“BABEŞ-BOLYAI” UNIVERSITY CLUJ-NAPOCA

FACULTY OF PHYSICAL EDUCATION AND SPORT

DOCTORAL SCHOOL OF PHYSICAL EDUCATION AND SPORT

DOCTORAL THESIS

- SUMMARY -

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The Integration of Athletic Elements into the Judoka’s Training Program In Order To Increase Their Sport Performances

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KEYWORDS: athletics, judo, training plan, intervention program, alternative training elements, cardio-pulmonary capacity increase, technical-tactical qualities

INTRODUCTION

This study has been established on the basis of the my previous experiences as a member of the Women's Judo Olympic Team (since 2006), but also upon the knowledge of the author, gained as a physical trainer at the "Cluj University" Football Club, where he activated for four years. All these professional experiences combine with a 15-year career as a teacher at the Babeş-Bolyai University of Cluj-Napoca, the Faculty of Physical Education and Sports.

At the same time, having been a performance athlete (gold medals at the National Junior Championship III 4X100 m in 1996-2000), I had the opportunity to appreciate the value that an optimized and personalized training can have on athletes in order to achieve the desired results in competitions. Knowing the wide range of specific physical training methods, the needs of the technical and tactical qualities of judoka, given the level and specificity of national and international competitions, have shaped the idea and the desire to leverage on my own experiences based on athletic science in developing and optimizing sport judoka training methods.

The realization of this idea has materialized in the completion of this PhD thesis.

PART I. THE THEORETICAL AND METHODOLOGICAL FOUNDATION OF THE STUDY

CHAPTER 1. INTRODUCTION TO THE THEME

1.1. The importance of the theme and its place in the research field

The current level of sports achievements, according to some prominent personalities in physical education and sports sciences (Rovniy, 2008; Platonov, 2015; Tsos et al., 2018; Rovniy et al., 2018) is exacerbated in competitions in the sense of competitiveness (Rovniy, Pasko, Galimskyi, 2017, Rovniy, Pasko, Stepanenko, Grebeniuk, 2017, Ashanin et al., 2018, Nesen et al., 2018). This emphasizes the training system of athletes in different stages of sports training. Judo athlete's professional development imposes high demands on improving physical fitness and functional capabilities under hypoxic conditions.

The motor activity of judokas is characterized by a wide variety of techniques that are made with a constant change of static and dynamic situations (Ananchenko, & Grin, 2006, Mulyk, & Kiyko, 2017, Ananchenko, Perebeynos, Pakulin, and Franken, 2018). The lack of objective data on the hypoxic training of judokas, the role of optimizing the hypoxic effects and the need to determine methods of objective monitoring of the development of technical and tactical qualities gave us the directions of research in this study.

1.2. Importance of the theme and international literature analysis

Judo is a Japanese martial art and is also an Olympic sport practiced by millions of people in the world. The judo competition expresses an enormous complexity for competitors. Athletes require technical and tactical skills, but psychological, emotional and physiological factors are also indispensable for success (Franchini, et.al., 2011; Pierantozzi et.al.2009, Pocecco et al., 2012). Obviously, this complexity also affects judo training, as coaches need to develop and implement an individualized training protocol for each judoka in order to obtain the best competitive results.

Many authors have highlighted the need to study the role of sports coaches (Jones et al., 2004, Gilbert et al., 2006, Nash et al., 2008).

Others have shown that training and competition must be considered as two different substrates in the general context of sport (Pepijn & van de Pol, 2011). However, the judo coaching specialty literature is relatively poor in references (in combat management is non-existent).

The judo technique has been traditionally analyzed through the systematic observation method, and some authors have also analyzed it by recording activities with complex and expensive camera systems (Blais, Trilles & Lacouture, 2007; Imamura, Alan, Escamilla & Edwards, 2006; Ishii, Ae, Suzuki & Kobayashi, 2018). In addition, most studies focused on studying the performance of Tori (the athlete performing the procedure) without analyzing the effect of that performance on Uke (the athlete on whom procedure is being perfomed), which is the main purpose of a judo throwing technique. Moreover, there are no studies on the effect of acute exposure at moderate altitude on the quality of technical performance, which is essential when at altitude training and in hypoxic situations (that happens in every fight).

We therefore see the need to revise and update scientific research, as well as to increase the number of judo coaching studies during physical training and during competitions, as well as improving the training plans developed by coaches.

1.3. Motivation of the theme choice

Being responsible for videography in the Women's Judo Olympic Team, I watched for many years the Team's sports activities, I had the opportunity to know the annual training plan, the results of the competitions, and I came to know staff members of the training team.

We have also noticed that these athletes are well monitored (from a medical, physiological, biochemical, nutritional point of view, etc.), have a well-defined annual plan of training and a valid training program that focuses more on the development of strength through anaerobic exercises, and on the development of technical-tactical qualities. These preparations are achieved by practicing and repeating specific combat techniques. Often, the elements for developing aerobic capabilities are lacking, to develop the cardio-pulmonary response (exercises that can prepare athletes for the so-called hypoxic moments during battles).

In addition to this, we rarely found in the judoka training program alternative elements for the development of force, speed, control, balance and, implicitly, the development of technical and tactical qualities. Multidimensional physical training can bring many benefits to any training plan specific to any particular sport.

With this study, we wish to contribute with a new approach (alternative) to the science and paradigm of the physical training of judoka, and we wish for this research to serve as a support to judo coaches as well, which will be able to use the results obtained in order to develop and improve their coaching methods.

1.4. The purpose and general objectives of the research

1.4.1. The purpose of the research

Carrying out research on the alternative trainings for the physical, technical and psychological development of judoka, which could then result in the development of an optimized procedure for the organization of specific training, focused on the needs of each athlete.

1.4.2. Research objectives

1.Presentation of the theoretical bases both in the science of athletics and judo. Understanding the fundamentals in sports training.

2. Identify the most appropriate elements of athletics for developing potential to introduce them into the training program of judo athletes.

3. Identify the metabolic, physical, technical-tactical, and psychological aspects that have developed following the implementation of the intervention program.

4. Develop an academic work to facilitate the development of a professional judoka profile and develop an opt-in training program; a work that can serve as a scientific basis for future research in this direction.

CHAPTER 2. SCIENTIFIC APPROACHES TO ATHLETICS

2.1 Definition and features of athletics

2.1.1.Definitions

In a more detailed definition, Sabau and Gheorghe (2012) have determined that athletics is a branch of physical education and sport which, through the variety of exercises, aims at both to the harmonious development of the body and the competition. Following certain forms of organization, rules and exact guidelines, the purpose of these exercises is to develop the body on a multilevel and to achieve superior sports performance.

2.1.2. Athletics as a formative sport

Through formative sports we understand the achievement of goals such as improving health by optimizing physical conditions (increased immunity of the body, development of tonicity and muscle tension, cardio-respiratory resistance, optimal body weight), the formation of a correct body fitness, improving general mobility and improving the level of execution of some competition elements, stimulating the development of psychological and affective processes, increasing motivation, and increasing the capacity to interact with the environment and increasing the ability to communicate socially.

"An important aspect of athletic exercises is that they are important for the development of basic motor skills such as speed, strength, and play a significant role in the fortification of the body" (Sabău & Gheorghe, 2012).

2.1.3. Athletics as a competitive sport

Athletics is a collection of sporting events that involve competitive running as well as jumping, throwing and walking. The most common types of athletic competitions are track and field, cross-country, mountain running and walking (Mahoney, Gabriel, & Perkins, 1987).

2.2. Biomotor qualities in athletics

Athletics is the sporting branch that mirrors and sums up at the same time the motility of an athlete, his ability to run, to jump, or to throw objects.

The physical qualities are those aspects of human motility that appear in equal parameters of the movement, have the same measurement pattern and are based on physiological and biochemical mechanisms (Zatiorski, 1968).

Biomotility also has a quantitative element in which the measure of force, speed and strength levels limits physical effort under qualitative demands. When athletes increase the load, the exercise is characterized as force; when speed or frequency increases, the effort is speed; and when the distance, duration or number of repetitions increases, the exercise is a resistance. If an exercise involves a high degree of complexity, it is a coordination excercise (Bompa, 2002).

2.2.1. Force

Total force is the sum of all the forces contributed by each part of the body. Force is used more economically when applied consistently and evenly. For example, a swimmer moves more efficiently when moving at constant speed and with uniform application of force (Chirosa, Feriche, Martínez, Calderón, Braga & Padial, 2006).

All forces must be applied in the desired direction. Any deviation from the straight line of the exercise of force will result in its loss of intensity. For example, a runner who walks with his toes outwards or over-balances will lose strength and energy (DeWeese, Hornsby, Stone, Stone, 2015).

2.2.2.Speed

Speed is a complex and complete action of the neuro-mechanical conditioning capacity of the locomotor-neuro-mechanical system in solving a task that requires rapid resolution by a quick response from the athlete (Platonov, 2013).

The sprinting technique must be started at low speeds and then transferred at maximum speeds. Stimulation, excitement, and proper combustion order of motor units, composed of a

motor nerve (Neuron) and the muscle group it controls, make possible the occurrence of high frequency movements (Rearick, Creasy & Buriak, 2011). The co-ordination and complex timing of motor units and muscles needs to be repeated at high speeds to implement the right sprinting models (Raglin & Wilson, 2000).

2.2.3. Strength

Strength training is usually done to increase both muscle mass and strength and is regularly incorporated into specific training programs to achieve the desired sporting performance (Scott, Slattery, Sculley, Hodson & Dascombe, 2015). It is assumed that the exercise would be expected to increase the skeletal muscle strength, which could have a subsequent influence on the various sporting abilities (Brown, Child & Donnelly, 1997). Interestingly, few studies are designed to examine the benefits of the resistance exercise (Henry, 2011).

2.2.4. Mobility (flexibility)

It is "the ability of an individual to make full use of the anatomical potential of locomotion, in a particular joint or in the body, concretized by performing large amplitude movements" (Alexe, 1993). The terms of mobility and flexibility are synonyms. Mobility targets the joints, and supplements the ligaments, tendons, muscles, but together they compose the anatomical-physiological structure of this quality (Alexe, 1993).

2.2.5.Dexterity

This is "the ability to quickly and accurately select and execute drive actions that are appropriate to unforeseen situations with increased efficiency" (Alexe, 1993).

Dexterity manifestation forms:

• General skill - related to definition, strength, and speed;

• Special skill - related to the different technical procedures, with the characteristics and particularities of each (Bogdan, 2009).

2.3. Athletic elements present in the judokas' physical training

2.3.1. Exercises that contribute to the development of force

Recently, more and more emphasis has been placed on a program for judokas, containing several types of training, including those to develop total body strength, aerobic and anaerobic capacity, muscle strength, flexibility and abilities in judo.

Many of the judo movements, especially throwing techniques, require the body's ability to spin and generate force from a certain position. It is necessary to emphasize the core, the thighs and the abdominal area to facilitate this type of movement. Plyometric force training performed with medical balls can be used by athletes and coaches to improve their training methods and later performance (Takahashi, 1992).

2.3.2. Exercises that contribute to the development of aerobic and anaerobic resistance

During a single judo match, athletes can perform a series of highly technical and demanding movements, subjecting their bodies to high levels of stress that prolong overtime, resulting in mental and physical fatigue. Taking this into consideration, it would be extremely beneficial for a judoka to have optimal neuromuscular control and low injury potential.

2.3.3. Functional training

The basic / basic exercises are: strength training, power training, dominant double and single leg exercises, dominant hip bent knee and straight leg exercises, horizontal presses, vertical presses, and vertical pulls. The omission of these exercises leads to some imbalances that increase the risk of injury, so it is advisable to do them at least once a week for optimal results (Henry, 2011).

CHAPTER 3. FUNDAMENTAL ASPECTS OF JUDO

Judo induces self-discipline and respect for athletes who practice it. Self-confidence, balance, concentration, leadership skills are a way to gain physical skills as well as mental development (Karakoc, 2014b). Judo is an Olympic sport that requires a very high technical, tactical and physical level. (Little, 1991).

The technical and tactical features, in their nature, have a high level of high intensity violence, are dynamic and require complex skill traits. All of these occupy an important place in the Judo success equation (Callister, 1991).

Judoka must maintain optimal performance throughout the year. This depends on several factors. It is therefore important that the properties of an athlete, such as strength, aerobic power, anaerobic strength, speed, flexibility, balance and coordination, are developed by judo-specific training, in addition to technical and tactical training (Karakoc, 2014a).

In addition, the excellent fitness level, physical strength, and a high level of muscle strength also play an important role in achieving success in international championships (Franchini, 2011).

The basic principles of judo are easy to understand and are essential for the person studying the judo technique. Judo techniques allow a weak and small man to control a large and powerful opponent, because these techniques are based on scientific principles such as leverage and balance.

In judo there are 6 categories of sports qualifications (belts, Kyu), each representing a degree of training of the athlete. Only knowing and acquiring all the technical procedures characteristic of each level of competence will allow the passage from one belt to another. These procedures are provided in the judo classification code and the athlete has to prove their execution without flaw. (Virtual Judo Magazine, 2011).

Biomechanically speaking, we can say that the specific effort deployed during a judo fight can be characterized as a particularly dynamic, very rarely a static effort (Stelian, 1981).

The performance of athletes depends largely on how the driving loads, the type of effort, the body's response to the effort, the compensation effort, the recovery capacity, and especially on the overcompensation following the effort made.

The upper limit of compensation in judo is represented by the effort characterized by a high intensity (Deliu, 2008). According to its main character of muscular movement [voluntary, the effort may be isometric or isotonic; and after the movement produced during the shock, the muscular effort can be static or dynamic (Şalgău & Mârza, 2007). In the static effort, the muscle attempts to overcome forces greater than its maximum capabilities that translate into battlefields by forcing the wrists, or by blocking the opponent. Most of the technical and tactical actions in judo are dynamic or combined efforts (Epuran, Holdevici & Toniţa, 2008, Iglesias, Clavel, Dopico & Tuimil, 2003).

According to the cyclicality criteria, the effort in judo is acyclic, the technical procedures and their combinations being carried out under constantly changing conditions (Şalgău & Mârza, 2007).

Energy mechanisms are required to a greater extent than those involved in fast-paced energy for throws and immobilizations. So the effort in judo is anaerobic and mixed (Iglesias, Clavel, Dopico & Tuimil, 2003).

Strength and resistance are considered as potential predictors of judo performance (Franchini, Miarka, Matheus & Del Vecchio, 2011; Franchini, Artioli & Brito, 2013). According to Franchini et. al. (Franchini, Miarka, Matheus & Del Vecchio, 2011), during the struggles, athletes have to show a developed muscular force and endurance - given that the goal is to dominate and unbalance the opponent - as well as muscular power to execute the techniques of throwing which involves both lower and upper muscle groups.

Strength as well as muscle strength can be developed by applying the right sports training. Sport training is optimal if it gets the maximum possible level of physical, psychological and technical-tactical training for athletes.

CHAPTER 4. BASICS OF SPORTS TRAINING

Sport training is characterized by a pedagogical conduct of increasing physical capabilities and athletic motor skills (Stelian, 1983).

Sports training is based on pedagogical, physiological, hygienic ideas, and other factors that are relevant to conducting the training process. (Dragan, 1978).

Sports training has the following characteristics: it is a system consisting of at least two components - the coach and the athlete, where the coach holds the leading, organizing and planning role of sports training, assuming the role of educating athletes. Athletic training is a progressive, graduated and individualized activity. (Holdevici & Christmas, 2013).

Among the objectives of sports training we find: multilateral physical development, specific physical development, technical factors, tactical factors, psychological aspects and team spirit.

The sports training process is the subject of studies based on training and contest data, studies that have resulted in numerous data and methods. Among the methodological requirements that apply to the training of the athlete we mention: ensuring continuity in training and competition, effort dynamics, volume, intensity, complexity in training and competitions, volume and amount of training, intensity of training, interdependence of training factors, importance physical education, education, psychological training, individualization (Dragnea & Mate, 2002).

The planning of training in the contemporary period and the stage of professional training (which we can now call planning strategies) is based on the idea that there is an optimal way to pursue training objectives through loads and tasks applied in different moments of sports training (Bompa & Buzichelli, 2019; Bompa & Buzichelli, 2015; DeWeese, Hornsby, Stone & Stone, 2015; Issurin, 2015).

A well-defined balance between training loads in specific and professional sports training and adequate recovery strategies are the key elements for high-performance athletes. In addition, maintaining this balance plays a crucial role for the general well-being of an athlete.

Encouraging an adequate training program is a complex process, influenced by many factors that are often unique to a single athlete and to that sport (Hecksteden et al., 2016).

Therefore, in order to ensure that a particular training plan is optimal for athletes performance and welfare, athletes' responses to the training process should be monitored (Coutts & Cormack, 2014, Meeusen et al., 2013, Soligard et al., 2016).

PART II. PRELIMINARY STUDY ON CARDIO-PULMONARY DEVELOPMENT POTENTIAL FOR JUDO ATHLETES

CHAPTER 5. CARDIO-PULMONARY EFFECTIVENESS TEST AS A POTENTIAL PERFORMANCE INDICATOR

5.1. The premises of the study

The starting point of our preliminary study is based on a general premise, namely: increasing the cardio-pulmonary capacity of judoka to improve energy consumption and drawing a personalized profile of the athlete.

5.2. Purpose, objectives and tasks of the study

The purpose of this research is to reveal the usefulness of introducing the training elements from athletics into the sport training of judokas, in order to achieve optimized performances and results both in the training and in the high level competitions.

5.3. Study hypotheses

Our hypothesis can be formulated as follows: the introduction of certain elements from athletics into the annual sports training plan of judokas can develop their cardio-pulmonary capabilities.

5.4. Subjects of the study

The control group (Lot I) included 22 members of the Pajura Sports Club in Bucharest, aged 14-18, trained by Sensei Bârca Aurel.

From the Experimental Group (Lot II) were 22 members of the Women's Judo Olympic Team, of 14-18 years old, coordinated by coach Bercean Florin.

5.5. Research Methods

In the first phase of our research, we chose to follow a well-known and widespread research scheme. As a starting point, we began with the method of studying the literature that provided us with a theoretical basis on which to build, and which also gave us a direction in the next research.

5.6. Elaboration of the intervention program and the evaluation tool

5.6.1. Intervention program

Following the research methods and the maximum possible exhaustion of all aspects to consider in order to determine the most relevant elements to be introduced in the judoka training program, we have chosen in our preliminary study to determine whether different forms of specific running (running being a basic element in athletics) influences the development of judoka athletes in any way, but especially from a cardio-pulmonary point of view.

5.6.1.1. 40-45 degree ramp run

This is an element that simultaneously develops muscular force (especially leg muscles - thighs and calves). At the same time, there is also an aerobic exercise that has the potential to increase cardio-pulmonary capacity, especially to improve VO2max and energy consumption.

Last but not least, it is a test of resistance that can improve the competitive performance of the athlete in the face of sustained effort (Edwards, Foster, Wallack, 2011, Auersperger et al., 2014)

5.6.1.2. Fartlek – long distance run with pace changing

This element is designed to improve aerobic resistance and is designed to develop cardio-pulmonary capabilities, a very important feature not only in allowing to perform more complex exercises, but also during competitions in intermittent hypoxic situations when the athlete

alternates between breathing moments and stopping breathing. In these situations, oxygen reserves play a very important role (Auersperger et al., 2014; Billat, Brune, Carbillet, Labbe & Samson, 2018).

5.6.2. The Evaluation Tool (TECP)

The cardio-pulomnary effort test (TECP) provides a great deal of information about the cardiovascular, musculoskeletal, respiratory, neuropsychiatric and homatopetic apparatus. The device used to perform the test was the Omnia 1.3 FitMate Pro.

CHAPTER 6. ANALYSIS AND INTERPRETATION OF RESULTS

6.1. Statistical indicators

Descriptive statistical elements were calculated; data presented using centrality, location and distribution indicators.

6.2. Statistical analysis

In order to provide perfect visibility and transparency on the complex and meticulous set of statistical data determined and calculated by the measuring apparatus, we present in the first phase the essence and the most relevant aspects of the obtained results:

In the pair samples we observed statistically significant, very significant or significantly significant differences in the following indicators:

On statistical analysis of barometric pressure values (mmHg)
At the statistical analysis of the barometric altitude values (m)
At the statistical analysis of experiment duration (s)
In the statistical analysis of the total energy consumed values (kcal)
In the statistical analysis of the amount of expired carbon dioxide (ml)
Statistical analysis of VE / VCO2 ratio values

At the statistical analysis of the carbon dioxide fraction at the end of expiration (%)

In non-paired samples we observed statistically significant, very significant or significantly significant differences in the following indicators:

In the statistical analysis of the energy consumed per day (kcal / day), the energy consumed per hour (kcal / h) and the energy consumption per minute (kcal / min)
In the statistical analysis of the total energy consumed values (kcal)
In the statistical analysis of the protein-free respiratory coefficient values
On the statistical analysis of the current volume (L) and ventilation values (L / min)
In the statistical analysis of the maximum oxygen consumption (ml / min)
In the statistical analysis of carbon dioxide production (ml / min)
In the statistical analysis of heart rate values (ml / heart cycle)
At the statistical analysis of the ideal maximum oxygen consumption (ml / min)
In the statistical analysis of the aerobic exercise capacity (%)
Statistical analysis of respiratory exchange ratio values
In the statistical analysis of carbohydrate values (kcal / day)
Statistical analysis of VE / VCO2 ratio values

In the light of these results we can consider that our proposed intervention program has had an impact on many aspects of the development of cardio-pulmonary capabilities and high differences are noted both between the two groups and in the pair samples between T1 and T2.

Of all these changes, perhaps the most important development in terms of applicability and relevance in both judoka and competitive training is the results found in the statistical analysis of the values of the *total energy consumed* (kcal) in the pair samples (this indicator is part of the *energy consumption* indicator group) and the statistical analysis of *maximum oxygen consumption* (ml / min) in non-paired samples (this indicator is part of the *metabolic indicators* group).

Cardio-pulmonary effort test - Omnia 1.3 (screenshot from initial testing)

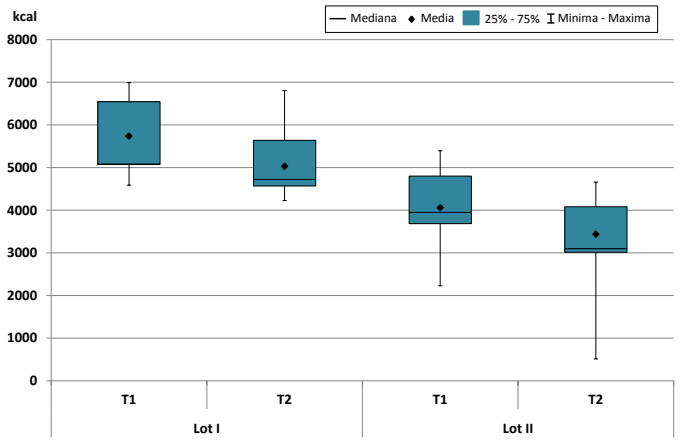
6.2.1. Group of indicators: Energy consumption

At the statistical analysis of the total energy consumed values (kcal) for non-paired samples, statistically significant differences were very significant at time T1 ($p < 0.01$) and statistically significant significant differences at T2 moment ($p < 0.001$) .

Considering the above results (energy consumption per day (kcal / day), energy consumption per hour (kcal / h) and energy consumption per minute (kcal / min) between the two batches, significant values of total energy consumed (kcal) was an expected result, a kind of logical conception of the starting point.

At the statistical analysis of total energy consumed values (kcal) for pairs, statistically significant differences in lot I ($p < 0.05$) and statistically significant differences in lot II ($p < 0$, 01).

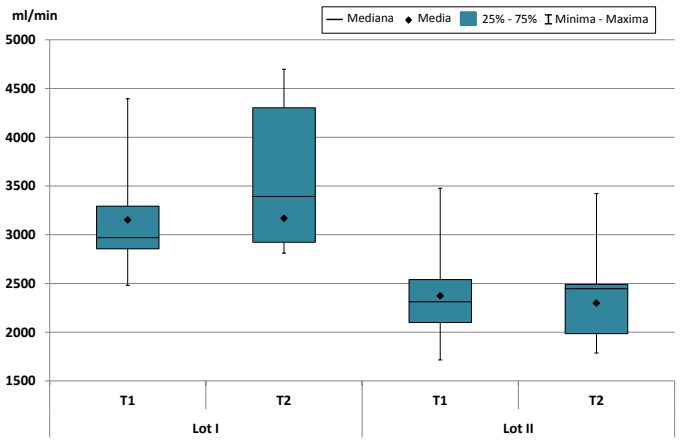
This result has a special significance in our research as it is an important proof in confirming the hypothesis that the intervention program (specific training elements from athletics) introduced in the specific training program of the experimental group have an impact on the development of the physiological capacities, in this case, in optimizing the total energy consumption during the effort.



Energy consumption - total energy consumed (EEtot)

6.2.2. Group of indicators: Metabolical

At the statistical analysis of the maximum oxygen consumption (ml / min) for pairs, no statistically significant differences were observed between the two time points in any of the batches ($p > 0.05$). In the statistical analysis of the maximum oxygen consumption (ml / min) for non-paired samples, statistically significant differences were observed at T1 moment ($p < 0.01$) and statistically significant differences at T2 moment ($p < 0.001$).



Metabolic indicators - maximum oxygen consumption (VO2max)

These results can be appreciated and taken into account when drawing up the athlete's personal profile and developing a focused and optimized training program to increase sport performance.

6.3. Conclusions and discussions

In practicing any sport or training program, the performance of the athlete, the efficiency and intensity of the effort made and, implicitly, his/hers performance will also depend on how the athlete can save his/her own energy consumption.

After analyzing the obtained results, we can state that the proposed intervention program had beneficial influences in the development of the aerobic force capacity of the studied group, the greatest positive impact being on the improvement of the **total energy consumption**.

PART III . PERSONAL RESEARCH IN TRAINING OF YOUNG JUDO ATHLETES AND THE IMPACT ON THEIR PROFESSIONAL DEVELOPMENT

CHAPTER 7. OPERATIONAL DESIGN OF RESEARCH

7.1. The premises of the research

Our research is based on the premise that elements of athletics can develop sporting skills and increase the competitive performance of judoka.

7.2. The purpose, objectives and tasks of the research

Our research is aimed at highlighting the evolution and psychological, physical, motor, energy and control development of young judo practitioners. We believe that improving these issues will lead to better results in competition.

7.3. Research hypotheses

The introduction of some elements from the athletics into the judo specific training program can increase the physical and technical-tactical performances of the judoka.

7.4. Stages of research

The research of our entire study had a total of fifteen stages.

7.5. Methods of research and evaluation tools

7.5.1. Research methods

17 athletes took part in this research, aged 14-18 years. Of these, all were able to participate in the initial testing and in final testing that took place at one year later.

The methods used were:

-studying specialized literature that provided us with a theoretical basis on which to build, and which also gave us a direction in the next research.
-browsing through a vast documentation from the current archive and record of the Women's Judo Olympic Team, focusing in particular on the various judo-specific training elements for choosing and implementing the most appropriate intervention programs.
-synthesis of professional opinions thorough, repeated and lengthy consultation with the Women's Judo Olympic Team Coach
-the method of observation
-the experiment method
-method of graphic representation
-statistical-mathematical method
-method of questionnaires (for psychological study)

7.5.2. Elaboration of the intervention program and evaluation tool

7.5.2.1. Running hurdles

This can help improve and develop the athlete's balance, a very important quality in a fight. Judoka must possess a superior capacity of dynamic force, balance and control when preparing for contact with the ground or an opponent. Balancing and motor control is equally important in executing different techniques and tactics in combat.

7.5.2.2. Sprints

There are many researches that have confirmed that judoka possessing greater rapidity has a decisive advantage over opponents who, in competition, move more slowly. It is confirmed that speed is essential to achieve top performance. If judoka does not execute correctly and in time the chosen technique (TOKUI WAZA), he/she will not win superiority over the opponent.

7.5.3 Evaluation tools

7.5.3.1. Miron Gerorgescu's Modified Test (MGM-15)

For measurements, we used the MGM-15 jumping rug that provides data on the force-speed asymmetry and also the structural consistency of motion control of a subject. The MGM-15 Jumping Carpet is used in the modified Miron Georgescu - 15 test, a platform on which the subject has to perform a set of 15 jumps, the first set on both legs, then on the left leg, and then on the right leg. The recorded data is analyzed by the embedded software of the instrument and the target coefficients are offered in very short time.

MGM-15 testing

7.5.3.2. Psychological evaluation SPM (Scale of Motivational Persistence)

7.5.3.2.1. Concept of motivational persistence and its dimensions

We conceptualize persistence as a three-dimensional feature, in which the framework consists of the prolongation of time. Due to the distinct properties and underground motivational mechanisms that lead to the persistence of temporarily different goals, we divide the concept

based on the approximation of the desired goals. The SPM psychological evaluation consists of 3 factors: Long Term Purpose Pursuing (LTPP); Current Pursuit Pursuit Tracking (CPP) and recurrence of unattained purposes (RUPs).

7.5.3.3. Concentrated Accurate Attention Count (TACC)

The ability to focus on appropriate stimuli during sports efforts has been recognized as one of the most important psychological skills underlying athletic success (Abernethy, 2001; Landers et al., 1994).

CHAPTER 8. RESULTS OF EXPERIMENTAL RESEARCH

8.1. Miron Georgescu Modified-15: Material and Methods

Descriptive statistical elements were calculated, data presented using centrality, location and distribution indicators.

8.2. Analysis and interpretation the results for MGM-15

Legend: H - height, MC - body mass, BMI - body mass index, PU - mean power unit, H_ - average flight height, V_rep - average ground time, CVE - coefficient of energy variability, CVS - structural, TSOLm - mini-soil time, HMax - maximum height, PMr - maximum unit output achieved, S.PMr - maximum unit power shot, PMp - maximum possible unit power, R.Fv-u - the unit-speed relationship , R.Fv-p - the precentual force-speed relationship, AU - unit asymmetry, AP - percentage asymmetry

Tabel. 5. Individual results obtained for each measured energy parameter and descriptive statistical parameters calculated at the level of the sports group in the final test

No.	NAME	Biological indicator		Mean Power Unit (W/Kg)			Dif. P 2feet-(lft+rght)		Asimetrie		Medium height (m)			Rep.speed (s)		
		Waist [m]	Mass [kg]	2 Feet.	Right	Left	W/kg	%	W/kg	%	2 Feet	Rgh.	Lft.	2 Fet	Right	Left
1	A.D.	1.65	55	3.09	1.55	1.58	-0.04	-1.27	-0.04	-2.47	0.17	0.08	0.08	0.18	0.24	0.27
2	A.I.	1.69	56	3.3	1.72	1.54	0.05	1.38	0.18	10.69	0.21	0.1	0.09	0.22	0.3	0.31
3	C.M.	1.56	43	2.95	1.61	1.59	-0.25	-8.31	0.02	1.11	0.17	0.09	0.08	0.2	0.29	0.26
4	C.A.	1.45	40	3.2	2.03	2.09	-0.92	-28.72	-0.07	-3.24	0.16	0.1	0.11	0.14	0.2	0.21
5	D.P.	1.59	51	4.22	2.03	2.1	0.09	2.04	-0.07	-3.45	0.27	0.12	0.12	0.17	0.28	0.25
6	G.M.	1.62	46	3.5	2.13	2.29	-0.93	-26.53	-0.16	-7.38	0.21	0.12	0.13	0.19	0.26	0.24
7	G.P.	1.74	59	3.2	1.56	1.38	0.26	8.15	0.17	11.2	0.19	0.09	0.07	0.2	0.28	0.28
8	H.F.	1.63	70	3.53	1.81	2.44	-0.73	-20.58	-0.64	-35.3	0.22	0.1	0.15	0.2	0.27	0.25
9	I.R.	1.63	54	3.55	2.14	1.9	-0.5	-13.99	0.23	10.89	0.24	0.14	0.11	0.24	0.31	0.28
10	I.C.	1.6	54	3.09	1.38	1.57	0.14	4.42	-0.19	-13.96	0.18	0.08	0.09	0.2	0.34	0.29
11	L.K.	1.62	57	4.18	2.02	2.31	-0.14	-3.42	-0.29	-14.21	0.26	0.12	0.14	0.16	0.29	0.28
12	N.O.	1.7	54	3.19	1.21	2.08	-0.11	-3.33	-0.87	-71.72	0.2	0.07	0.12	0.21	0.32	0.27
13	P.A.	1.56	53	3.79	1.75	2.29	-0.24	-6.37	-0.54	-30.6	0.23	0.1	0.13	0.18	0.27	0.26
14	P.O.	1.69	64	2.87	1.51	1.28	0.09	2.98	0.23	15.44	0.16	0.08	0.08	0.19	0.29	0.36
15	R.C.	1.61	55	3.71	2.23	2.56	-1.08	-28.99	-0.32	-14.35	0.23	0.14	0.16	0.18	0.28	0.26
16	S.A.	1.6	59	4.57	1.29	2.92	0.36	7.82	-1.62	-125.56	0.3	0.06	0.17	0.16	0.26	0.2
17	Sz. C.	1.54	43	4.47	2.46	2.79	-0.78	-17.51	-0.33	-13.61	0.28	0.15	0.17	0.14	0.26	0.24
	medie	1.62	53.71	3.55	1.79	2.04	-0.28	-7.78	-0.25	-16.85	0.22	0.10	0.12	0.19	0.28	0.27
	ab.st.	0.07	7.40	0.51	0.35	0.48	0.44	12.28	0.46	34.07	0.04	0.03	0.03	0.03	0.03	0.04
	medie+ab.st.	1.68	61.11	4.07	2.14	2.52	0.17	4.50	0.20	17.21	0.26	0.13	0.15	0.21	0.31	0.30
	medie-ab.st.	1.55	46.30	3.04	1.44	1.56	-0.72	-20.06	-0.71	-50.92	0.17	0.08	0.09	0.16	0.25	0.23
	maxim	1.74	70.00	4.57	2.46	2.92	0.36	8.15	0.23	15.44	0.30	0.15	0.17	0.24	0.34	0.36
	minim	1.45	40.00	2.87	1.21	1.28	-1.08	-28.99	-1.62	-125.56	0.16	0.06	0.07	0.14	0.20	0.20
	CV [%]	4.13	13.78	14.48	19.31	23.43	0.00	0.00	0.00	0.00	19.34	24.52	27.12	13.94	11.06	13.38

At the statistical analysis of the mean unit power values - PU - (W / kg), taking into account the lower limbs regardless of their grouping (both or singular), statistically significant differences were observed between at least two groups at T1 and at time T2 ($p < 0.001$).

At the statistical analysis for non-paired samples of mean unit power values statistically significant differences were observed between BF (both feet)-RF (right foot), BF (both feet)-LF (left foot) both at time T1 and at time T2 ($p < 0.001$). We can see an improvement in average unit power values.

No statistically significant difference between the two time points, regardless of the lower limb grouping (BF, RF or LF) ($p > 0.05$), was observed in the statistical analysis for pairs of mean unit mean values.

At the statistical analysis of the CVE values, taking into account the lower limbs regardless of their grouping (both or singular), statistically significant differences were observed between at least two groups at both T1 and T2 ($p < 0.001$).

In the statistical analysis for non-perennial samples the values of coefficient of energy variability were statistically significant differences between BF (both feet)-RF(right foot), BF(both feet)-LF(left foot) both at time T1 and at time T2 ($p < 0.001$).

At the statistical analysis for pairs of energy coefficient values, statistically significant differences were observed between the two time points for LF(left foot) ($p < 0.05$).

At the statistical analysis of the coefficients of structural variability - CVS, taking into account the inferior limbs regardless of their group (both or singular), statistically significant differences between groups were not observed at either the T1 moment or the time T2 (p> 0, 05).

8.3. SPM + TACC questionnaires: Material and methods

Descriptive statistical elements were calculated, data presented using centrality, location and distribution indicators.

8.4. Analysis and interpretation of results - Scale of Motivational Persistence (SPM)

No statistically significant difference between the two times ($p > 0.05$) was observed in the statistical analysis of Long Term Purpose Pursuing (LTPP) values.

No statistically significant differences between the two times ($p > 0.05$) were observed in the statistical analysis of Current Pursuit Pursuing Tracking (CPP) values.

No statistically significant differences between the two times ($p > 0.05$) were observed in statistical analysis of recurrence of unattained goals (RUPs).

As expected, statistically significant differences between the two times ($p > 0.05$) were not observed in the statistical analysis of the values of the motivation persistence score (PM) on the basis of the three previous items.

8.5. Correlations between SPM-ACC tests

No statistically significant difference between the two times ($p > 0.05$) was observed in the statistical analysis of concentrated attention (ACC) values.

At the statistical analysis of correlation between SPM and ACC values, no correlation between ACC and ACC items could be observed.

8.6. Conclusions of experimental research on MGM-15 test

The analysis of the data obtained from the experiment indicates a considerable development in most of the studied parameters, both in the case of the pair samples and in the case of non-paired samples.

The synthesis of the results shows that there are evolutions to the following parameters:

The statistically significant differences between BF-RF, BF-LF at both T1 and T2 ($p < 0.001$) were observed in the statistical analysis of the mean unit power values - PU - (W / kg) for non-paired samples.

This energy parameter gives us important information about strength-speed qualities. Thus, we can judge whether there is a force-speed asymmetry if one of the two values (force or speed) is deficient or is excess. Based on the detailed results presented in the study, it has been observed, compared to the initial testing, that the athletes have improved the quality of the force-speed relationship.

This result confirms that training (our intervention program) has been developed and designed to improve the power-to-speed imbalance and energy asymmetries.

8.7. Conclusions of psychological tests (SPM + TACC questionnaires)

All we could see as a difference is an acceptable and similar correlation between LTPP (long-term pursuit of goals) and RUP (recurrence of unintended purposes).

The fact that no psychological changes have been made to athletes may mean that the training period was short to cause mental changes, or the elements of the intervention program were not specifically focused to alter the psychological state of the athletes, but focused more on the physical and technical-tactical development of the judoka.

8.8. Conclusions of the implementation of the intervention program

Considering the athletic elements chosen in the intervention program, the results of the measurements and, last but not least, the judoka's sports performance, justify the following conclusions:

- The incorporation of athletic scores into the judo specific training program was a breakthrough in the development of cardio-pulmonary, strength and technical-tactical capabilities as well as in some psychological aspects of athletes.
- The fact that before we made the intervention program, we conducted a thorough documentation of the specialized literature was a big advantage, but we believe that the final decision on choosing the most effective training exercises was influenced by the vast experience of the coaches of the Women's Judo Olympic Team.
-We could notice that, as far as juniors are concerned, their awareness of the real value of drawing a personalized profile of the athlete, and the adjustment of the sports training plan according to him, remained limited.
-The elements from the athletics, although known and established as effective training elements in the training of judo athletes, are not widely used by coaches, so the athletes of the experimental group have embraced these novelties as elements of vitality, dynamism and diversity in the rigorous judo training program.

CHAPTER 9. GENERAL CONCLUSIONS, DISCUSSIONS, ELEMENTS OF ORIGINALITY AND LIMITS OF RESEARCH

9.1. General conclusions of the thesis

Our research hypothesis, which aimed to analyze whether a training program made up of specific athletic elements introduced into the specific training program of the judoka has an impact on the development of aerobic capacities, to those of force and speed and, implicitly, to technical-tactical skills, has been largely confirmed. This conclusion is reflected in the following aspects:

In the cardio-pulmonary effort test, although we did not record statistically significant differences in all the studied indicators, we observed, among other things, statistically significant differences in the *total energy consumed* indicator (kcal) both in the experimental group and in the group control, as well as to the metabolic *maximum oxygen consumption* (ml / min) in non-paired samples. The evolution of these two indicators (in addition to the development of other cardio-pulmonary responses) is encouraging because it shows that the intervention program has the potential to develop the aerobic exercise capacity of judo athletes, a very important quality of judokans both in training, as well as in competitions, when faced with situations of sustained intermittent labor and hypoxic situations.

At the Miron Georgescu Modified-15 test, which tested the athletes' evolution in terms of force development, speed and balance of force and speed, as well as movement control, we were able to record significant results for the vast majority of indicators, both in the energy indicator category as well as in the category of control indicators. This proves that the applicative program, in its extended form (having more intervention than the preliminary study) has beneficial influences on the physical and technical-tactical development of the judoka. These qualities are considered the basic qualities of a judo athlete when it comes to obtaining competitive results.

When applying the SPM and TACC psychological tests, we could notice as a difference an acceptable and similar correlation between LTPP (long-term pursuit of goals) and RUP (recurrence of unseen goals). Since the results of the other indicators did not show statistically significant differences, we conclude that the interventional intervention program did not have a significant impact on the mentality of the athletes. We believe that the psychological development of judokans requires other psycho-physical training programs.

With this research, we wish to contribute with a new (alternative) approach to the science and paradigm of the physical preparation of the judokas, and we wish for this research to serve as support to judo coaches as well, which will be able to use the presented results to develop and improve their methods and means of coaching.

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