873	**10**	**, 403**	**-3.45**	**-12.26**	**5.35**
	Test value = 24					

Long. hand (cm)	t	df	Sig. (2-tailed)	The difference in averages	95% Confidence interval difference	
					Minimum	Maximum
	-23,745	52	, 241	-4.62	-5.01	-4.23
Wingspan (cm)	Test value = 198					
	t	df	Sig. (2-tailed)	The difference in averages	95% Confidence interval difference	
					Minimum	Maximum
	-3,921	10	.003	-13.27	-20.81	-5.73

The table shows the statistical data for the goalkeeper position and the results obtained after applying the T test for a series of tests specific to the game of handball, the data being obtained using the statistical calculation program SPSS version 20.0.

In terms of height**(0.124)**, body mass (0.403) and hand length (0.241) we can see that the value of the degree of significance exceeds the limit of 0.05, these revealing its importance in structuring a current profile of the junior handball player. Another idea that can be extracted from these statistical data is that the evidence in which p> 0.05 by different values, differentiated influences are distinguished for each specific area of the land.

The only results that show statistical differences are related to the magnitude (0.03), where the value p <0.05.

Table 8. T test for extremes on common evidence in the literature

Height (cm)	Test value = 183					
	t	df	Sig. (2-tailed)	The difference in average	95% Confidence interval difference	
					Minimum	Maximum
	-4,374	20	, 000	-9.52	-14.06	-4.98
Body mass (kg)	Test value = 79					
	t	df	Sig. (2-tailed)	The difference in average	95% Confidence interval difference	

					Minimum	Maximum
	-4,508	20	, 000	-12.71	-18.59	-6.83
Long. hand (cm)	Test value = 24					
	t	df	Sig. (2-tailed)	The difference in average	95% Confidence interval difference	
					Minimum	Maximum
	-25,875	42	, 000	-4.81	-5.19	-4.44
Wingspan (cm)	Test value = 194					
	t	df	Sig. (2-tailed)	The difference in average	95% Confidence interval difference	
					Minimum	Maximum
	-9,667	20	, 000	-19.52	-23.74	-15.31

Table 5.25 covers the extremes in the application of T-tests to common samples encountered in the literature.

In the case of the players in this position, we can say that the value p <0.05, which means the inclusion of all the results of these tests in a degree of statistical significance that can be taken into account.

For players active in the extreme position, for all identified common samples, the p-value is less than 0.05 aspect which reveals notable statistical differences regarding the two profiles for the players active in this position.

From the perspective of the tests identified in the case of extremes (left / right), other elements of motor ability may have an increased importance in the construction / structuring of the performance profile.

HYPOTHESIS 3

3. Through the motor evaluation of the players, we highlight a series of specific elements that can constitute the performance profile of a handball player.

The validation of this hypothesis was done by using the independent statistical test T-test which regained its functionality on several levels. A first direction is represented by the divergences represented by the values of the somatic area through which the comparison of the

results was made, these being different from those found in the specialized literature for each specific position of this collective sport. The second direction is directed towards motor assessment and there are also values that can build the idea that the current components of a performance profile tend to differ compared to more distant periods of practicing this sport.

Table 9. Pivot T test on common samples in the literature

	Test value = 29			
Lifting from trunk to bed (rep / 30 s)	**Sig. (2-tailed)**	**The difference in average**	**95% Confidence interval difference**	
			Minimum	**Maximum**
	, 145	**-3.20**	**-8.12**	**1.72**

In Table 5.25 a comparison was made between common tests identified in the literature and those components of the evaluation protocol in order to highlight statistical links through which we can update the performance profile of the junior handball player.

Regarding the pivots, for the lifting of the trunk from lying to bending, the value of statistical significance is 0.145 (p> 0.05), this aspect highlighting the presence of this sample in future profiles. For the components of this specific position in the game of handball, there is a constant need to sustain repeated efforts in conditions of anaerobic endurance, we can accurately highlight the struggle of this player in the 6-meter semicircle to create free spaces and to create an advantage. and to take possession of the ball.

Table 10. T test for intermediaries on common evidence in the literature

	Test value = 202			
Lifting from trunk to bed (rep / 30 s)	Sig. (2-tailed)	The difference in average	95% Confidence interval difference	
			Minimum	Maximum
	, 000	-3,765	-5.71	-, 92

For handball players working as intermediaries, the value of the test in the motor category is 0.00. The low degree of statistical significance (p <0.05), shows a low degree of importance for

this assessment in relation to the specific item compared. From the point of view of the effort of a handball player working in this position in the game of handball, other elements can be considered as having a high degree of relevance, for example a high degree of development of psychomotor behaviors such as dynamic balance.

Preliminary research findings

First of all, by reporting the used evidence and implicitly the profile to the literature, it was possible to identify the points of interest of researchers, but also any elements that need to be included in the process of creating a profile as current as possible to the requirements of the game.
.

Secondly, by performing statistical calculations, such as independent T-tests, it was possible to classify the results in the general averages of a population, the deviations being explained by changing priorities in the preparation process.

In view of all the statistical calculations made, we can say that this performance profile of the junior handball player falls into the category of current ones through all the tests used that reach the main points of interest in terms of motor and somatic assessment of a performance athlete.

Somatic characteristics need to be evaluated in the case of athletes, regardless of the level at which they practice a particular sport, because it provides relevant information that can be used in selecting the best means and methods in the training process.

The field tests that create a picture from the point of view of motor skills on the players are also elements that should not be missing from this evaluation of the juniors. Through all the information gathered, it is possible to see the areas that need additional attention, so that the evolution of young athletes can be guided in accordance with the current requirements of the sport in question.

We can also state that the main differentiation between the profiles found in the literature and the profile created in this preliminary study are represented by the numerous evidence specific to the game of handball.

Other elements that can be extracted from all the information here are those related to some psychomotor behaviors that can be highlighted in the measurement protocol. As we all know, they are divided according to the areas they influence.

For the handball game we can say that some of the most important psychomotor behaviors are dynamic balance, sensory-motor coordination, general dynamic coordination, as well as a well-defined body scheme and fixed notions of laterality. We support this idea in view of the nature of this sport which has high speed indices, rapid succession of phases, long moments when players' stimuli are required, so that a good fixation of behaviors will allow them a good manifestation in terms of motor skills.

The hypotheses proposed for this preliminary study were confirmed in terms of the results obtained and analyzed from a statistical point of view, so we support the importance of the presence of motor, somatic and psychomotor notions in the evaluation process of handball players. All these constituent elements of the profile provide basic notions about the level of development of young athletes with the ultimate goal of supplementing the training process to achieve a higher level of performance.

CHAPTER IV. MAIN RESEARCH - RECONFIGURING THE PSYCHOMOTRIC PROFILE WITH A FOCUS ON THE PLAYERS 'AREAS OF ACTION

4.1. The purpose, premises, tasks and objectives of the research

Goals

It is important to analyze the skills endowment from a somatic, psychomotor and psychological point of view in order to select the best specific tests that can provide an overview of the level of development of players, juniors III, which can optimize the talent selection process and optimize the training process.

Other aspects that can be deduced from this study can be represented by the emergence of motivational persistence, planning ability and self-discipline as psychological elements that may have the role of influencing the development of the activity of young handball players (can be seen as a series of components that need to be evaluated for the performance of performance sports).

Premises

After studying the literature, we came across a series of scientific papers about which we can say that it addresses component parts of the profile of a junior handball player. From this perspective, a selection of them was made in order to be able to determine if there are terms of comparison between results, as well as the classification of the players in the test group in the proposed environments at European and international level.

In particular, we were able to highlight a number of articles that were concerned with examining the somatic profile of handball players according to age categories.(Granados et al., 2013; Jaric et al., 2001; Ibnziaten et al., 2002; Massuca et al., 2011;Muratovic et al., 2014; Rousanglou et al., 2014; Karaba et al., 2015; Hoppe et al., 2017; Milanese et al., 2012) but not all the information presented could be used as terms of comparison due to large age differences compared to our research group. Other authors such as Pires, (1986); Srhoj et al., (2002); Bezerra & Simao, (2006), Vrbik et al., (2011), Ilic et al., (2011) Barraza et al., (2015), Ramos-Sanchez et

al., (2016), Mateo-Silleras et al. ., (2016), Ilic et al., (2015) studied a series of somatic characteristics according to the specific positions of the handball game, and through them structured the studies and basic ideas of the research to the links between anthropometry and characteristics of body composition for practitioners of this team sport.

Structure information they could be partially used by them, another cause being the differences between the samples used for which no objective comparisons can be made between the research groups.

The main premise of the research is to update and propose the performance profile of junior handball players III from the perspective of psychomotor behaviors. This main aspect of the doctoral thesis aims to bring an improvement in the process of selection and evaluation of players, and where appropriate to direct them to other areas of action in the structure of this collective sport.

The following premise is correlated with the adaptation of the profile of junior handball players, by highlighting some indices that require increased importance in their training process, as well as in terms of selection in the moments following access to a higher level of the junior period.

The selection of the components of the evaluation protocol was due to the verification of a wide range of samples, tests and measurements in the preliminary research. Through its development, the most favorable evaluation methods were identified that were used in the fundamental research within this doctoral thesis.

Research objectives

In the present research, the main idea from which we started was based, to a large extent, on the elements related to the psychomotor area and the influence they can have in determining the specific areas of action of junior players III of handball. Thus, we can say that in this study a series of hypotheses can be deduced that can lead to the specific research directions to fulfill the purpose of this doctoral thesis.

All these psychomotor skills result from the specifics of the technical elements and procedures, are indispensable in performing the motor tasks of the moment and each of them contributes to building the basis on which the profile of the junior handball player is structured.

Other elements targeted by the objectives are related to:

- Highlighting the main features that can be extracted from the perspective of psychomotor behaviors;
- Focus on athletes' areas of action;
- Reconfiguring the performance profile of junior players III;

Research tasks

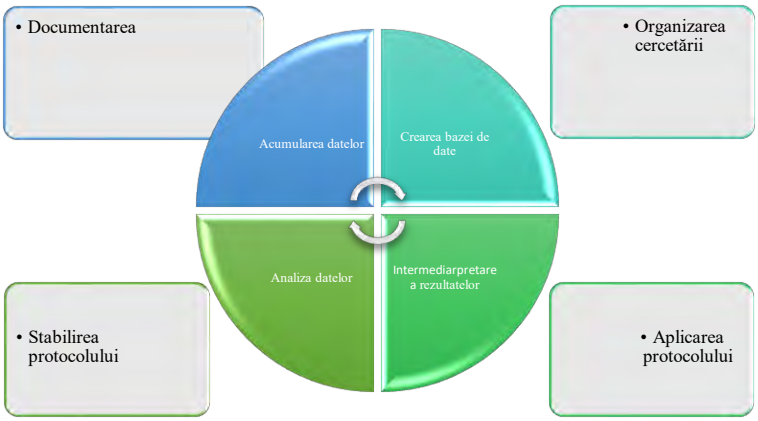

Figure 1. Research tasks

4.2. Research hypotheses

General hypothesis

The performance profile of the handball player, junior III, can be made (outlined) according to psychomotor, somatic and psychological benchmarks (tests), focusing on the specific area of action.

Hypothesis 1.1

The level of psychomotor behaviors, spatial-temporal orientation, sensory-motor coordination, dynamic balance and general dynamic coordination, in relation to the values of the somatic area outline an updated profile of handball players, juniors III.

Hypothesis 1.2

Motivational persistence, planning ability and self-control related to the analyzed psychomotor behaviors can complete the performance profile of juniors III, by highlighting the correlation.

4.3. Material and method

The research in question was carried out on a group of 181 junior III handball players, members of the teams LPS Vaslui, Handball Kids Joy Vaslui, LPS Iași, CSS Bacău, LPS Suceava, CSU Suceava, AHC Potaissa Turda, CSS Sighișoara, CNOE Sighișoara, LPS Tg. Mures

The tests took place between June and September 2021, prior to the start of the national competitions. The level of manifestation of players' skills differs depending on when they start playing handball, and the age of some members of the test team may be different due to the possibility of these athletes to activate at advanced age and thus gain additional motor and psychological experience.

4.3.1. Research variables

Table 11. Independent research variables

Independent variable		Number	Percentages
High school profile	Sport	54	30%
	Humanistic	127	70%
Performance type	National lot	30	17%
	sports Club	151	83%

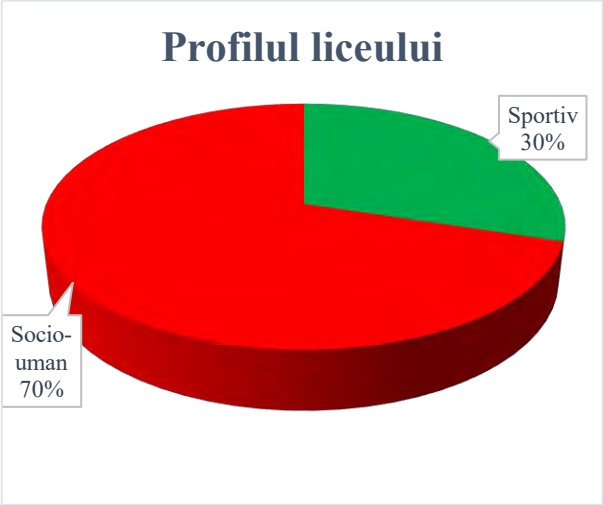

Figure 4. High school profile

Figure 5. Type of performance

The attached graphs show the distribution of the research group in terms of high school profile and type of performance. Thus, it can be observed that 30% of the practitioners of this collective sport attend the courses of a high school with sports specialization, while the remaining 70% are part of the category of those who follow the courses of a school with a socio-human profile. For this characteristic, further studies can be deduced by using different evaluation methods.

For the type of performance, we notice that 17% of the national team members represent an important benchmark in research, the other 83% of athletes being affiliated to private or state sports clubs.

Dependent variable

The dependent variables, in this study, are represented in the largest share by the presence of psychomotor and motor characteristics, psychic elements, especially motivational persistence, planning ability and self-discipline. All this is considered to have a considerable impact on the practice of playing handball at an optimal level, being constituent elements of the profile of the handball player, junior III, in the intermediate selection and predictors of performance.

4.3.2. Statistical analyzes used

- Multifactorial ANOVA - to obtain a specific data set that renders the statistical significance of the information accumulated following the application of test batteries to the group of players;
- Post hoc LSD analysis to accurately highlight the differences between the specific positions of the handball game;
- Descriptive analyzes - also performed in the SPSS v26.0 program, with the main purpose of outlining the general values of the performance profile of the evaluated handball players (juniors III);
- Distribution of positive or negative values compared to the mean in the Gaussian curve.
- Pearson correlations between the components of the evaluation protocol for each handball-specific position;
- Calibration of the general averages of each operating area;
- Linear regression on research variables;
- Data Security Analysis - Alpha Cronbach.

4.3.3. Research period, place and subjects

As mentioned above, the evaluation process took place over a period of 12 weeks as follows:

- **08.06.2021 -**evaluation of the junior team III from the High School with Sports Program in Iași (Annex 1.4);
- **02.07.2021 -**evaluation of the private club Kids Joy Handball Vaslui (Annex 1.5);
- **03.07.2021–**evaluation of the members of the junior handball team III within the High School with Sports Program from Vaslui (Annex 1.6);
- **08.07.2021–**application of the battery of tests on the junior players III within the team of the Bacău School Sports Club (Annex 1.7);
- **04.08.2021–**testing of junior players III, members of the handball team Club Sportiv Potaissa Turda Association (Annex 1.8);
- **03.08.2021 -**evaluation of the junior handball players III within the team of the High School with Sports Program Târgu Mureș (Annex 1.9);

- **15.08.2021–**application of tests and measurements on the junior players III within the team of the Sighișoara School Sports Club (Annex 1.10);
- **03.09.2021–**evaluation of the members of the junior team III within the High School with Sports Program Suceava (Annex 1.11);
- **04.09.2021–**application of the battery of tests on the junior players III within the team of the Suceava University Sports Club (Annex 1.12);
- **23.09.2021–**evaluation of the junior handball players III within the team of the National Sports Center of Excellence Sighișoara (Annex 1.13).

4.4. Results and discussions

The research results can be differentiated in terms of the statistical analyzes used. In an early stage, descriptive statistical analyzes were performed to establish the basic ideas of the specific positions of this sport, followed by Pearson correlations in order to highlight the significant links between the control tests and the constitutive measurements of the evaluation protocol.

All these analyzes were followed by the division of the research group into two components, namely club team practitioners and players selected for the national junior group. ANOVA analysis was performed on them to highlight significant links ($p < 0.05$), both between groups and within groups, the analysis being followed by repeated post hoc measurements to obtain the most conclusive data and links between samples and posts.

All these calculations were followed by descriptive analysis and T-tests in pairs to establish the links between the mental and motor characteristics of the groups of players.

In this study, calibrations of measurements and psychomotor behaviors were made to include the results in the proposed ratings in order to highlight the strengths and weaknesses of the players and implicitly the positions that can lead to reorientation of the training process to increase performance indices for game-specific positions. handball even at the junior level III.

4.4.1. Verification of hypotheses by performing statistical calculations

Hypothesis 1.1

The level of psychomotor behaviors, spatial-temporal orientation, sensory-motor coordination, dynamic balance and general dynamic coordination, in relation to the values of the somatic area outline an updated profile of handball players, juniors III.

Regarding the degree of connection between the elements of psychomotority and those of the somatic area, Pearson correlations were calculated for each specific position. The statistical meanings are multiple, and the values obtained may provide the idea that a good interaction between the two elements can lead to the construction of a complete psychomotor performance profile of junior players III.

All accumulated data were analyzed using the SPSS v26 statistical calculation program. A first set of statistical indicators represented in this study are represented by the mean, the standard error of the mean, the median, the modulus, the standard deviation, the area, the minimum value, the maximum value and the sum.

Table 12. Pearson correlations of the evaluation protocol1

		Height (cm)	Body mass (kg)	Muscle (%)	Long. m. inf. (cm)	Spine mobility (cm)	Dynamic balance
Wingspan (cm)	Pearson correlation	, 954 **	, 661 **	0.134	, 428 *	-0.337	0.274
	Sig. (2-tailed)	0.000	0.000	0.481	0.018	0.068	0.143
Long. m. inf. (cm)	Pearson correlation	, 487 **	0.088	, 556 **	1	-, 382 *	, 405 *
	Sig. (2-tailed)	0.006	0.644	0.001		0.037	0.026

Another statistical analysis performed in this study is the Pearson correlation between the control samples used. The most important values obtained are highlighted in the attached tables. First, the magnitude has strong correlations with height (r = .954) and a degree of significance less

than 0.05 (p = 0.00), this means that for the game of handball height can condition the value of the magnitude. Being a sport that requires involvement in physical contact with opponents and blocking the balls thrown towards the goal, a good level of development of the magnitude in relation to height can be an advantage in practicing this collective sport. Another strong correlation of magnitude (r = .661) is highlighted in relation to the body mass of the players. This aspect can have both positive and negative elements depending on the specific position we are referring to. For pivotal players, values above the team average in terms of body weight can be accepted due to the hard contact at the level of the 6-meter semicircle, the body dimensions being important in the case of that position.

For the length of the lower limb, the samples and measurements in relation to which we can observe statistical significance are represented primarily by height where the strength of the correlation between the two can be framed in the moderate range of significance (r =, 487), muscle mass with a strong connection (r = .556). A high ratio of somatic characteristics can influence the most effective practice of this team sport. If in the case of the length of the lower limb we can relate the correlations with the height through specific elements of movement during the game, a high level of muscle mass in the lower train can improve the technical procedures of throwing the ball and physical involvement in the semicircle.

Regarding the mobility of the spine, the value of r has a moderate negative significance in relation to the length of the lower limb. Thus, through this negative value we can say that mobility in the spine decreases as the length of the lower limb increases. This aspect can mainly influence the occupants of the goalkeeper position who need a good development of both somatic elements in order to be able to practice this sport at a high level.

The length of the lower limb also has a moderate correlation (r = .405) in relation to the dynamic balance, and an increased value of this somatic index positively influences the ability to achieve elements that engage the dynamic balance. The relation of this value to the practical activity can be highlighted in the realization of the jump shots, where this component of psychomotor skills makes its presence fully felt.

Table 13. Pearson correlations of the evaluation protocol2

		Height (cm)	Body mass (kg)	Wingspan (cm)	Long. m. inf. (cm)	Dynamic balance		General dynamic coordination
Spatial-temporal orientation	Pearson correlation	, 760 **	, 490 **	, 812 **	, 395 *	, 392 *	, 481 **	-0.272
	Sig. (2-tailed)	0.000	0.006	0.000	0.031	0.032	0.007	0.146

In the table with number 6.59 we find another series of correlations between the control samples used to establish the level of statistical significance. First, the spatial-temporal orientation obtains strong correlation values in relation to height (r = .760, p = 0.00) and magnitude (r = .395, p = 0.0). Through these elements we are shown that high values of somatic elements condition a good development of spatial-temporal orientation. This psychomotor behavior is constantly found in all the actions of the handball game through the elements that require a continuous reporting of one's body in relation to opponents, teammates and specific elements executed.

Spatial-temporal orientation has moderate correlations with other somatic elements such as body mass (r = .490, p = 0.00), lower limb length (r = .395, p = 0.03) and dynamic balance (r = , 481, p = 0.00). These moderate meanings of the correlation mean that these somatic elements can directly condition the psychomotor behavior in question by the high values they highlight, and a high level of them can contribute to a higher degree of manifestation of this essential skill in the game of handball.

Table 14. Pearson correlations of the evaluation protocol for the far right3

		Body fat (%)	Muscle (%)	General dynamic coordination	
Dynamic balance	Pearson correlation	-, 412 *	, 486 **	-, 452 *	-, 629 **
	Sig. (2-tailed)	0.024	0.006	0.012	0.000

Other statistically significant correlations can be seen between dynamic balance and body fat (r = -, 412, p = 0.00) which means that the value of dynamic balance decreases as body fat

increases. This aspect is important in the game of handball, as it can limit the actions of the players and the realization of specific technical elements and procedures. Another moderate correlation can be observed in the case of the extreme right for the muscular mass of the players (r = .486, p = 0.00). The game of handball is characterized as a contact sport, and a good ratio between psychomotor behaviors and this somatic element can positively influence the practice of the sport in question.

We can also observe a moderately negative correlation in the ratio between dynamic equilibrium and general dynamic coordination (r = -, 629). From this we can extract the idea that dynamic equilibrium can suffer when the values of general dynamic coordination tend to increase. A primary conclusion regarding this information is given regarding the existence of a balance in the development of psychomotor behaviors as well as somatic elements that may undergo changes through training (body mass, muscle mass, body fat).

Hypothesis 1.2

Motivational persistence, planning ability and self-control related to the analyzed psychomotor behaviors can complete the performance profile of juniors III, by highlighting the correlation.

Regarding the hypothesis in question, a descriptive statistical phase was carried out in a first phase for the three components of the analyzed questionnaire, in order to establish the degree of manifestation for each one in order to obtain a general level of manifestation for the club teams and the Romanian national team. .

Pearson correlations were made in relation to the component elements of psychomotor skills, which resulted in different degrees of statistical significance between the elements covered in the hypothesis.

A first step, in using the information accumulated based on the application of the questionnaire, was represented by the reliable analysis of the items by calculating the Alpha Cronbach index for the 3 components of the psychological area.

Table 15. Alpha Cronbach's analysis of the items in the questionnaire

Total item statistics	
	Total correlations
Motivational persistence	, 549
Planning	, 719
Self-discipline	, 514

Following the analysis of the results for the three elements covered by the questionnaire used, the values obtained for the safety analysis can be classified as significant and applicable to our research group. The highest score was obtained by the Planning component (= .719).

Table 16. Analysis of the psychic components for the club teams

	Motivational persistence	Planning	Self-discipline
Average	**6.31**	**6.39**	**6.44**
Number	**151**	**151**	**151**
Standard deviation	**2.52**	**2.27**	**2.30**

The members of the club teams underwent the same analyzes to determine the main factors that can influence the psyche and implicitly the performance in the handball game even at junior level. Following the statistical calculation of the averages for the components of the mental spectrum targeted in this study, we can highlight for motivational persistence an average of 6.31 (33%), planning 6.39 (33%) and self-discipline 6.44 (34%).).

Table 17. Analysis of the psychic components for the national group

	Motivational persistence	Planning	Self-discipline
Average	**5.47**	**6.07**	**5.67**
Number	**30**	**30**	**30**

	Motivational persistence	Planning	Self-discipline
Standard deviation	2.83	2.39	2.60

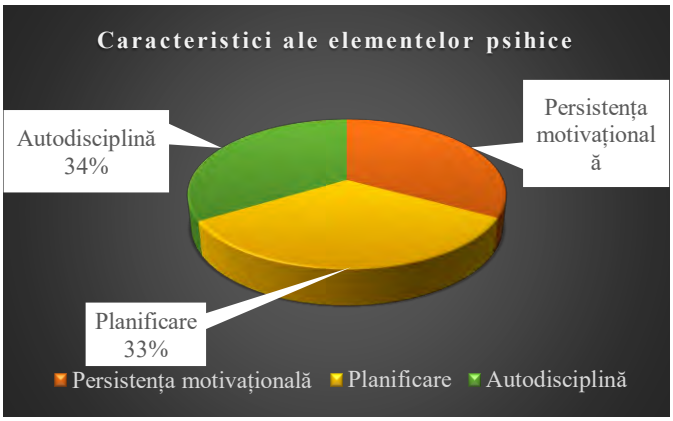

Figure 6. The characteristics of the psychic elements for the club teams

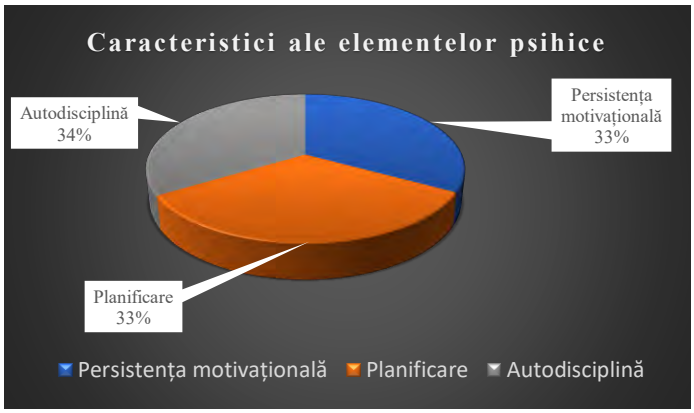

Figure 7. Characteristics of the psychic elements for the national group

The members of the national group of juniors were tested by applying a questionnaire that addresses issues related to motivational persistence, planning ability and self-discipline. In the attached graph you can see the averages of the three components, namely the motivational persistence shows an average of 5.47 (32%), the planning ability of these juniors III, handball players, with an average of 6.07 (35%) and self-discipline with an average of 5.67 (33%).

From the graphs and tables, we can see a better distribution of psychic parameters in terms of club team members compared to national team players, but overall, the data obtained for both

samples express only minimum values for what the three elements represent, players with a tendency towards perfectionism, excessive focus on a single element and paying attention to less important things than the urgent ones at the moment.

These results can be interpreted from the perspective of the maturation process in which, according to age, handball players are.

Table 17. Pearson correlations of psychomotor behaviors in relation to self-discipline

		Sensory-motor coordination (ms)	Dynamic balance (inch)	General dynamic coordination (s)	Spatial-temporal orientation (s)
Self-discipline	**Pearson correlation**	-, 541	, 500	-, 246	-, 810
	Meaning	0.051	0.050	0.049	0.014
	N	181	181	181	181

To complete this psychomotor profile of the junior handball player, we can highlight in the Pearson correlations, the results obtained between the psychomotor behaviors and a first characteristic targeted by the questionnaire, namely self-discipline.

First, self-discipline has a strong correlation with spatial-temporal orientation (r = -, 810) and sensory-motor coordination (r = -, 541). From a statistical point of view, as the psychological aspect tends to have high values, there are decreases in the two psychomotor components. Given the type of evaluation performed, the low times for the two components mean an improvement in the overall level of manifestation of junior players II, thus highlighting the importance of a good link between the structural components of the performance profile.

Other correlations obtained are in relation to the dynamic equilibrium (r =, 500) and the general dynamic coordination (r = -, 246). For the first psychomotor behavior analyzed, we notice a strong connection that means a directly proportional increase in relation to self-discipline. From a practical point of view, an explanation for this aspect can be given the ability of players to direct their movements as efficiently as possible, the results being observed when performing elements and procedures specific to the game of handball (jumping).

Table 18. Pearson correlations of psychomotor behaviors in relation to planning

		Sensory-motor coordination (ms)	Dynamic balance (inch)	General dynamic coordination (s)	Spatial-temporal orientation (s)
Planning	**Pearson correlation**	-0.102	0.118	-0.710	-0.142
	Meaning	0.17	0.113	0.01	0.05
	N	181	181	181	181

For the relationship between psychomotor behaviors and the elements of the psyche following the coding of the questionnaire, other series of statistical calculations were performed to determine the connection between these aspects that we consider to be important in sports practice. The sensory-motor coordination compared to the planning has a low value in terms of statistical calculation. Psychomotor behavior, which is differentiated by the results obtained, is the general dynamic coordination that reveals a strong negative correlation (r = -, 710, p = 0.01) this means that a high level of planning can lead to improved results in regarding this psychomotor behavior. To translate this result into a specific handball activity,

Table 19. Pearson correlations of psychomotor behaviors in relation to motivational persistence

		Sensory-motor coordination (ms)	Dynamic balance (inch)	General dynamic coordination (s)	Spatial-temporal orientation (s)
Persistence motivational	**The value of R**	, 815	, 570	, 860	, 015
	P	, 02	, 04	, 02	, 0.04
	N	181	181	181	181

The last set of statistical analyzes performed were between psychomotor behaviors and the third characteristic followed by the application of the questionnaire, namely the motivational persistence which in the attached table has statistically significant correlations with the level of sensory-motor coordination (r =, 815) , dynamic equilibrium (r = .570), and general dynamic coordination. There is a lack of connection between spatial-temporal orientation and motivational

persistence r having a value of 0.15, which cannot include this result in the category of significant correlations.

4.4.2. The innovative element resulting from the research

Simultaneously with the selection of tests and measurements to achieve a complete profile of the junior handball player, a software program was created entitled "Skills?" through which these results of the players will be observed in real time in a format that is suitable with the elements that need to be taken into account for the practice of this collective sport. It will be possible to observe the values of somatic elements, their psychological characteristics and level of development as well as the psychomotor behaviors of athletes in real time at the level of positions on the playing surface, which can increase and improve coaches' attention in training young athletes.

Through the elements displayed by this software program, the overall images that are created complement the evaluation protocol, so we return to the idea that the scientific basis has its role, importance and applicability for long-term practice of a sport (individual or collective) at the highest possible level.

For the creation of the "frontend" interface, vector images were used which were modified to create the 3 pages in which the players' information will be highlighted. In order to create the 3D plan of these vectors, subsequent changes took place in the Photoshop program, and the obtained pages will be written in code through the Angular platform.

Angular is a framework that has the ability to provide similar experiences with applications, through high performance in offline modes. Angular uses strategies similar to Ionic, Cordova, or Native Script, and application compatibility can be seen across all operating systems (Mac, Windows, and Linux).

The Angular application modifies templates in code, optimized for JavaScript virtual machines, offering the benefits of handwritten code with a productive "framework". As for the testing of the written units, it can be used through "Karma", and the "Protractor" mode facilitates the test scenario through speed and stability.

Regarding the animations, elements with high performance and complex choreography can be made and the accessibility of the applications through the ARIA components is much improved.

Component overview

Components are the block of elements for Angular applications, each of which consists of:

- An HTML template that decides which items appear on the page;
- A typescript class that defines behaviors;
- A CSS selector that defines how components are used in the template;
- Optionally, CSS styles applied to the template;

Creating and configuring Angular components

Each component requires a CSS selector. This selector instructs Angular to instantiate the components whenever it has a counterpart in the HTML template. For example, a hello-world.component.ts component that is defined by a selector as app-hello-world instructs Angular to instantiate the tagged components and appear in templates as <app-hello-world>, and these aspects that can also be found in the application in question for the elements introduced regarding the evaluation of handball players.

A component has a lifecycle that starts when Angular instantiates the component class and renders it in the visual template. The life cycle continues with the detection change, and Angular ensures the links between the data properties at the same time, updating the view and the instance of the competence as needed.

The component lifecycle ends when the platform destroys the component instance and removes the provided template from the DOM. The directives have a similar life cycle, with Angular being able to create updates and destroy pending courts.

The application can use the lifecycle hook method to gain access to key elements of a component or directive cycle and has the ability to modify detection and respond to updates.

Each interface defines the prototype for a single "hook" method whose interface name has the prefix "ng". By implementing this method in components or class directives, Angular checks the input properties in a short time for those directives or components for the first time.

In Angular, the style of a component can be encapsulated in its host element so as not to jeopardize the rest of the application. The decorative component provides encapsulation of options that can be used to control how the encapsulation is applied to each element base.

Encapsulation modes:

- ShadowDom - Angular Encapsulation uses the built-in Shadow DOM API to close the component view inside a ShadowRoot (used as a host component) and applies the styles provided in a standalone manner.
- **Emulated encapsulation**- Angular modifies CSS selector components so that they can only be applied to their view and does not affect other elements within the application

Figure 8. Presentation of the innovative element of research1

Figure 8. Presentation of the innovative element of the research2

References

1 Salman, A.F. (2014). The effect of coordination training in developing some of the skills of women in handball players in Sweden. *The Swedish Journal of Scientific Research*. ISSN 2001-9211. Volume 1. Issue 1.

2 Maman, P., Sandeep, K.B., Jaspal, S.S. (2011). Role of sports vision and eye hand coordination training in performance of table tennis players. *Brazilian Journal of Biomotricity*. V5, n.2. ISSN 1981-6324.

3 Cicma, I.T., Mereuță, C. (2013). The importance of the psychological training in increasing the performance in handball. *Procedia Social and Behavioural Sciences*, 84. 1350-1355

4 Șimșek, E., Arslan, H. (2019). The examination of relationship between balance performances and some anthropometric characteristics of athletes in different brances. *International Journal of Applied Exercise Physiology*. 8(4), ISSN 2322-3537.

5 Karadenizli, Z.I. (2016). The effects of plyometric education trainings on balance and some psychomotor characteristics of school handball team. *Universal Journal of Educational Research*. 4(10). DOI 10.13189/ujer.2016.041007.

6 Stadler, M., Niepel, C., Greiff, S. (2019). Differentiating between static and complex problems: A theoretical framework and its empirical validation. www.elsevier.com/locate/intell. Doi: https://doi.org/10.1016/j.intell.2018.11.003.

7 Genk, H., Cigerci, A.E., Sever, O. (2019). Effect of 8-week core training exercises on physical and psychological parameters of female handball players. *Physical education of students*, 2019; 23(6): 297-305. Doi: https://doi.org/10.15561/20755279.2019.0604

8 Prakash, D., Patel, R.K. (2019). Prognostication of handball performance as a rationale of coordinative abilities by framing multiple regression models. *International Journal of Physical Education and Sports*. 4(6.). pages 07-13.

9 Sunawa, M.K., Tri, R., Tri, S. (2018). The contribution of hand-eye coordination, muscle arm strength, and concentration to standing throw shoot results. *Journal of Physical Education and Sports*. 7(2). Doi: https://doi.org/10. 15294/jpes.v7i2.25120

10 Awamleh, A.A.A, Mansi, T., Alkhaldi, H. (2013). Handedness differences in eye-hand coordination and, choices, simple reaction time of international handball players. *Journal of Physical Education of Sports*. 13(1). Doi: 10.7752/jpes.2013.01013.

11 Singh, S. Prakash, V. (2019). Comparison of selected physiological variables among basketball, volleyball and handball. *International Journal of Yogic, Human Movement and Sports Sciences.* 4.(1). Doi: 1075-1077

12 Karadenizli, Z.I., Inal, H.S., Meric, B., Aydin, M., Bulgan, C. (2014). Accuracy and velocity of the elite female turkish handball players. *International Journal of Sports Sciences.* 4(1). Doi: 10.5923/j.sports.20140401.04

13 Viseux, F. Barbier, F., Parreira, R., Lemaire, A., Villeneuve, P., Leteneur, S. (2019). Less than one milimeter under the great toe is enough to change balance ability in elite women handball players. *Journal of Human Kinetics.* 69/2019. Doi: 10.2478/hukin-2019-0024.

14 Oliveira, V.L., Leite, G.S., Leite, R.D. Assumpcao, C.O., Pereira, G.B., Barholomeu Neto, J. (2009). Efeito de un periodo de destreinamento sobre variaveis neuromusculares em atletas de handebol. *Fitness Performance Journal*. 8(2). Doi: 10.3900/fpj.8.2.96.p.

15 Eler, N., Eler, S. (2018). 2D/4D, lateralization and strenght in handball players. *Journal of Education and Training Studies*. 6(5). Doi: https://2.org/101 1114/jets.v6i5.3220

16 Massuca, L.M., Fragoso, I., Teles, J. (2013). Attributes of top elite team-handball players. *Journal of strength and Conditioning Research*. 28(1)/178-186.

17 Ingebrightsen, J., Jeffreys, I. (2012). The relationship between speed, strenght and jumping abilities in elite junior handball players. *Serbian Journal of Sports Sciences*. 6(3)/ 83-88. Udc: 796.322-055.1:612.

18 Karadenizli, Z.I., Erkut, O., Ramazanoglu, N., Uzun, S., Camliguney, A.F., Bozkurt, S., Tiryaki, C., Kucuk, V., Sirmen, B. (2014). Comparison of dynamic and static balance in adolescents handball and soccer players. *Turkish Journal of Sport and Exercise*. 16(1).doi: 10.15314/tjse.201416111.

19 Massuca, L. Branco, B. Miarka, B., Fragoso, I. (2015). Physical fitness attributes of team-handball players are related to playing position and performance level. *Asian Journal of Sports and Medicine*. 6(1): e24712.

20 Vikashpaul, V., Bhat, T. R. (2019). Comparative study of selected motor fitness components between handball and basketball players. *Journal of Advances in Sports and Physical Education*. Doi: 10.21276/jaspe.2019.2.3.3

21 Cenk, G. A., Mustafa, A., Bilal, D., Ozan, S., Mujdat, O., Kadir, G. (2012). Anthropometric features and balance among elite handball players. *Science.Movement and Health*. 12(2).

22 Debanne, T., Chauvin, C. (2014). Modes of cognitive control in official game handball coaching. *Journal of Cognitive Engineering and Decision Making*. 20(10). Doi: 10.1177/1555343414538819.

23 Zebis, M.K., Sanderhoff, C., Andersen, L.L., Fernandes, L., Moller, M., Ageberg, E., Myklebust, G., Aagard, P., Bencke, J. (2019). Acute neuromuscular activity in selected injury prevention exercises with app-based versus personal on-site instruction: A randomized cross-selectional study. *Journal of Sports Medicine*. Doi: https://doi.org/10.1155/2019/1415305.

24 Lohchab, P. (2014). A comparison of coordinative ability between volleybal land handball male players. *BBSSES.* 5(3). ISSN: 2321-9726(online)

25 Acsinte, A., Eftene, A., Hantău, C., Acuilar, O.G., Makoto, M. (2013). Neuromuscular coordination and proprioceptive training in young handball players. *Procedia Social and Behavioral Sciences*. 117. Doi: 10.1016/j.sbspro.2014.02.244.

26 Loffing, F., Hagemann, N. (2014). Skill differences in visual anticipation of type of throw in team-handball penalties. *Psychology of Sport and Exercise*. Doi: https://dx.doi.org/10.1016/j.psychsport.2014.01.006

27 Galazoulas, C., Bassa, E., Gaitanou, A., Skoufas, D., Karamousaldilis, D. (2019). Upper body vibration as part of warm-up: its effect on throwing velocity in elite adolescent handball players. *Sport Sciences for Health.* Doi: https://doi.org/10.1007//s11332-019-00604-7.

28 Bădău, D. Identification of general coordination level according to laterality in handball. *Department of Human Motor Science.*

29 Mastuana, S., Punjab, S. (2017). Comparative study among female cricket and handball players on hand reaction time and eye hand co-ordination. *Indian Journal of Physical Education & Applied Sciences.* 7(4). Doi: 05-2016-4497 5451.

30 Talaghir, L.G., Berdila, A., Iconomescu, T.M. (2019). Study regarding psychomotor aspects approached by Romanian authors. *Journal of Physical Education and Sport.* 19(6). Doi: 10.7752.jpes.2019.s6347.

31 Massuca, L., Fragoso, I. (2015). Morphological characteristics of adult male handball players considering five levels of performance and playing position. *Higher Institute of Police Sciences and International Security, 39*(1): 109-118.

32 Hammami, M., Hermassi, S., Gaamouri, N., Aloui, G. (2019). Field tests of performance and their relationship to age and anthropometric parameters in adolescent handball players. *Frontiers in Psychology.* Doi: 10.3389/fphys.2019.01124.

33 Masanovic, B.D., Bavcevic, T.T., Prskalo, I.A., (2019). Comparative study of anthropometric measurement and body composition between junior handball and basketball players from the Serbian national league. *Pedagogics psychology.* Doi: 10.15561/18189172.2019.0206.

34 Potora, C., Mavritsakis, N., Tache, S. (2016). The anthropometric profile of junior handball players. *Palestrica of the thrid millennium – Civilization and Sport.* 17(4). 261-268

35 Vila, H., Manchado, C., Rodrigues, N., Abraldes, J.A. (2012). Anthropometric profile, vertical jump, and throwing velocity in elite female handball players by playing positions. *Journal of Strength and Conditioning Research.* 26(8)/2146-2155.

36 Massuca, L., Fragoso, I. (2015). Morphological characteristics of adult male handball players considering five levels of performance and playing position. *ICPOL.* 39(1):109-118.

37 Gerber, M., Best, S., Meerstetter, F., Walter, M., Ludyga, S., Brand, S., Bianchi, R., Madigan, D.J., Isoard-Gautheur, S., Gustafsson, H. (2018). Effects of stress and mental toughness on burnout and depressive symptoms: A prospective study with young elite athletes. *Journal of Science and Medicine in Sport.* 21(12)/ 1200-1205.

38 Wiliams, A.M., Davids, K., Williams, J.G. *Visual perception in sports.* E& FN Spon.

39 Coon, D., Mitterer, J.O. *Psychology: Modules for active learning.* Wadsworh Cengage Learning.

40 Florian Loffing, Jörg Schorer & Steve P. Cobley (2010) Relative Age Effects are a developmental problem in tennis: but not necessarily when you're left-handed!, *High Ability Studies*, 21:1, 19-25, DOI: 10.1080/1359 8139.201 0.488084

41 Granacher, U., Gollhofer, A., Hortobágyi, T. et al. The Importance of Trunk Muscle Strength for Balance, Functional Performance, and Fall Prevention in Seniors: A Systematic Review. *Sports Med* 43, 627–641 (2013). https://doi.org/10.1007/s40279-013-0041-1.

42 Dello Iacono, Antonio & Martone, Domenico & Padulo, Johnny. (2016). Acute Effects of Drop-Jump Protocols on Explosive Performances of Elite Handball Players. *The Journal of Strength and Conditioning Research*. 30. 10.1519/JSC.0000000000001393.

43 Adlerton, Anna-Karin & Moritz, Ulrich & Moe-Nilssen, Rolf. (2003). Forceplate and accelerometer measures for evaluating the effect of muscle fatigue on postural control during one-legged stance. *Physiotherapy research international : The journal for researchers and clinicians in physical therapy*. 8. 187-99. 10.1002/pri.289.

44 Maszczyk, A., Gołaś, A., Pietraszewski, P., Kowalczyk, M., Cięszczyk, P., Kochanowicz, A., Smółka, W., Zając, A., 2018. Neurofeedback for the enhancement of dynamic balance of judokas. *Biology of Sport*. doi:10.5114/biolsport.2018.71488

45 Hrysomallis, C., 2011. Balance Ability and Athletic Performance. *Sports Medicine*. doi:10.2165/11538560-000000000-00000

46 Viseux, F., Barbier, F., Parreira, R., Lemaire, A., Villeneuve, P., Leteneur, S., 2019. Less Than One Millimeter Under the Great Toe is Enough to Change Balance Ability in Elite Women Handball Players. *Journal of Human Kinetics*. doi:10.2478/hukin-2019-0024

47 Vijayaragavan, R., & Perumal, V. (2016). Effect of balance exercise program on static balance of male handball players at school level. *International journal of physical education, sports and health*, 3, 285-288.

48 Raymakers, J. A., Samson, M. M., & Verhaar, H. J. (2005). The assessment of body sway and the choice of the stability parameter(s). *Gait & posture*, 21(1), 48–58. https://doi.org/10.1016/j.gaitpost.2003.11.006

49 Zemková, Erika & Hamar, Dusan. (2014). Agility performance in athletes of different sport specializations. *Acta Gymnica*. 44. 133-140. 10.5507/a g.2014.013.

50 Strzalkowski, Nicholas & Ali, R. & Bent, Leah. (2017). The firing characteristics of foot sole cutaneous mechanoreceptor afferents in response to vibration stimuli. *Journal of Neurophysiology*. 118. jn.00647.2016. 10.1152 /jn.006 47.2016.

51 Horn, T. S. (2008). Coaching effectiveness in the sport domain. *Advances in sport psychology Human Kinetics*. (pp. 239–267,455–459).

52 Nicholls, G.J., Cheung, P.C., Lauer, J., Patashnick, M. (1989) Individual differences in academic motivation: Perceived ability, goals, beliefs, and values, Learning and Individual

Differences, 1(1). Pages 63-84,ISSN 1041-6080, https://doi.org/10.1016/1041-6080(89)90010-1.

53 Sotiriu, R. (1999). *Handbal. Antrenament, Teorie-Metodică,* Bucuresti

54 Gonzalez, C.C., Burke, M.R., 2018. Motor Sequence Learning in the Brain: The Long and Short of It. *Neuroscience.* doi:10.1016/j.neuroscience.2018.01.061.

55 Molina-Luna, K. et al. (2009). Dopamine in Motor Cortex Is Necessary for Skill Learning and Synaptic Plasticity. *Plos ONE*. doi:10.1371/journal.pone.0007082

56 Vissing, K. et al. (2008). Muscle Adaptations to Plyometric vs. Resistance Training in Untrained Young Men. *The journal of strength and conditioning research*. doi:10.1519/jsc.0b013e318185f673

57 Wilkerson, G. B., Colston, M. A., Short, N. I., Neal, K. L., Hoewischer, P. E., & Pixley, J. J. (2004). Neuromuscular Changes in Female Collegiate Athletes Resulting From a Plyometric Jump-Training Program. *Journal of athletic training,* 39(1), 17–23.

58 Paul, Maman, & Kumar Biswas, Sandeep, & Singh Sandhu, Jaspal (2011). Role of sports vision and eye hand coordination training in performance of table tennis players. *Brazilian Journal of Biomotricity*, 5(2),106-116. ISSN: 1981-6324.

59 Ursanu, G., (2015), *Optimizarea capacității mortice.* Facultatea de Educație Fizică și Sport

60 Dane, Senol & Erzurumluoglu, Ali. (2003). Sex and handedness differences in eye-hand visual reaction times in handball players. *The International journal of neuroscience*. 113. 923-9. 10.1080/00207450390220367.

61 Abbott, A., Button, C., Pepping, G. J., Collins, D. (2005). Unnatural selection: Talent identification and development in sport. *Nonlinear Dyn. Psychol. Life Sci*., 9, 61–88.

62 Baker, D. G., Newton, R. U., (2008). Comparison of Lower Body Strength, Power, Acceleration, Speed, Agility, and Sprint Momentum to Describe and Compare Playing Rank among Professional Rugby League Players: *Journal of Strength and Conditioning Research*, 22(1),153–158. https://doi.org/10.1519/JSC.0b013e31815f9519

63 Bojić, I., Kocić, M., Veličković, M., Nikolić, D. (2017). Correlation between morphological characteristics and situational – motor abilities of young female handball players. In: S. Pantelić (Ed.), *20 Scientific Conference "FIS Communications 2017" in Physical Education, Sport and Recreation,* (pp. 317-322). Niš: Faculty of sport and Phyisical Education, University of Niš.

64 Buchheit, M., Laursen, P., Kuhnle, J., Ruch, D., Renaud, C., Ahmaidi, S., (2009). Game-based Training in Young Elite Handball Players. *International Journal of Sports Medicine*, 30(04), 251–258. https://doi.org/10.1055/s-0028-1105943

65 Campa, F., Silva, A. M., Talluri, J., Matias, C. N., Badicu, G., Toselli, S. (2020). Somatotype and bioimpedance vector analysis: A new target zone for male athletes. *Sustainability,* 12, 4365. https://doi.org/10.3390/su12114365

66 Carvalho, A., Mourão, P., & Abade, E. (2014). Effects of strength training combined with specific plyometric exercises on body composition, vertical jump height and lower limb strength development in elite male handball players: a case study. *Journal of Human Kinetics volume,* 41, 125-132.

67 Ĉavala, M., Rogulj, N., Srhoj, V., Srhoj, L., & Katić, R. (2008). Biomotor structures in elite female handball players according to performance. *Collegium Antropologicum*, 32(1), 231-239.

68 Chaouachi, A., Brughelli, M., Levin, G., Boudhina, N. B. B., Cronin, J., Chamari, K., (2009). Anthropometric, physiological and performance characteristics of elite team-handball players. *Journal of Sports Sciences*, 27(2), 151–157. https://doi.org/10.1080/02640410802448731

69 Chappell, J.D., & Limpisvasti, O. (2008). Effect of a neuromuscular training program on the kinetics and kinematics of jumping tasks. *American Journal of Sports Medicine*, 36(6), 1081–1086.

70 Fernández, J.J., Vila, M.J., Rodriguez, F. A., (2004). Modelo de un estudio de la estructura condicional a través de un análisis multivariante enfocado a la detección de talentos en jugadores de balonmano. *Mot. Eur. J. Hum. Mov*., 12, 169–185.

71 Gabbett, T. J., (2002). Physiological characteristics of junior and senior rugby league players. *British Journal of Sports Medicine*, 36(5), 334–339. https://doi.org/10.1136/bjsm.36.5.334

72 Ghuman, P.S., & Godara, H.L. (2013). The analysis of plyometric training program on university handball players. *Journal of Sports and Physical Education*, 1(2), 37-41.

73 Gioftsidou, A., Malliou, P., Sofokleous, P., Pafis, G., Beneka, A., & Godolias, G. (2012). The effects of balance training on balance ability in handball players. *Exercise and Quality of Life,* 4(2), 15-22.

74 Gorostiaga, E. M., Granados, C., Ez, J. I. N., Lez-Badillo, J. J. G., Izquierdo, M. (2006). Effects of an Entire Season on Physical Fitness Changes in Elite Male Handball Players. *Medicine & science in sports & exercise*, 38 (2), 357–366. doi:10.1249/01.mss.0000184586.74398.03

75 Gorostiaga, E. M., Granados, C., Ibáñez, J., Izquierdo, M. (2005). Differences in physical fitness and throwing velocity among elite and amateur male handball players. *Int. J. Sports Med*., 26, 225–232. doi: 10.1055/s-2004-820974

76 Gorostiaga, E.M., Granados, C., Ibanez, J., Izquierdo, M. (2005). Differences in physical fitness and throwing velocity among elite and amateur male handball players. *Int. J. Sport. Med*., 8 (10), s. 860–867. doi:10.1055/s-2007-964989.

77 Granados, C., Izquierdo, M., Ibañez, J., Bonnabau, H., & Gorostiaga, E. (2007). Differences in physical fitness and throwing velocity among elite and amateur female handball players. *International Journal of Sports Medicine*, 28(10), 860-867.

78 Granados, C., Izquierdo, M., Ibañez, J., Bonnabau, H., Gorostiaga, E. M.(2007). Differences in physical fitness and throwing velocity among elite and amateur female handball players. *Int. J. SportsMed*., 28, 860–867. doi:10.1055/s-2007-964989

79 Grigore, V., Mitrache, G., Predoiu, R., Roșca, R. (2012). Characteristic of instrumental movements–eye hand coordination in sports. *Procedia-Soc. Behav*. Sci. 2012, 33, 193–197.

80 Hammami, M., Gaamouri, N., Aloui, G., Shephard, R.J., & Chelly, M.S. (2018). Effects of combined plyometric and short sprint with change-of-direction training on athletic performance of male U15 handball players. *Journal of Strength and Conditioning Research*, 33(3), 662-675.

81 Hermassi, S., Gabbett, T.J., Spencer, M., Khalifa, R., Chelly, M.S., & Chamari, K. (2014a). Relationship between explosive performance measurements of the lower limb and repeated shuttle-sprint ability in elite adolescent handball players. *International Journal of Sports Science & Coaching,* 9(5), 1191-1204.

82 Hoff, J., & Almasbakk, B. (1995). The effects of maximum strength training on throwing velocity and muscle strength in female team-handball players. *Journal of Strength and Conditioning Research,* 9, 255-258.

83 Holm, I., Fosdahl, M.A., Friis, A., Risberg, M.A., Myklebust, G., & Steen, H. (2004). Effect of neuromuscular training on proprioception, balance, muscle strength, and lower limb function in female team handball players. *Clinical Journal of Sports Medicine,* 14(2), 88-94.

84 Justin, I., Vuleta, D., Pori, P., Kajtna, T., Pori, M. (2013) Are taller handball goalkeepers better? Certain characteristics and abilities of Slovenian male athletes. *Kinesiol. Int. J. Fundam. Appl. Kinesiol*., 45, 252–261. UDC: 796.322:796.056.222:796.012.1(497.4)-055.1

85 Karcher C., Buchheit M. (2014) On-court demands of elite handball, with special reference to playing positions. *Sports Medicine, 44*(6), 797-814.

86 Kida, N., Oda, S., Matsumura, M. (2005). Intensive baseball practice improves the Go/Nogo reaction time, but not the simple reaction time. *Cogn. Brain Res*., 22, 257–264. Doi: 10.1016/j.cogbrainres.2004.09.003.

87 Krüger, K., Pilat, C., Ückert, K., Frech, T., & Mooren, F. C. (2014). Physical Performance Profile of Handball Players Is Related to Playing Position and Playing Class: *Journal of Strength and Conditioning Research*, 28(1), 117–125. https://doi.org/10.1519/JSC.0b013e318291b713

88 Lidor, R., Melnik, Y., Bilkevitz, A., Arnon, M., Falk, B. (2005). Measurement of talent in judo using a unique, judo-specific ability test. *J. Sports Med. Phys. Fit*., 45, 32–37.

89 Manchado,C., Tortosa-Martínez, J., Vila, H., Ferragut, C., Platen, P.(2013). Performance factors inwomen's teamdhandball: Physical an physiological aspects –A review. *J. Strength Cond. Res*., 27, 1708–1719. Doi: 10.1519/JSC.0b013e3182891535.

90 Mankowska, M., Poliszczuk, T., Poliszczuk, D., Johne, M. (2015). Visual perception and its effect on reaction time and time-movement anticipation in elite female basketball players. *Pol. J. Sport Tour*., 22, 3–8. DOI: 10.1515/pjst-2015-0008.