



ORIGINAL RESEARCH PAPER

A MODEL FOR OPTIMIZING THE LEARNING OF BASIC TECHNIQUES OF FIGHT IN STANDING POSITION FOR YOUNG JUDOKAS

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Abstract

The growing popularity of judo around the world is forcing researchers and coaches to constantly look for new, effective, and scientifically based tools and methods for learning judo techniques for optimal competition performance. The opinions of judo specialists on mastering the judo technique are divided into two groups: one believes that a smaller amount of technique should be taught, and that the focus should be on mastering these techniques better, while the other believes that the basics of technical training are the acquisition of basic techniques, i.e., the acquisition of 40 techniques. Increasing the efficiency of the training process with a well-thought-out set of tools and methods is an important condition for mastering the basic techniques of fight in standing position in judo. The research aim is the approbation of the model for optimizing the learning of basic techniques of fight in standing position for young judokas. Research methods: research and analysis of literature sources, expert evaluation method, modelling, observational experiment, and mathematical statistics. The research involved judokas aged 7-12 (58 judokas) and 3 judo experts. The research results reveal that the model for optimizing the acquisition of basic techniques of fight in standing position in judo consists of identifying the learning needs of judokas; setting learning goals; setting learning tasks; choice of learning methods and tools; assessment of learning results, as well as general developmental, auxiliary exercises, and special developmental and competition exercises. The optimization of learning the basic techniques of fight in standing position in judo is initially done by using general developmental, auxiliary exercises, special

development, and competition exercises, during which the elements of the technique are mastered up to the skill level, followed by 5 student grades (kyo) with 8 techniques in each. The experience of accumulated movements is expanded, and body movements are managed in 3 planes, as well as physical properties are developed in parallel, with an emphasis on coordination skills.

Key words: judo, judo techniques of fight in standing position, optimizing learning of the basic technique for young judoka.

Introduction

Optimization theory reveals that from some of the available alternatives, the best choice can be determined that optimizes (maximizes or minimizes) a specific goal function (Bhatti, 2000), thus optimizing the training process while planning the learning process is possible in setting the learning-training goals and tasks; in the selection and specification of the curriculum, taking into account the goal, as well as the selection of the most appropriate forms, methods and means of learning (Bocioaca, 2014). Learning optimization is a system of measures that enables a coach to achieve the best possible results in the specific circumstances. Optimizing the learning-training process by taking into account the general learning and training goals, pedagogical regularities, learning principles, real learning opportunities for each athlete and the entire learning group, as well as the coach's own capabilities, means to define specific learning tasks for the specific learning-training session or the session cycle, to specify the learning content in accordance with them, to select appropriate forms, methods and means of learning-training. All this makes it possible to achieve the planned training results within the allocated time with the optimal effort of the students.

Movement learning theory emphasizes that movement skills are acquired by restricting excess degrees of freedom, (Bernstein, 1947), revealing that the coordination of movements is, in essence, the restriction of excess degrees of freedom as a condition for the acquisition of basic techniques of fight in standing position in judo by developing physical properties, selecting methods and means, and increasing the demands on the judoka psyche, attention, and its development. (Sielużycki et al., 2019; Koshida et al., 2017; Franchini et al., 2017; Iermakov et al., 2016; Franchini et al., 2013; Bompá & Haff, 2009). The learning process should start with mastering the elements of judo at a high level, but unfortunately the coaches do not pay much attention to it and are in a hurry to teach steep fighting techniques, as well as to complete the competition tasks. Once the elements of judo are mastered at a high level, you should continue to teach the basics

of martial arts. A long-term approach to coaching (adapted from Balyi, 2005) plays a very important role in athlete training. Coaches need to understand what tools and methods are best for each age and what to look for. This knowledge is based on sensitive periods of human development. The goals and objectives of training change at each age so that the athlete does not get tired of doing the same thing. The long-term training of judo is grouped according to the students' mastery levels (*kyo*).

The amount of technical training is the number of techniques that an athlete can perform or performs in training. This is called the total or training volume. The competition volume is the number of different techniques performed in the competition. Judo uses more than 100 different techniques, but most leading judokas use only a small portion of these techniques (often 1-2 "crown numbers"). Of course, this does not mean that they do not know how to perform other techniques. When fighting with less qualified athletes, a rich arsenal of techniques is used, but in responsible fights - only the favourite techniques (Adam, 2007; Kļys et al., 2020). The basics of fight in standing position in judo are stances (9 types), grips (6 types), movement types (3 types), turns (7 types), movement directions (9 types), falling technique (7 types) and moving the opponent to an unstable position (8 types), which are to be mastered at a high level of skill (Inogai & Habersetzer, 2002). It is also necessary to determine the technical tactical variables of the fight and their role in the competition and, consequently, in the training process (Miarka et al., 2012; Kļys, 2020).

At each stage, optimization can be performed under an important condition, i.e., a conscious practice and an individualization process (Baker & Young, 2014; Macnamara et al., 2016; Ericsson, 2020). Learning in childhood is usually uncritical and trust-dominated: the child tries to acquire as much as possible and trusts the adults as they introduce the child to what he or she needs to know. However, interest in learning has been growing since the onset of puberty. The development of young people's identity is linked to their ability to choose goals and frameworks, and therefore the formation of identity is very important in the learning process during this period (Illeris, 2007). The aim of this research is approbation of the model for optimizing the learning of basic techniques of fight in standing position for young judokas.

Material and methods

To approbate the model for optimizing the learning of basic techniques of fight in standing position for young judokas, research and analysis of literature sources was performed, as well as expert evaluation method, modelling, observational experiment, and mathematical statistics were applied. The research involved judokas aged 7 – 12 (58 judokas) and 3

judo experts. The study has been approved by the Latvian Academy of Sport Education Ethics commission.

The aim of the application of the expert evaluation method was to determine the level of acquisition of the basic techniques of fight in standing position of young judokas before and after the application of the content of the learning optimization model. Within the framework of the research, the evaluation of student throw complexes (student kata) was implemented. Three experts participated in the research. Before the evaluation, the experts got acquainted with the evaluation criteria, the aim, and tasks of the event. The technical performance was evaluated with a certain number of points:

1. grip – 1 point.
2. adaptation to the throw, unbalancing the opponent – 1 point.
3. body turn – 1 point.
4. pre-throw position (starting position) – 2 points.
5. execution of throws – 2 points.
6. fixation after the throw with securing the partner – 1 point.
7. large amplitude and throw speed – 1 point.
8. performance of the whole action without the slightest braking (the whole set of movements is smooth and beautiful) – 1 point;
9. the allowable reduction of the judge's evaluation for a small mistake – 0.5 points.

Aesthetics (0-3 points) – movement without lifting the legs, correct bow, synchronous performance and leaving correctly, and moving on the ground.

The purpose of modelling in this research work is to develop and test the model for optimizing the learning of basic techniques of fight in standing position for young judokas. The model type is structurally functional, which is based on a theoretical and conceptual model. The model is developed in several stages: *First stage*. In the first stage of the modelling, the research of scientific literature sources on the possibilities of optimizing the learning of basic techniques of fight in standing position in judo for young judokas was performed. At the beginning of the model development, a problem was defined, which is related to the diversity and possibilities of performing the diverse and complex basic techniques of fight in standing position in judo, which poses many unresolved tasks, the goal of which is to increase the efficiency of the training process. The analysis of the scientific literature provided an understanding of the research problem. *Second stage*. In the second stage of modelling, the realization of the arsenal and efficiency of the techniques of fight in standing position of the strongest judokas in the world and in Latvia was analysed and described, explaining its significance in the technical training of a judoka in the competition and

training process. *Third stage.* In the third stage of modelling, the acquisition of the basic techniques of fight in standing position for young judokas was determined before the development of the model for optimizing the learning of the basic techniques of fight in standing position for young judokas. *Fourth stage.* In the fourth stage of modelling, a model for optimizing the learning of the basic techniques of fight in standing position for young judokas was developed and approbated. *Fifth stage.* In the fifth stage of modelling, the acquisition of the basic techniques of fight in standing position for young judokas was determined after the approbation of the model for optimizing the learning of the basic techniques of fight in standing position for young judokas.

The observational experiment was carried out with the aim to determine and analyse the efficiency of the model for optimizing the learning of the basic techniques of fight in standing position for young judokas. The experiment took place in three stages. In the first stage of the research (January 2019 – March 2019), the acquisition of basic judging techniques for young judokas before the development of the optimization model was studied. In the second stage of the research (January 2019 – December 2019), the model for optimizing the learning of basic judo fighting techniques was used in practice. In the third stage of the research (December 2019), the acquisition of basic judging techniques by young judokas using the optimization model is analysed and defined. The groups of participants in the experiment consisted of 58 judokas aged 7 – 12 (the first group included 29 people, and the second group included 29 people). The model for optimizing the learning of basic techniques of fight in standing position in judo consists of identifying the learning needs of judokas; setting learning objectives; setting learning tasks; selecting learning methods and tools; assessment of learning results, as well as general developmental, auxiliary exercises, special developmental and competition exercises. The task of these exercises: extension of the accumulated movement experience, management of body movements in 3 planes, development of physical properties, with emphasis on coordination skills. The model is based on 352 exercises and the learning process is divided into three stages: the initial learning stage - creating an idea of the learner's movement; the stage of in-depth and detailed learning (skill development); the stage of strengthening and further development (skill building).

The obtained data were mathematically processed with Microsoft Office Excel and SPSS 22.0 data processing programme. Calculated descriptive statistics, Kolmogorov-Smirnov test, Spearman's rank correlation and Mann-Whitney U test.

Results

Acquisition of judo fundamental techniques for young judokas before the development of the model for optimizing the learning of basic techniques of fight in standing position for young judokas.

The level of technical preparedness of judokas aged 7 – 12 was determined. The young judokas were divided according to age and the skill levels. Each pupil's skill level determines the number of throws from different throw classification groups, which must be performed using different types and principles.

The results of *the yellow belt (5th kyo)* are as follows:

1. *De-ashi-barai* M= 6.82 (SD=0.91) with value range from 4 to 8.
2. *Sasae-tsurikomi-ashi* M=6.07 (SD=0.97) with value range from 4 to 8.
3. *O-soto-gari* M=6.48 (SD=0.90) with value range from 4 to 8.
4. *O-goshi* M=6.15 (SD=0.86) with value range from 4 to 8.
5. *Morote-seoi-nage* M=6.19 (SD=1.03) with value range from 4 to 8.
6. In aesthetics M=1.68 (SD=0.47) with value range from 1 to 3.

The results of *the orange belt (4th kyo)* are as follows:

1. *Uki-goshi* M=7.40 (SD=0.64) with value range from 6 to 8.
2. *O-uchi-gari* M=6.57 (SD=0.87) with value range from 5 to 8.
3. *Ko-soto-gari* M=6.70 (SD=1.52) with value range from 4 to 8.
4. *Ko-uchi-gari* M=6.33 (SD=1.16) with value range from 4 to 7.5.
5. *Koshi-guruma* M=7.05 (SD=0.51) with value range from 6 to 8.
6. *Tsurikomi-goshi* M=5.33 (SD=1.79) with value range from 3 to 9.
7. *Okuri-ashi-barai* M=6.13 (SD=1.21) with value range from 4 to 8.
8. *Tai-otoshi* M=6.27 (SD=1.04) with value range from 5 to 8.
9. *Harai-goshi* M=6.20 (SD=0.96) with value range from 5 to 8.
10. In aesthetics M=2.07 (SD=0.87) with value range from 1 to 3.

The results of *the green belt (3rd kyo)* are as follows:

1. *Ko-soto-gake* M=6.50 (SD=1.08) with value range from 4 to 8.
2. *Tsuri-goshi* M=7.24 (SD=0.59) with value range from 6 to 8.
3. *Yoko-otoshi* M=7.47 (SD=0.65) with value range from 6 to 8.
4. *Ashi-guruma* M=6.78 (SD=0.98) with value range from 4 to 8.
5. *Uchi-mata* M=6.79 (SD=0.75) with value range from 5 to 8.
6. *Tomoe-nage* M=7.15 (SD=0.74) with value range from 6 to 8.
7. *Kata-guruma* M=6.74 (SD=0.66) with value range from 6 to 7.5.
8. In aesthetics M=1.53 (SD=0.35) with value range from 1 to 2.5.

The evaluation of the acquisition of basic martial arts techniques by three experts before the development and approbation of the learning optimization model shows that the level of athletes in all three levels of students' mastery (*kyo*) is almost good. The arithmetic mean is 6.57 points. The model for optimizing the learning of basic techniques of fight in

standing position for young judokas is based on the sources of scientific literature, scientific theories and on the results of previous research (Fig. 1).

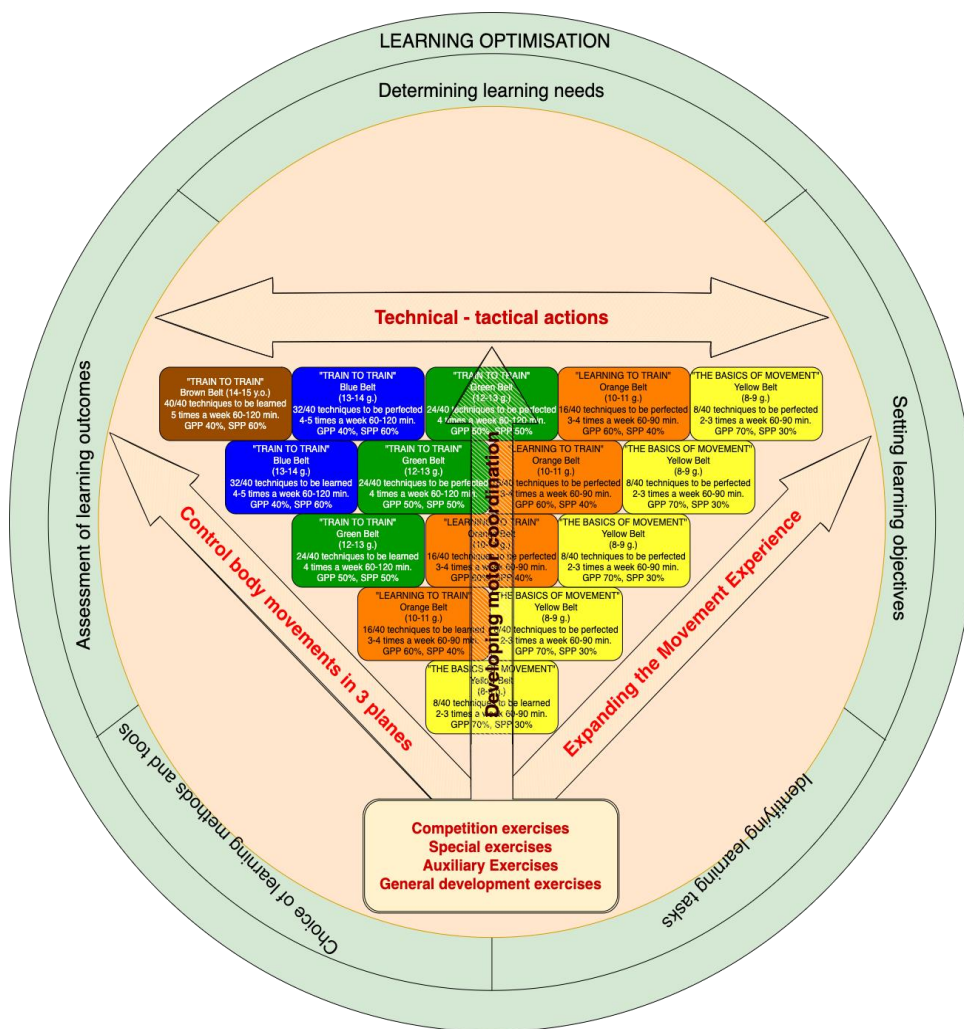


Figure 1. *The Model for Optimizing the Learning of Basic Techniques of Fight in Standing Position for Young Judokas*

The outer circle – learning optimization – includes the second circle - learning optimization stages. The stages are as follows: determining the learning needs of judokas; setting learning objectives; setting learning tasks; choice of learning methods and tools; assessment of learning outcomes, followed again by the first stage, which indicates that the variability of these stages is an ongoing process. At each stage, optimization can be performed under a conscious practice and an individualization process. This model for

optimizing the learning of basic techniques of fight in standing position for young judokas content is based on general, advanced, and competitive exercises. The most important physical trait required to master the basic techniques of judo fighting in standing position is coordination, and it must be developed all the time (see the arrow that goes through the triangle). In parallel, there is an extension of technical experience (see the right side of the triangle) and control of body movements in the horizontal, vertical, and sagittal planes (see the left side of the triangle), while the upper edge of the triangle indicates an extension of the technical tactical operation. The rectangles in the triangle represent the long-standing preparation of the judokas. The rectangles are in different colours (according to the colours of the belts) and indicate the age, the number of workouts per week, their duration, and the percentages of general physical preparation (GPP) and special physical training (SPT). The best judo specialists in different countries have identified and use a certain number of separate technical units (ATVs) from different classification groups. The world-renowned Kodokan Five-Step (*Go-kyo*) Basic Technique Kit contains 40 standing techniques. In 5 – 7 years, students learn eight to forty techniques of standing fighting. The five-step system allows you to solve several tasks. In each level of pupils' judo skills (5th kyo-1st kyo – yellow-brown belt), 8 basic combat techniques must be mastered, which contain different principles of throwing from four groups of throws (legs, hips, hands and throws while falling).

If in the first year of training the yellow belt technique of fight in standing position is mastered, then in the second school year the orange belt technique of fight in standing position must be mastered, improving the previously acquired yellow belt technique. When teaching the green belt technique, the technique of all previous belts should be improved. This principle should continue to be followed when learning other belt techniques - always improve the previous technique to reach a skill level that will help to create combinations or connections of the technique. The main task of the student is to expand the movement experience to find their best throws to compete with. A judoka with a large range of learned throws can decipher his/her opponent's intentions and successfully defend himself/herself. To master a complex movement task, the movements must be repeated many times with a partner on one place from both sides, moving straight in both directions, and in various other directions. Knowledge creates an opportunity to acquire skills and abilities to perform techniques. The acquisition of certain techniques is a means of developing the coordination of movements. This is due to two factors that contribute to the improvement of coordination:

1. inclusion of limbs and body parts in the performance of movements.
2. performance of movement tasks in different anatomical planes and around different axes of the body (vertical, horizontal, sagittal).

General preparatory exercises (routine exercises, elements of acrobatics and gymnastics), special preparatory exercises, adapted games, games and simplified forms of wrestling, as well as competition exercises (tipping, throwing), which include all technical activities used in competitions and Kata in a demonstration, are used as assets.

After applying the content of the model for optimizing the learning of basic techniques of fight in standing position for young judokas, an exam was organized to determine the level of pupils' technical readiness. The Mann-Whitney U test for the 2 independent clusters helped to determine that the increase in scores was mathematically significantly different, as almost all throws had a p-value of <0.05 or <0.01 for the reciprocal alternative, so it can be assumed with 95% or 99% probability that the average score for judo combat techniques is significantly different. Thus, in this case the increase is statistically significant. The reliability of all throw changes is shown in Table 1, 2, 3.

Table 1

Credibility of the Change in Average Technique Assessment of the Yellow Belt (5th kyo)

Nr.	Name of Technique	1 st assessment	2 nd assessment	Increase Credibility
	<i>De-ashi-barai</i>	M=6.82 (SD=0.91)	M=8.15 (SD=0.96)	p<0.01
	<i>Sasae-tsurikomi-ashi</i>	M=6.07 (SD=0.97)	M=7.95 (SD=1.03)	p<0.01
	<i>O-soto-gari</i>	M=6.48 (SD=0.90)	M=8.21 (SD=0.85)	p<0.01
	<i>O-goshi</i>	M=6.15 (SD=0.86)	M=7.86 (SD=0.76)	p<0.01
	<i>Morote-seoi-nage</i>	M=6.19 (SD=1.03)	M=8.02 (SD=0.81)	p<0.01
	Aesthetics	M=1.68 (SD=0.47)	M=2.33 (SD=0.49)	p<0.01

The increase of the results of the yellow belt (see Table 1) is plausible for all techniques, as $p < 0.01$. The average increase for all techniques is 1.7 points.

An increase in the results for *the orange belt* (see Table 2) is plausible in 6 cases, as $p < 0.01$ or 0.05, but unlikely in 3 cases. The average increase for all techniques is 2.16 points.

Table 2

Credibility of the Change in Average Technique Assessment of the Orange Belt
(4th kyo)

N.	Name of Technique	1 st assessment	2 nd assessment	Increase Credibility
1.	<i>Uki-goshi</i>	M=7.40 (SD=0.64)	M=9.38 (SD=0.64)	p<0.01
2.	<i>O-uchi-gari</i>	M=6.57 (SD=0.87)	M=8.65 (SD=0.91)	p<0.05
3.	<i>Ko-soto-gari</i>	M=6.70 (SD=1.52)	M=8.68 (SD=1.54)	p>0.05
4.	<i>Ko-uchi-gari</i>	M=6.33 (SD=1.16)	M=8.47 (SD=1.28)	p>0.05
5.	<i>Koshi-guruma</i>	M=7.05 (SD=0.51)	M=9.08 (SD=0.54)	p<0.05
6.	<i>Tsurikomi-goshi</i>	M=5.33 (SD=1.79)	M=7.77 (SD=1.97)	p>0.05
7.	<i>Okuri-ashi-barai</i>	M=6.13 (SD=1.21)	M=8.48 (SD=1.37)	p<0.05
8.	<i>Tai-otoshi</i>	M=6.27 (SD=1.04)	M=8.55 (SD=1.20)	p<0.05
9.	<i>Harai-goshi</i>	M=6.20 (SD=0.96)	M=8.37 (SD=1.05)	p<0.05
10.	Aesthetics	M=2.07 (SD=0.87)	M=2.73 (SD=0.48)	p>0.05

An increase in the results of the **green belt** (see Table 3) is plausible for all techniques, as $p < 0.01$ or 0.05 . The average increase for all techniques is 1.59 points.

Table 3

Credibility of the Change in Average Technique Assessment of the Green Belt (3rd kyo)

N.	Name of technique	1 st assessment	2 nd assessment	Increase credibility
1.	<i>Ko-soto-gake</i>	M=6.50 (SD=1.08)	M=8.31 (SD=0.67)	p<0.05
2.	<i>Tsuri-goshi</i>	M=7.24 (SD=0.59)	M=8.64 (SD=0.54)	p<0.01
3.	<i>Yoko-otoshi</i>	M=7.47 (SD=0.65)	M=9.07 (SD=0.51)	p<0.01
4.	<i>Ashi-guruma</i>	M=6.78 (SD=0.98)	M=8.60 (SD=0.48)	p<0.01
5.	<i>Uchi-mata</i>	M=6.79 (SD=0.75)	M=8.36 (SD=0.75)	p<0.01
6.	<i>Tomoe-nage</i>	M=7.15 (SD=0.74)	M=8.65 (SD=0.74)	p<0.05
7.	<i>Kata-guruma</i>	M=6.74 (SD=0.66)	M=8.15 (SD=0.74)	p<0.05
8.	Aesthetics	M=1.53 (SD=0.35)	M=2.58 (SD=0.26)	p<0.05

After processing the results, it can be concluded that the use of the content of the model for optimizing the learning of basic techniques of fight in standing position for young judokas technique has improved the technical preparation results for all three grades of students (kyo – yellow, orange, green belt) by an average of 1.82 points. This is due to the fact that more attention was paid to the biomechanics of teaching of judo elements and the implementation of techniques. Thus, the basic principles of performing technical techniques were determined and appropriate means were selected for their acquisition.

Discussion

We can conclude that the optimization of the acquisition of basic

optimizing learning and improving the technical skills of athletes; improving the conditions of the training process, the level of the coach's knowledge, sparing partners in a level of equal and higher technical training, in the context of equipment and inventory (Туманян, 2006; Шулика, 2006; Ciaccioni et al., 2019, 2021).

The obtained results are of practical significance because they allow to understand the development trends of judo technical skills; to find out what techniques are most often used today and to recognize them automatically during the fight at the so-called level of intuition (anticipation); to apply adequate protection and to perform the necessary countermeasures; to develop a tactical technical model against a specific fighter; to make general adjustments in the curriculum and in the training of athletes. Colleagues from the University of Zagreb think similarly. They say that the results of this type of research can serve professionals in choosing more rational technical and tactical training content and in developing new, modern learning procedures and approaches in judo training (Segedi & Sertić, 2014).

The model for optimizing the learning of basic techniques of fight in standing position for young judokas consists of general developmental, complimentary exercises, special developmental and competition exercises. The task of these exercises is to expand the accumulated movement experience, to control body movements in 3 planes, to develop physical properties, with an emphasis on coordination skills. Training should begin with basic elements of judo martial arts, continuing with 40 basic judo martial arts techniques, all of which should be completed in 5 – 7 years. All the above is intended to expand technical tactics. The author of the dissertation used 352 exercises as a basis for the model and divided the learning process into three stages. The stages are as follows: the initial learning stage - creating an idea of the learner's movement; the stage of in-depth and detailed learning (skill development); the stage of strengthening and further development (skill building). 352 exercises were selected as the basis for solving the question of optimizing the learning of the basic techniques of judo's complex and varied standing fighting. These are: general developmental exercises – 30; judo special preparatory exercises – 5; physical training exercises – 29; acrobatic exercises – 16; judo standing martial arts exercises – 39; judo standing basic competition exercises – 179; fall technique learning exercises – 34; custom sports games and simplified types of fighting – 20. All these exercises are arranged in chains of training algorithms. The chain of training algorithms is the sequential use of the training parts (introductory, main, and final) with the chosen tools and methods according to the objectives of the training. Circuits of training

algorithms have been developed for each of the principles of performing the basic technique of upright fighting, which was used to prepare students for taking the set of techniques – the *kyo* exam.

The learning process should start with mastering the elements of judo at a high level, but unfortunately the trainers do not pay much attention to it and are in a hurry to teach steep fighting techniques, as well as to complete the competition tasks. Once the elements of judo are mastered at a high level, you should continue to teach the basics of martial arts. A long-term approach to coaching (adapted from Balyi, 2005) plays a very important role in athlete training. Coaches need to understand what tools and methods are best for each age and what to look for. This knowledge is based on the sensitive periods of human development. The goals and objectives of training change at each age so that the athlete does not get tired of doing the same thing. In his work, the author has grouped the long-term training of judo according to the students' mastery levels (*kyo*).

The results of the research allow to improve the efficiency of the training process and, thus, to improve the new judo learning programme in the initial stage of training. Recommendations for judo coaches to facilitate technical preparation and optimize the learning of complex and various techniques of fight in standing position for children and adolescents aged 7 – 12:

1. The acquisition of the technique must begin with the basic elements of judo standing technique, achieving them at the skill level.
2. This should be followed by 40 basic judo fighting techniques, divided into 5 students' mastery levels (*kyo*).
3. The assessment must take place under equivalent conditions according to the same criteria and parameters, using the same type of judo technique assessment protocols.
4. In order to control the rich spectrum of basic judo techniques of fight in standing position (diversity), the authors of the research recommends the use of the modified *Kodokan* standing basic techniques of fight in standing position classification according to anatomical features, and the division of the technique according to the principle of household performance (lifting-breaking, sweeping, cutting, mowing, chopping), as well as the use of short explanations of throws in the mother tongue for better technical learning.
5. Coaches must use chains of training algorithms, which in accordance with the objectives of the training exercise contain the implementation of successive parts of training (introductory preparation, main and final part), using the selected means and methods.

6. In the period from 7 to 12 years of age, the receipt of students' mastery degrees (*kyo*) is determined by the main criteria for judo training, i.e., technical fitness indicators, which are based on appropriate physical fitness, but the results of the competition – victories and prizes – are a secondary criterion.

Conclusions

At the beginning of the experiment, the level of athletes in all three skill levels (*kyo*) was almost good. The arithmetic mean was 6.57 points:

In the yellow belt (5th *kyo*) the lowest rated *sasae-tsurikomi-ashi* $M=6.07$ ($SD=0.97$), with a value range from 4 to 8, but the highest in the *de-ashi-barai* $M=6.82$ ($SD=0.91$), with a value range from 4 to 8. The average score for the yellow belt is 6.34 points.

In the orange belt (4th *kyo*) the lowest rated *tsurikomi-goshi* $M=5.33$ ($SD=1.79$), with a value range from 3 to 9, but the highest rated *uki-goshi* $M=7.40$ ($SD=0.64$), with a value range from 6 to 8. The average score for the orange belt is 6.44 points.

In the green belt (3rd *kyo*) the lowest rated *ko-soto-gake* $M=6.50$ ($SD=1.08$) with a value range from 4 to 8, but the highest in the *yoko-otoshi* $M=7.47$ ($SD=0.65$), with a value range from 6 to 8. The average score for the green belt is 6.95 points.

The model for optimizing the learning of basic techniques of fight in standing position for young judokas consists of identifying the learning needs of judokas; setting learning objectives; setting learning tasks; choice of learning methods and tools; assessment of learning results, as well as general developmental, auxiliary exercises, special developmental and competition exercises. The task of these exercises: to expand the accumulated experience of movements, to control body movements in 3 planes, to develop physical properties, with an emphasis on coordination skills. The model is based on 352 exercises and the learning process is divided into three stages: the initial learning stage - creating an idea of the learner's movement; the stage of in-depth and detailed learning (skill development); the stage of strengthening and further development (skill building). The content of this model was used in training sessions for a whole year, after which the result of the model implementation was determined.

The evaluation of the acquisition of the basic techniques of fight in standing position after the development and approbation of the learning optimization model shows that the level of athletes in all three levels of students' mastery (*kyo*) is very good. The arithmetic mean is 8.39 points:

In the yellow belt (5th *kyo*) the lowest rated was *sasae-tsurikomi-ashi* $M=7.95$ ($SD=1.03$), with values ranging from 6 to 10, but the highest rated was *O-soto-long* $M=8.21$ ($SD=0.85$), with values ranging from 6 to 10. The average score for the yellow belt is 8.04 points.

In the orange belt (4th *kyo*) the lowest rated was *tsurikomi-goshi* $M=7.77$ ($SD=1.97$), with values ranging from 5 to 10, but the highest was *uki-goshi* $M=9.38$ ($SD=0.64$), with values ranging from 8.5 to 10. The average score for the orange belt is 8.60 points.

In the green belt (3rd *kyo*) *kata-guru* was rated the lowest $M=8.15$ ($SD=0.74$), with values ranging from 7 to 9, but the highest was the *yoko-otoshi* $M=9.07$ ($SD=0.51$), with values ranging from 7.5 to 10. The average score of the green belt is 8.54 points.

The use of the model for optimizing the learning of basic techniques of fight in standing position for young judokas has improved the technical preparation results for all three grades of students (*kyo* - yellow, orange, green belt) by an average of 1.82 points, which is statistically significant.

References

1. Adam, M. (2007). Effectiveness of techniques performed by outstanding judo competitors. *Research Yearbook*, 13(2), 216-220.
2. Baker, J., & Young, B. W. (2014). 20 years later: Deliberate practice and the development of expertise in sport. *International Review of Sport & Exercise Psychology*, 7(1), 135-157.
3. Balyi, I., Way, R., & Higgs, C. (2013). *Long-Term Athlete Development*. Champaign, Illinois: Human Kinetics.
4. Bernstein, N. A. (1947). *O Postroenii Dvizhenii*. [On the construction of movements.] Medgiz: Moscow. *ML Latash (Trans Ed.), Bernstein's construction of movements*, 1-220.
5. Bhatti, M. A. (2000). *Optimization problem formulation*. In *Practical Optimization Methods*, New York, NY: Springer.
6. Bocioaca, L. (2014). Technical and tactical optimization factors in judo. *Procedia-Social and Behavioral Sciences*, 117, 389-394.
7. Bompa, T. O., & Haff, G. (2009). *Periodization: theory and methodology of training*. Leeds: Human Kinetics.
8. Bompa, T. O., & Buzzichelli, C. (2018). *Periodization: theory and methodology of training*. (6th ed.). Human Kinetics. Champaign, IL.
9. Ciaccioni, S., Capranica, L., Forte, R., Chaabene, H., Pesce, C., & Condello, G. (2019). Effects of a Judo Training on Functional Fitness, Anthropometric, and Psychological Variables in Old Novice Practitioners. *Journal of aging and physical activity*, 27(4), 831-842.
10. Ciaccioni, S., Pesce, C., Capranica, L., & Condello, G. (2021). Effects of a judo training program on falling performance, fear of falling and exercise

- motivation in older novice judoka. *Ido Movement for Culture. Journal of Martial Arts Anthropology*, 21(3), 9-17.
11. Ericsson, K. A. (2020). Towards a science of the acquisition of expert performance in sports: Clarifying the differences between deliberate practice and other types of practice. *Journal of sports sciences*, 38(2), 159-176.
 12. Franchini, E., Artioli, G. G., & Brito, C. J. (2013). Judo combat: time-motion analysis and physiology. *International journal of Performance Analysis in sport*, 13(3), 624-641.
 13. Franchini, E., Julio, U., Panissa, V., Lira, F., Agostinho, M., & Branco, B. (2017). Short-term low-volume high-intensity intermittent training improves judo-specific performance. *Journal of Science and Medicine in Sport*, 20, e116.
 14. Iermakov, S., Arziutov, G., & Jagiełło, W. (2016). Quick training of students to judo techniques. *Arch Budo* 12: 15-24.
 15. Illeris, K. (2007) *How we learn. Learning and non-learning in school and beyond*. New York: Routledge.
 16. Inogai, T. & Habersetzer, R. (2002) *Judo pratique*. Paris: Amphora.
 17. Kłys, A., Sterkowicz-przybycień, K., Adam, M., & Casals, C. (2020). Performance analysis considering the technical-tactical variables in female judo athletes at different sport skill levels: Optimization of predictors. *Journal of Physical Education and Sport*, 20(4), 1775-1782.
 18. Koshida, S., Ishii, T., Matsuda, T., & Hashimoto, T. (2017). Biomechanics of judo backward breakfall for different throwing techniques in novice judokas. *European Journal of Sport Science*, 17, 417-424.
 19. Macnamara, B. N., Moreau, D., & Hambrick, D. Z. (2016). The Relationship Between Deliberate Practice and Performance in Sports: A Meta-Analysis. *Perspectives on psychological science: a journal of the Association for Psychological Science*, 11(3), 333-350.
 20. Miarka, B., Julio, U., Vecchio, F. D., Calmet, M., & Franchini, E. (2012). Technique and Tactic in Judo: A Review. *Revista de artes marciais asiáticas*, 5(1), 911-112.
 21. Segedi, I., & Sertić, H. (2014). Classification of judo throwing techniques according to their importance in judo match. *Kinesiology*, 46 (1), 108-113.
 22. Sielużycki, C., Maśliński, J., Kaczmarczyk, P., Kubacki, R., Cieśliński, W.B. & Witkowski, K. (2019). Can Kinect aid motor learning in sportsmen? A study for three standing techniques in judo. *PLoS ONE* 14(2), e0210260.
 23. Туманян, Г. С. (2006). *Школа мастерства борцов, дзюдоистов и самбистов*. [Mastery school of wrestlers, judokas and sambists]. Москва: Академия.
 24. Шулика, Ю. А. & Кobleва, Я. К. (2006). *Дзюдо система и борьба*. [Judo system and wrestling]. Ростов-на-Дону: Феникс.

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