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Abstract of the doctoral thesis:

THE IMPACT OF THE SPECIAL PROGRAMS FOR LANDINGS
TRAINING ON THE SPORTS PERFORMANCE IN WOMEN'S
ARTISTIC GYMNASTICS
- AGE 8-10 YEARS OLD -

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Part I: **THEORETICAL ASPECTS REGARDING THE SPORTS PERFORMANCE IN WOMEN'S ARTISTIC GYMNASTICS, FROM THE PERSPECTIVE OF LANDINGS**, includes 5 chapters: **Chapter 1**: Scientific research methodology elements; **Chapter 2**: The landing - the final stage of the flight-phase elements in Women's Artistic Gymnastics; **Chapter 3**: Landings' training and evaluation; **Chapter 4**: Particularities of 8-10 years old age; **Chapter 5**: Conclusions.

Motivation for choosing the theme

In the practical approach of the Artistic Gymnastics training in general, and of the landings as the final stages of the acrobatic elements with a flight phase, in our case, there is a need for studies on the subject, to support the scientific efforts for performance in sports.

Also, the practical work highlights the first reality in the preparation's intimacy in the Artistic Gymnastics, referring to the fact that it's not putting a lot of emphasis on the special preparation and training of the landings, although they have a very important role in getting final results.

For those reasons, we have chosen the subject of research in doctoral studies. With our approach we want to create a special program for the landings training, leading to their efficiency by reducing / eliminating the penalties, thus to increase athletic performance.

The purpose and the objectives of the research

The research purpose of the present thesis is to highlight the effects of a special landings training and perfecting program to all of the Women's Artistic gymnastics apparatus.

The study objectives:

- Realisation of a summary regarding the landings problematic in Women's Artistic Gymnastics;
- Determining the landings level of correctitude, at all competition apparatus;
- Increasing the athletic performance by implementing a special landings training program.

Upon reading the specialized literature, we highlight the following **conclusions:**

- The landing is the final action of the elements with a flight phase and can be defined as the moment when the gymnast returns with feet on the ground, through the intervention of the external and the internal forces, being performed by progressively bending the lower limbs, slightly bending the trunk, General Center of Gravity projection stabilization within the supporting surface and using arms for balance (onward-down, forward or sideways).
- The landings can be systematized according to several criteria, such as lower limb joints angle, landing technique, landing place, the axis of rotation of the body segment that is landing.
- The landing surfaces can influence its execution and accuracy and even the mood of the athlete.
- The internal and the external forces that are acting on the body in the landing moment are representing an important factor of its execution.
- Acquaintancy of the age particularities, by the coach, is a very important factor in the training process` design and planification, and the motor and psychomotor skills necessary for the landings must be developed according to the specific stage of growth and development of the organism.
- The landings training can be done in any part of the lesson of each type of training lesson by designing / selecting the appropriate exercises and the realization of some specific programs for the type of lesson and for the preparation period.

Part II: **PRELIMINARY RESEARCH ON CORRECTNESS OF THE LANDINGS**, comprises 4 chapters: **Chapter 6:** The preliminary research methodology; **Chapter 7:** Comparative analysis regarding the quality of landings made at the World Artistic Gymnastics Championships, Nanning, 2014; **Chapter 8:** Study regarding the biomechanical analysis of the landings; **Chapter 9:** The conclusions of the preliminary research.

The purpose of the preliminary research

Given the rigors of the Code of Points and the elements systematization within it, the landings are representing a distinct group. Thus, the main purpose of the preliminary research was *to develop a synthetic picture of the landings situation made at all four apparatus of the Women's Artistic Gymnastics, as their final phase.*

The research objectives

- Setting qualitative differences between Romania and the top three ranked countries at the Artistic Gymnastics World Championships in Nanning, 2014;
- Determining the correctiveness of the landings.

The preliminary research included two studies:

Study 1: Comparative Analysis on the quality of landings made at the World Artistic Gymnastics Championships, Nanning 2014

The analysed subjects were 24 gymnasts, aged between 16 and 23 years old, participants in the qualification contest at the World Artistic Gymnastics Championship, held in Nanning, 2014. The gymnasts are part of the representative teams of Romania, the United States, China and Russia.

Procedure: In order to realize the comparative analysis, there were carried out several actions, as follows:

- there were watched videos of each apparatus, as scheduled;
- there was made video arbitration;
- there were defined the suitable landings penalties and was settled their correctiveness by using the Code of Points, developed by the International Gymnastics Federation;
- there was made comparative analysis.

For each tenth of penalty, there were granted points on a scale from 10 to 0, corresponding to each penalty size, starting from 0.00 to 1.00 penalty points.

Study 2: Study regarding the biomechanical analysis of landings

The analysed subjects were the Junior III, Level 4 gymnasts, qualified in the apparatus finals of the Junior Individual National Championships, Onești, 2013. The total number of gymnasts was 15 but some of them have competed at several apparatus.

Procedure: The biomechanical study was based on the analysis of the landings from dismounts or acrobatic elements' flight faze (floor)'s characteristics at the four apparatus, following four phases, as follows:

- Start position (PS) - the moment of separation;
- The multiplier of the body position (PM) - the maximum height reached by the General Center of Gravity (GCG) in the flight;
- Final position 1 (PF1) - the moment of first contact of the feet with the ground;
- Final position 2 (FP2) – landing securing.

Preliminary research conclusions

- The comparative analysis between the results achieved at landing by the Romanian team and the results achieved by the teams of the United States, China and Russia, highlighted execution mistakes at all the gymnasts, because they are not mastering the landings. It was also confirmed the necessity of a high difficulty and a very good execution, in order to win a medal.

- At vault, Romania is losing an average of 0.25 points at each landing, while the other teams are losing between 0,175 and 0,225 points.

- At the uneven bars, the average of women gymnasts penalties is 0.1 points, tied with the gymnasts from USA, with an average higher than Russia, and 0.05 points lower than China's 0.20 points. However, the difference at this apparatus is made of the exercises difficulty and the technical execution of the elements, chapters were Romania is losing many points.

- At the balance beam, Russia lost the most points at the landings, 1.3 points, while the other teams had penalties of between 0.4 and 0.8 points, Romania having a total penalty of 0.7 points.

- At floor, the romanian women athletes had penalties, with an average of 0.525 points on landings; at this apparatus, China was the team with the highest penalties, having an average of 1.05 points.

- After analysing the results of the study no.1`s preliminary research, there was highlighted the role of the landings on sports performance which can influence and change the rankings. The landings have a greater influence on the ranking of the individual all-around, but they also change the hierarchy of the teams competition.

- The biomechanical analysis performed on the junior gymnasts highlighted the kinematic and dynamic characteristics of the landings.

- Following the results obtained from the study no.2 of the preliminary research, we can establish the correct landing model, from the biomechanical side of view, at every apparatus, for the gymnasts aged 12-13 years old.

- The tests performed in the preliminary research have had focused our attention on the fact that there are deficiencies at the landings. These errors also lead to loss of precious points, which adversely affects performance and hence their ranking.

- We believe that the scientific studies are constituting a good basis for the part III of the thesis that, through the designed research we wish to highlight the impact of the landings training programs, on the performance of the 8-10 years old gymnasts.

Part III: **RESEARCH ON THE IMPACT OF THE SPECIAL PROGRAMS FOR LANDINGS TRAINING ON THE SPORTS PERFORMANCE FOR GYMNASTS AGED 8-10 YEARS OLD**, includes five chapters: **Chapter 10**: Methodological issues concerning basic research; **Chapter 11**: The special program for landings training; **Chapter 12**: The obtained results, with their processing and interpretation; **Chapter 13**: Conclusions; **Chapter 14**: Elements of originality, the research limits and the results dissemination.

The purpose of the research:

The main purpose of the basic research is *the highlighting of some executions improvements determined by the implementation of a special program for landings training.*

Objectives:

- Determining the stage level of the different qualities needed for the landing execution in Women's Artistic Gymnastics, at the gymnasts aged 8-10 years old;
- Setting the intervention program with an eye to induce some qualitative transformations in the terms of landings at each of the four apparatus;
- Determining the correctness of the landings executed in the competition, by the junior gymnasts aged 8-10 years old.

The research hypotheses are:

- **The use of a special program for landings training can determine some significant differences in the junior gymnasts results at the trials and at the evaluation tests.**
- **The application of a special program for landings training will lead to improved execution landings made by the athletes in the competition.**
- **There is a significant correlation between the trials and the evaluation tests, and the penalties recorded at the landings executed in the competition, by the gymnasts of the analysed group.**
- **There is a significant correlation between the applied penalties for the landings executed in the competition and the official rankings compiled, based on the achieved athletic performance.**

The applied test and evaluation trials were: computerized probes (The concentration and the mobility of attention, The distance and speed estimation, reactivity, motor coordination and vigilance), Pencil-paper tests (The grid of

irrational thinking, The emotions measuring scale, The scale of behavioral test, The Toulouse- Piéron test), Psychomotor tests (The Matorin test, The distance-appreciation test, The appreciation of the motion range and the kinesthetic sense test, The Flamingo test, The test of maintaining the landing position on the balance board, The Bass test), Technical tests (are aiming the landing technique at the Women's Artistic Gymnastics apparatus, from descents or from elements with a flight phase) are adapted to each apparatus; the main requirement is to execute some correct landings at a fixed point) and The landings-evaluation in the contest.

The research duration

The pedagogical experiment was conducted between 15/09/2014 – 10/07/2015. In this period the initial testing was conducted (15 - 20.09.2014), the special program for the landings training was implemented, and at the final testing was done at the end of the period (02 - 10.07.2015).

Regarding the results obtained in the competition by the gymnasts, the initial testing was done in the 23-28.03.2015 week, within a verification competition held at each of the clubs, and final testing was done at the Junior III's National Championship, Buzau, 27-30.05.2015, for the level 1 and 2 gymnasts, and within the Junior I and II's National Championship, Onesti, 29.06-01.07.2015.

Subjects who took part in this experimental research were of 21 juniors III, Level 1 and 2, and junior II, level 3 gymnasts. These are athletes legitimized at CSS Steaua Bucharest (10 gymnasts), CSS no.2 Bucharest (5 gymnasts) and CS Dinamo Bucharest (6 gymnasts).

The content of the special programs of landings` training

The program for landings training was developed according to the age and training particularities of the subjects in the analysed group.

It has been divided into three sub-programs which were staggered throughout the pedagogical experiment.

The content of the training program included gymnastic-specific means, customized for the subjects who were participating at the research, by using different starting positions (standing, sitting on hands) and muscular activity regimes. To those, we have added one game in order to keep the gymnasts interest upon this aspect of the training.

The experiment conclusions

- **Hypothesis 1**, which involves "*the use of a special program for landings training can determine some significant differences in the junior gymnasts results at the trials and at the evaluation tests*" is **confirmed** based on the following aspects:

- In terms of **computer-based tests**, improvements are found at the means, for all the tested coefficients. In the case of the 12 tested factors: efficiency of attention (C1), the concentration and mobility of attention's test performance (C2), estimation of distance and speed (C3), learning capacity (C4), operant memory (5) the reactivity test performance, motor coordination and vigilance (6), useful reaction time (7), resistance to disturbance (8), optimal personal rhythm (9), time-pressure resistance (10), perceptive field inspection (C11) and self tempo (12), the differences recorded between the initial and the final testing are statistically significant for $\alpha = 0.05$, $N = 21$, because the Wilcoxon test's value for all the coefficients listed above is less than the tabular value, 59;

- Observing the **pencil-paper test** results, the differences recorded between the two testing are significant for five out of the six tests applied. For the scale of negative emotions measuring (H3), the Wilcoxon test's value is bigger than the tabular value ($79.5 > 59$), which makes the differences between the initial and the final testing not to be statistically significant;

- From the point of view of the **psychomotor tests**, there is observing a progress for all the realised tests; the differences recorded between the initial and the final testing are statistically significant for $\alpha = 0.05$, Wilcoxon test's value being compared with that in the tabular value for $N = 21$, equal to 59; in the case of the Matorin test, right turn (26) and left turn (45), the estimation of the distance test (38), the result of the deviation calculated for the distance estimation test (45), maintaining the landing position on the balance board (44 test), the Flamingo test (0), the Bass test (32), and evaluation of the range of motion and kinesthetic sense (2);

- Looking at the **technical tests** results, there are also recorded some environmental improvements, and the differences between the two tests are statistically significant for $\alpha = 0.05$, the Wilcoxon test's value being reported at the same tabular value, 59, in the case of the vault (5), uneven bars (15), balance beam (13.5) and floor (17).

● The analysis of the obtained by the athletes in the competition, at the landings executed at the four apparatus, allows us to conclude that the **hypothesis no. 2**, that "*the application of a special program for landings training will lead to improved execution landings made by the athletes in the competition*" is **confirmed**, as follows:

- The mean of the applied penalties for the performed landings at the vault decreases at the final testing by 0.08 points, and the differences recorded between the two tests are significant for $\alpha = 0.05$ and $N = 21$, where the Wilcoxon test's value is 25, and the tabular value is 59;

- The mean of the penalties for the executed landings performed at the uneven bars, is by 0.11 points lower at the final testing than the initial one, and the difference between the two tests is significant for $\alpha = 0.05$ and $N = 19$, the value of the Wilcoxon test is equal to 34 and the tabular value is equal to 46;

- The progress recorded at the balance beam landings are seen due to a final average decrease by 0.18 points and a significant difference where the Wilcoxon test's value is less than the tabular one ($14.5 < 59$) for $\alpha = 0.05$ and $N = 21$;

- Also, at the floor, it is recording a progress of the final mean by 0.15 points less than the initial testing and a significant difference for $\alpha = 0.05$ and $N = 21$, where the Wilcoxon test's value is equal to 51.

- After the correlative analysis of the results obtained at the trials and at the tests applied and the results of athletes obtained at the landings, in the competition, we can say that the **hypothesis 3** that "*there is a significant correlation between the trials and the evaluation tests, and the penalties recorded at the landings executed in the competition, by the gymnasts of the analysed group*", **confirms**.

- The **hypothesis no. 4**, according to which "*there is a significant correlation between the applied penalties for the landings executed in the competition and the official rankings compiled, based on the achieved athletic performance*", is partially **confirmed**, given the results of the Spearman correlation between the penalties applied for the landings and the ranking obtained by each of the gymnast in the analysis group.

- In conclusion, the result of the experimental research highlights the improved execution of the landings and also contributes to the improvement of the athletic performance.

General conclusions

- Analysing the specialized literature, there is seen the diversity of landing types and of the surfaces that can be landed on, those having an important role on the execution technique. The motor and the psychomotor skills required for the landings execution, trained in accordance to the particularities of age, determine the level of correctitude of the landings execution.

- In this research, the purpose and the objectives have been achieved. The initial testing of the gymnasts aged 8-10 years old allowed the determination of the different qualities level needed for the landing execution, at the time of testing, before the implementation of the special programs for landings training. The final testing, conducted after the applying of the special programs for landings training, allowed the appreciation of the tested qualities' dynamics. The analysis of the obtained data confirmed that by conducting some special programs for landings training, the execution and sports performance are improved.

- The results of the correlation between the computerized tests and landings performed in competition, at the uneven bars and at the balance beam, are not statistically significant. At the uneven bars, the landing is heavily influenced by the technical correctness of the descent. During the exercise at the

balance beam, the gymnasts demonstrate a higher level of balance, great courage, self-control and a high degree of attention and concentration. It should be noted that all these aspects give rise to mental fatigue which makes landings from this apparatus to be unpredictable, which is why we believe that the results were not statistically significant.

- The correlative analysis of the results obtained at the pencil-paper tests (those that have information about the emotional intelligence of the subjects) and the results obtained at the landings in the competition, allows us to state that the emotional state, the irrational thinking, the behavior and the focussing level of the athletes don't influence the landings executions.

- The results obtained at the psychomotor tests and the ones obtained at the floor, in the competition, in terms of landing does not correlate, because at this apparatus were taken into calculation all of the landings executed from acrobatic elements, performed by the gymnasts aged 8-10 years old.

- The results of the correlative analysis between the penalties applied for the landings executed in the competition, at the uneven bars and the sports performance obtained at this apparatus are not statistically significant. The explanation is that at the uneven bars many points are lost during the exercise and less at the landing. At the balance beam, the correlation between penalties at the landing performed from descent and the ranking of the gymnasts obtained at this apparatus is not significant because the athletes, during their exercise, are performing multiple landings that may influence the final score. To prove this, we realised a correlative analysis between the total landings penalties during the exercise at the balance beam and the athletic performance obtained, which is statistically significant.

- Based on the progress of the gymnasts, following the experimental research, we can state that the implementation of a program specifically designed to improve the training and the perfecting of the landings, provides an improvement in the execution and implicit, in the sports performance.

- Considering the results achieved and the recorded positive effect, we wish to capitalize the landings training program by developing a training model for landings preparation at the junior III and junior II gymnasts, level 1, 2 and 3. We recommend the following model:

LANDINGS TRAINING MODEL

- **Materials needed:** vault table, floor, balance beam, trampoline, 20 cm thick landing mattress, mattress protectors;
- **Organizational structure:** the training lesson;

- **Content:** means of different movement groups, correlated with the age, the training level and the apparatus particularities. Among them *the landings training program* must contain the following:

- Sitting on vault table, facing the direction of travel, salto forward tucked, in depth and fixing the landing (5 repetitions x 3 sets);
- Sitting on the springboard with the back to the direction of movement salto backward tucked and landing position fixing (5 repetitions x 3 sets);
- Sitting on the vault table, facing the direction of travel, stretched jump with 180⁰ turn, in depth and fixing the landing (5 repetitions x 3 sets);
- Sitting on the vault table, with the back to the direction of travel, stretched jump with 180⁰ turn, in depth and fixing the landing (5 repetitions x 3 sets);
- On floor, salto backward tucked and fixing the landing (5 repetitions x 3 sets);
- Sitting at the end of the balance beam, with the back to the direction of travel, salto backward tucked and fixed landing (5 repetitions x 3 sets);

- **Time spent / week:**

- *the preparatory period:* 15 minutes in 6 lessons;
- *pre-competitive period:* 15minutes in 6 lessons;
- *the competitive period:* 10 minutes in 6 lessons;

- **Assessment of impacts:** tests and evaluation trials:

- a) Computerized tests (concentration and mobility of attention, distance and speed estimation, reactivity, motor coordination and vigilance);
- b) Psychomotor tests (Matorin test, Distance-estimation test, The range of motion and kinesthetic sense estimation test, The Flamingo test, The maintaining of the balance on the balance board test, The Bass test);
- c) Technical tests (at the apparatus in Women's Artistic Gymnastics, with landing at a fixed point).