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# OPTIMAL COMBINATION OF TRAINING INFLUENCES ON THE PREPARATION OF ELITE JUDOKAS IN THE ANNUAL CYCLE

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**Aim.** The paper is aimed at the elaboration and scientific argumentation of the optimum relationship between different components of elite judokas' preparation during the annual training cycle. **Materials and methods.** The study was conducted in the national judo male team of the Republic of Moldova (n = 24, 18–25 years). The research was focused on the elaboration of experimental methods for judokas' preparation during the annual training cycle by using physical, technical-tactical, competitive and recovery training. A pre-competitive training mezzocycle (MzC) was planned by distributing the effort parameters to 5 micro-cycles (MiC-s), calculating the mean, ±SD and the correlation between the indicators of training MiC-s by using the Spearman Rank Correlation nonparametric test. The detailed analysis of the annual training plan highlights its structure formed of three periods, 12 MzC-s, and the relationship between physical, technical – tactical and recovery training. **Results.** The results of the statistical calculations reveal (mean; ±SD) the number of days per MiC, namely 3.6 ± 0.89 days; total duration per MiC – 280.35 ± 35.1 min; total duration per training session – 80.77±17.3 min; total duration of general physical training (GPT) 24.51±10.1 min; and of special training (ST) – 45.3 ± 56.3 min. Effort ratio per MiC is 19.08 ± 2.5 %; GPT is 30.0 ± 9.9 %, ST –70.0 ± 9.9 % and the ST means – 129.34 ± 42.92 reps; RANDOURI and SHIAI – 10 ± 5.0 min. The characteristics of elite judokas' pre-competitive training and the correlation of effort parameters in the pre-competitive period were also analyzed. **Conclusion.** The results reveal strong correlations between all the indicators of effort and training means in each MiC of elite judokas' pre-competitive training, which confirms that the combination of different training components improves motor skills and technical-tactical mastery.

***Keywords:*** *judo, correlation, effort, methodology, planning, performance.*

## Introduction

Nowadays, the exigencies to which the athletes are subjected, the competition extent and the permanent increase of the number of competitors for the highest awards within the international famous competitions entail the scientists and practitioners' concern for the identification of some new means and methods for the elite athletes' training [1, 14, 26].

A method to increase the effectiveness of the training consists in the proper structuring and achievement of the training process at different stages of the annual cycle [13]. According to traditional macro-cycle training periodization [11], the entire program has been divided into smaller units; preparatory period, competitive period and transitional period [4, 23, 24].

Training is the activity of planning the accurate objectives of detailed training and performance [2], as well as the means, methods, organization forms and appropriate goals. I. Hantau (2005) shows that the training structure determines the number of macrostructures per year, also the number of mezzo-structures whose content is given by the methodological requirements of the training and conduct of competitive effort [8].

The physical effort in judo is characterized by carrying out the specific techniques that lead to the stress of changing homeostasis level [16, 25].

The tendency of increasing the unidirectional efforts provides the means and methods oriented towards the preponderant solving of a specific task, which is manifested by the development of certain physical qualities or the technique improvement [7, 10]. Although a course of the training effort, formally as a methodical process of their structuring, does not correspond to the complex training principles of athletes [3], the application of such kind of efforts in special micro- and mezzo-cycles increases the effectiveness of the training process [15].

In terms of targeted program concept, the training process constitutes a unified whole, split into parts (stages, mezzo-cycles, micro-cycles) with certain tasks well defined, with objectives arising from the development laws of body adaptation process to a specific regime of muscular activity [13, 19–21].

The main *purpose of the study* is the elaboration and scientific argumentation of the optimum relationship of the different components of elite judokas' preparation during the stages of the annual training cycle, which determines its timeliness.

*Hypothesis of the study*. The combination of different components of the training according to the principle of separate and successive concentrations in micro- and mezzo-cycles of judokas' training sessions can increase the effect of the mutual influence of training efforts and improves the development of motor skills and technical-tactical mastery.

**Materials and Methods**

***Participants and period of the study***

A number of 24 judokas, 18 to 25 years old, in the categories U18 – cadets, U21 – junior and U23 – youth (n = 24; 4 athletes in competition category of 60 kg, 4–66 kg, 3–73 kg, 3–81 kg, 4–90 kg, 3–100 kg and 3 – at +100 kg), members of men's national judo team of the Republic of Moldova, participated in this study. The study was conducted during the competitive year 2017 aiming at the participation in three major competitions and monitored the relationship of the various components of elite judokas' preparation in the training annual cycle stages.

***Structure, content and parameters of effort in the annual training cycle***

The annual training plan of judo athletes was structured in three periods: preparatory, competitive and transitional.

The preparatory period included one mezzo-cycle formed of three micro-cycles.

The competitive period included 10 training mezzo-cycles: 5 pre-competitive and 5 competitive ones.

The transitional period comprised a recovery mezzo-cycle, formed of 4 micro-cycles.

The content and parameters of effort in each training mezzo-cycle (micro-cycles) were established by combining the means of general, specific and technical-tactical physical preparation depending on the training period and the competitive weight class.

***Experimental methods applied***

The practical achievement of judokas' training process structuring was based on the so-called principle of superposition in the organization of the effort with different preponderant directions. The compliance with this principle requires such a distribution of the efforts throughout the annual cycle to ensure the successive application of more intensive and specific influences on the consequences of adopting the previous activities.

The applied experimental method consisted in correlating the components of the general, specific and technical-tactical physical training of judokas, according to the training objectives and periods.

During the preparatory period, the aim was to combine the means of general and specific physical training by progressively moving to the technical and tactical training. In micro-cycle 1 GPT – 55 %, MiC 2 – GPT – 60 % and SPT – 65 % while in MiC 3 – SPT – 70 % and TTT – 75 %. The objectives of the training took into consideration the weight class, therefore the preparation focused on endurance and execution speed in the case of the lower classes 60 to 81 kg and on strength and endurance in the case of the upper classes 90 – +100 kg.

Throughout the competitive period, the pre-competitive training alternated with the competitive one. The pre-competitive mezzo-cycles combined the means of specific physical training and technical-tactical training during each micro-cycle by progressively increasing the effort parameters in conformity with the weight class. The lower classes of 60–81 kg had to perform a higher number of reps compared to the upper classes. The competitive mezzo-cycle focused on the technical-tactical training improvement according to the competitive weight class. The goal set for the lower classes was to reach 65 % number of reps while the upper categories were supposed to reach 35 %.

The transitional period focused on the general physical training in order to maintain the optimal overall fitness at 55–65 % of the initial level of the annual training cycle.

***Statistical analysis***

The correlative analysis was made between the effort parameters and the training means of each MiC-s of the pre-competitive training of elite judokas. The "KyPlot" program for statistical calculation (mean ± SD) and the nonparametric test Spearman Rank Correlation were used

to this end. These indicators refer to MiC-s: horizontal variables (types of MiC-s) and vertical variables (parameters of training effort analyzed in the pre-competitive MzC 7).

**Results and discussions**

In order to organize judokas' training process, the procedure of concentrated efforts was basically applied; it consists in the centralization of the volume of special physical training means at certain stages of the annual cycle. This fact created objective conditions for ensuring the training adequate influence on athlete's body as a prerequisite for increasing the capacity for work of this one [28].

***Experimental methodology structure of the annual training cycle of the elite judokas***

Taking into account these theoretical and methodological principles regarding the problem of optimal structuring of athletes' training annual cycle, some experimental methods for judokas' training were developed. In order to highlight the combination of the preparation influences during the annual training cycle we selected the example of the pre-competitive mezzo-cycle 7 and the competitive mezzo-cycle 8 which had as performance goal the participation in the World U18 Championships Santiago de Chile, World Cadet Championships, 9–13 Aug 2017, Santiago de Chile, Chile.

The structure of these methods is schematically shown in Fig. 1.

The detailed analysis of the data presented in Fig. 1 demonstrates the fact that the spectrum of athletes' training optimization within the annual training cycle includes successive solutions of the tasks of physical training and regeneration based on the principle of successive association for training effort organization, recommended by Verkhoshansky (1985) and adapted by us to the specific character of performance judo [27].

The main strategy of structuring the training process involves the gradual increase of effort basic parameters in terms of specialization activity. The development rhythm of the capacity to execute the high-intensity efforts in the beginning exceeds the tempo of effort growth required by the competitive activity. This contributes to a more advanced level of physical training and creates the conditions to achieve the competitive tasks of maximum intensity that must be solved when the competitive period starts [17, 18].

All the means of physical training (PT) implemented during the preparatory period are divided into three groups, corresponding to the monitoring system of the training influence exerted by these means on judokas' bodies. It results that the moderate intensity exercises (see Fig. 1 – PT1), executed in the first half of the period, are achieved by gradually increasing the volume intended to prepare the body for activity and intensive development of endurance to repeated efforts. The means of physical training with a high potential (see Fig. 1 – PT2) and a large volume during the physical training stages are applied for optimizing the parameters of the intensity of training influences. These means should provide a considerable influence upon judokas' bodies in order to ensure the restructuring for adaptation. The special physical training means of very high intensity (see Fig. 1- PT3) are mainly used at the stage of technique development and are meant to ensure the effectiveness of judokas' activity in conditions similar to the competitive activity.

The optimal combination of the three types of physical training means during the preparatory period guarantees the creation of favorable conditions for the technical and tactical mastery improvement; the predominant setting of the tasks will be performed starting from the second half of the period [10].

The technical and tactical means of training (see Fig. 1 – TTT) play a primary role in the training process, maintaining their significance along the entire competitive period. This stage increases the role of competition preparation (CP) which ensures, along with the technical and tactical training, a maximal training effect and guarantees the competitive activity success [24]. The annual training cycle focused on the participation in three very important competitions where the athletes-subjects of the study ranked as follows: E.M. (18 years old): 3rd place – European Cadet Championships U18 Kaunas, European Cadet Championships, 30 Jun – 1 Jul 2017, Kaunas, Lithuania; 1st place – World U18 Championships Santiago de Chile, World Cadet Championships, 9–13 Aug 2017, Santiago de Chile, Chile and D.G. (23 years old): 1st place – European Championships U23 Podgorica, 10–12 Nov 2017, Podgorica, Montenegro.

A natural diminution of effort intensity, along with the predominance of GPT means consistent with the recovery ones (see Fig. 1), occur during the intermediate period of the annual training cycle. This fact entails the gradual decrease of the main indicators of judokas' training and the optimal training necessary for raising the effort in the next annual training cycle.

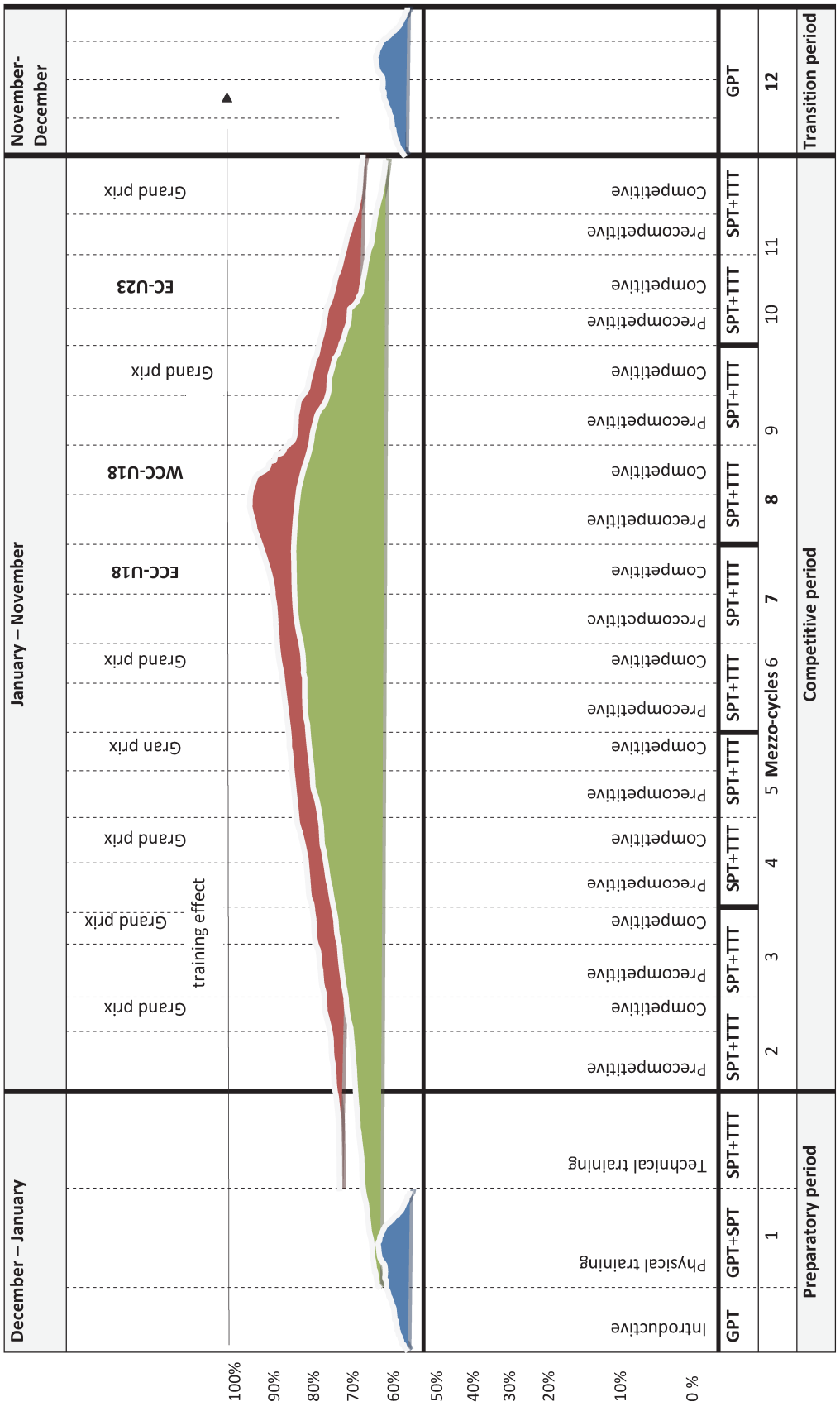


**Fig. 1. Experimental methodology structure of the annual training cycle of judokas' performance in 2017:**
GPT – general physical training; SPT – special physical training; ST – special training; TTT – technical-tactical training; RM – recovery mezzo-cycle (intermediate period); ECC – European Cadet Championships U18, Kaunas, Lithuania; WCC – World Cadet Championships U18, Santiago de Chile, Chile; ec-U23 – European Championships U23, Podgorica, Montenegro

***The characteristics of judo players' pre-competitive training methodology***

In order to prove the efficiency of combining the different components of the training according to the principle of their separate and successive concentration into micro and mezzo-cycles of training within the annual training cycle of the judokas – subjects of the study, we analyzed and estimated the variation of the effort parameters in the competitive period (pre-competitive MzC 7) having as performance goal the participation in the World Cadet Championships U18. The main characteristics of the training effort settings in the pre-competitive training methodology are presented in Table 1.

The pre-competitive MzC 7 is formed of 5 micro-cycles (MiC): I – introductive, II – model, III – regeneration, IV – specialized and V – maintaining (keeping fit and to the parameters of effort).

The detailed analysis of the content of this chart demonstrates that taking into account the goals of pre-competitive training phase [22], the training effort (according to experimental methodology) is divided into 5 relatively independent micro-cycles (MiC-s) lasting 5 days [6, 12].

The first MiC effort is oriented towards the optimal restructuring of body adaptation maximum efforts. The dynamics of the training effort volume has a cyclical character. The biggest indices of volume are scheduled in the introductory MiC, which has 330 min and, on the training, – 82.5 min, namely 23.6% of the training volume of MzC. The volume of the general training per training session has a share of 45.2 % equivalent of 37.2 minutes; the volume of the special training is 54.8 % – 45.3 minutes. Regarding the content of the general training volume estimated in the introductory MiC, in the case of TAISO (warm-up): running, squats, push-ups, exercises for abdomen strength and UKEMI (falls), this one includes 4 sets × 15 reps with 30 sec pauses between sets. As for the special training: TANDOKU-RENSHU (starting the procedure without opponent) 10 sets × 2 min = 280 reps, UCHI-KOMI (with opponent) – 5 sets × 2 min = = 150 reps, totalizing 429 reps / training session and 1716 reps / MiC. The indicators of efforts medium intensity during the MiC have an oscillating character well defined. In the introductory MiC, these ones have a level bigger than the usual and represent 5.2 points. Depending on the objectives of the MiC, there were planned 6 lessons with training, coaching and control fights. The training used the method of serial repetition with basic guiding meant to ensure the adaptation to effort.

In the second MiC it was created the efficient competitive model for the automation of appropriate stereotypes required by the specific conditions of real contests. The volume of effort in the model MiC, expressed in training duration, is 240 min and on training – 80 min, namely 17.1 % of the MzC. At the same time, in the next MiC a considerable improvement of the special training volume is planned; the analyzed correlation shows that the volume of general training per workout session dropped by half related to the introductory MiC with a weight of 20.2 % equivalent to 16.16 minutes while the volume of special training – of 79.8 % equivalent to 63.84 minutes. The content of the means of the general training volume estimated in the model MiC is: for TAISO and UKEMI, each one 2 sets × × 10 reps with 30 sec pause between sets; special training: UCHI-KOMI (with opponent) – 10 sets × × 2 min = 300 reps, BUTSUKARI-GEIKO (study of the procedure or combinations with a partner who does not offer resistance and with different partners) – 5 × 2 min = 160 reps, totalizing 464 reps / training session and 1392 reps / MiC; RANDORI (with task) – NE-WAZA (ground fighting with various partners of different size) and SHIAI (fight similar to a competition, keeping the score without penalties and changing the opponent) – 2–3 × 5 min, pause 5 min. In the model MiC, the level of training intensity increases up to 5.2 points. There were planned 8 lessons with training, coaching and control fights. The training used the method of competitive modeling with basic guiding for the creation of the competitive stereotypes [5, 9].

The third MiC has a character of relief and creation of healthy conditions for regeneration after the maximum efforts. The volume of effort in the MiC, expressed in training duration, is 265 min and on training – 88.33 min, namely 18.9 % of MzC. The volume of general preparation per training session increases related to the model MiC by a share of 34.6 % equivalent to 30.56 minutes and the volume of the special training – 65.4 % equivalent to 57.77 minutes. Concerning the content of the means of the general training volume estimated in the model MiC model: at TAISO and UKEMI too, the number of sets increases up to 4 sets × 10 reps with 30 sec pause between sets, while at special training: TANDOKU-RENSHU (starting the procedure

**Table 1**

**Characteristics of judo players' pre-competitive training methodology**

| Training ways and efforts indices | | Micro-cycles | | | | | Total; Mean ± SD |
|---|---|---|---|---|---|---|---|
| | | I Introductory | II Model | III Regeneration | IV Specialized | V Keeping fit | |
| The MiC-s duration (days) | | 4 | 3 | 3 | 3 | 5 | 18<br>3.6 ± 0.89 |
| The volume of training effort | min / MiC | 330 | 240 | 265 | 300 | 265 | 1400<br>280 ± 35.1 |
| | min / training | 82.5 | 80 | 88.33 | 100 | 53 | 403.83<br>80.77 ± 17.3 |
| The volume of training effort (%) | | 23.6 | 17.1 | 18.9 | 21.4 | 18.9 | 100.0<br>19.98 ± 2.5 |
| The volume of general training means | % | 45.2 | 20.2 | 34.6 | 25.8 | 24,2 | 30.0<br>30.0 ± 9.9 |
| | min | 37.2 | 16.16 | 30.56 | 25.8 | 12.82 | 150<br>24.51 ± 10.1 |
| TAISO, UKEMI | reps no | 4 × 15 | 2 × 10 | 4 × 10 | 3 × 10 | 1 × 10 | + |
| The volume of SP means (%) | % | 54.8 | 79.8 | 65.4 | 74.2 | 75.8 | 70.0<br>70.0 ± 9.9 |
| | min | 45.3 | 63.84 | 57.77 | 74.2 | 40.18 | 241.11<br>45.3 ± 56.3 |
| TANDOKU-RENSHU | reps no | 280 | – | 120 | – | 56 | 456<br>152 ± 115.3 |
| UCHI-KOMI | reps no | 150 | 300 | 96 | 180 | 52 | 778<br>155.6 ± 94.5 |
| BUTSUKARI-GEIKO | reps no | – | 160 | | – | 52 | 212<br>106.0 ± 76.4 |
| YAKU-SOKU-GEIKO | reps no | – | – | 120 | 178 | 48 | 346<br>115.3 ± 65.1 |
| NAGE-KOMI | reps no | – | – | – | 168 | – | 168<br>160 ± 0.0 |
| RANDORI | min | – | 10–15 | – | 5–10 | – | 15–25 |
| SHIAI | min | – | 15 | – | 5–10 | – | 20–25 |
| Total rep. / ST | reps no | 430 | 464 | 336 | 530 | 208 | 1968 |
| Relation of training effort according to intensity areas (%) | minimal | 25.5 | 18.5 | 22.8 | 18.0 | 15.2 | 20.0 |
| | medium | 47.0 | 22.5 | 71.4 | 41.0 | 68.1 | 50.0 |
| | big | 17.5 | 10.0 | 5.8 | 25.0 | 16.7 | 15.0 |
| | maximum | 10.0 | 49.0 | 0 | 16.0 | 0 | 15.0 |
| Medium intensity of MiC-s (points) | | 5.2 | 5.8 | 3.8 | 5.3 | 3.9 | 4.8 |
| Proportion of effort on MiC-s (no rep.) | | 1716 | 1392 | 1007 | 1590 | 1034 | 6720 |
| Number of training battles, coaching and control | | 6 | 8 | 0 | 6 | 0 | 20 |
| Preponderant application of the methods | | Repeated in series | Competitive | Gradually repeated | Repeated in series | Gradually repeated | |
| Basic directionality of MiC-s | | Ensuring the adaptation to effort | Formation of competitive stereotypes | Reestablishment after the maximum effort | Modification of accumulated potential | Creation of the optimum training state | |

without opponent) - 4 × 2 min = 120 reps with 30 sec pause between sets, UCHI-KOMI (with opponent) – 3 × 2 min = 96 reps, YAKU-SOKU-GEIKO (repeating the combinations) – 4 × 2 min = = 120 reps with 30 sec pause between sets, with a total of 355 reps / training session and 1007 reps per MiC. In the MiC of regeneration, the level of training intensity decreases up to 3.8 points. In this training there were not planned lessons with training, coaching and control fights. The training used the method of gradual reps with basic guiding meant to ensure the regeneration after maximal effort.

The fourth MiC (specialized one) has the purpose of active restructuring of the assimilated special training potential in constant dexterities of the technical-tactical mastery, achieving the competitive activity conditions. A substantial dynamic is attested in the correlation of general and special training means of judo athletes. The volume of effort in MiC expressed in training time is 300 min and on training – 100 min, namely 21.4 % of the MzC. The volume of the general preparation per training session decreases by 25.8 % (equivalent to 25.8 minutes) related to MiC of regeneration while the volume of special training is 74.2 % equivalent to 74.2 minutes. As for the content of the general training volume estimated in the specialized MiC at TAISO and UKEMI too, there are 3 sets × 10 reps with a pause of 30 sec between sets; for the special training: UCHI-KOMI (with opponent) – 6 sets × 2 min = 180 reps, YAKU-SOKU-GEIKO – 6 × 2 min = 178 reps, NAGE-KOMI (reps at the preferred procedure, with partner throwing) – 6 × 2 min = 168 reps, with a total amount of 530 reps per training and 1590 reps / MiC; RANDORI (with task) NE-WAZA (grounding fight) and SHIAI – 1–2 × 5 min, pause of 5 min. In the specialized MiC, the level of training intensity increases up to 5.3 points. There were planned 6 lessons with training, coaching and control fights. The training used the method of serial reps with basic guiding for the transformation of the accumulated potential.

The fifth MiC is intended for keeping fit and solves the issues regarding the optimum increase of judo players' training level. The volume of the effort in this MiC expressed in training time is 265 min and on training – 53 min, namely 18.9 % of the MzC. The volume of general training per training session decreases compared to the specialized MiC by a share of 24.2 % equivalent to 12.82 minutes, while the volume of special training increases – 75.8 % equivalent to 40.18 minutes. Concerning the content of general training means volume estimated in the MiC of keeping fit, we notice that in the case of TAISO and UKEMI as well, the number of sets decreases up to 1 set × × 10 reps with a 30 sec pause between sets. As for the special training: TANDOKU-RENSHU (starting the procedure without opponent) – 2 × 2 min = 56 reps with 30 sec pause between sets, UCHI-KOMI (with opponent) – 2 × 2 min = 52 reps, BUTSUKARI-GEIKO – 2 × 2 min = 52 reps, YAKU-SOKU-GEIKO – 2 × 2 min = 48 reps, pause of 30 sec between sets, with a total of 206 reps / training and 1034 reps per MiC. In the keeping fit MiC, the level of training intensity increases up to 3.9 points. There are no sessions with training, coaching and control fights. The training used the method of gradual repetition with basic guiding meant to develop the optimal preparation status.

***Training means of each MiC-s of the pre-competitive training of elite judokas***

The results of the statistical calculations highlight the following values: the mezzo-cycle has 18 days; (mean ± SD) with 3.6 ± 0.89 days; total duration per MiC-s of 1400 min with 280.35 ± 35.1 min, total duration per training = = 403.83 min with 80.77 ± 17.3 min; the total duration of the general physical training is 150 min with 24,51 ± 10,1 min; special training – 241.11 min with 45.3 ± 56.3 min – the detailed presentation of the effort parameters can be found in Table 1 and Fig. 2.

In terms of ratio of the volume effort per MiC, the total amount of the MiC-s is 100 % with 19.08 ± 2.5 %; the ratio of the volume of general physical training is 30 % with 30.0 ± 9.9 % and the specific training – 70 % with 70.0 ± 9.9 %; the effort parameters are shown in detail in Table 1 and Fig. 3.

In terms of number of reps of the special training means within the MZC, we notice that TANDOKU-RENSHU has a total of 456 reps with 152 ± 115.3 reps; UCHI-KOMI – 778 reps with 155.6 ± 94.5 reps; BUTSUKARI-GEIKO – 212 reps with 106.0 ± 76.4 reps; YAKU-SOKU-GEIKO – 346 reps with 115.3 ± 65.1 reps and NAGE-KOMI – 168 reps; the detailed presentation of the specific training means is shown in Table 1 and Fig. 4.

***Training means of each MiC of the competitive training of elite judokas***

Table 2 shows the characteristics of the competitive training methodology for judokas in MzC 8.

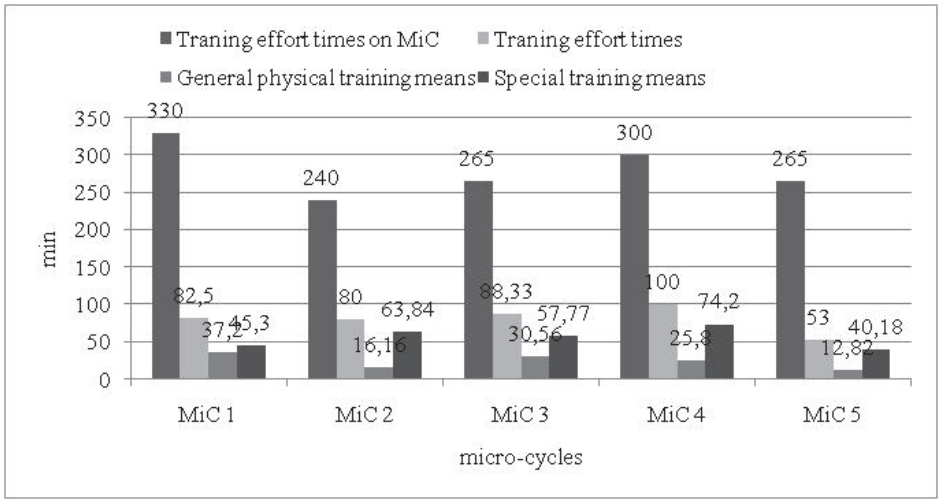


**Fig. 2. Time characteristics of training effort volume:**
MiC – micro-cycles; MiC1 – Introductory; MiC2 – Model; MiC3 – Regeneration; MiC4 – Specialized; MiC5 – Keeping fit

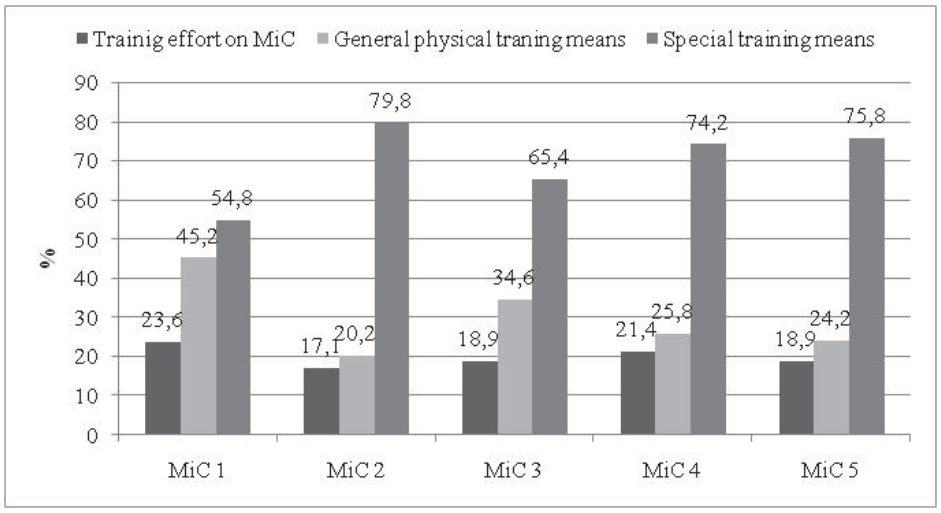


**Fig. 3. Ratio of training effort volume per training session in each micro-cycle**

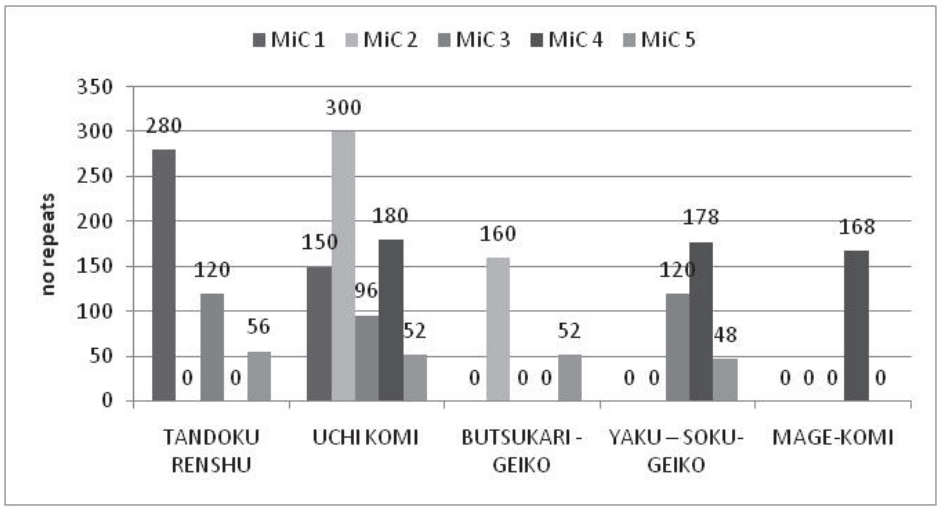


**Fig. 4. Variation of the number of reps of the specific training means in each micro-cycle**

The analysis of the competitive MzC content highlights two MiC-s of training, with a total duration of 9 days and 1000 min. The distribution of the training effort volume / MiC is 60 % and 40 %, where the volume of the specific training means in MiC 1 is 33.3 % and the volume of technical-tactical means is 66.7 % (440 reps); in MiC 2 the volume is 100 % for technical-tactical means (500 reps). Regarding the intensity of training effort, a higher weight of 47 % average intensity in MiC 1 and 49 % maximum intensity in MiC 2 is observed, with a total ratio of the effort per MiC-s of 2200 reps in MiC 1 and 2000 reps in MiC 2.

A non-parametric correlation analysis (Spearman Rank Correlation) was performed to highlight the influence of the training means and effort indicators in the micro-cycles for pre-competitive training of elite judokas (Table 3).

The results of the correlation reveal strong

**Table 2**

**Characteristics of judokas' competitive training methodology (mezzo-cycle 8)**

| Training ways and efforts indicators | | Micro-cycles | | Total |
|---|---|---|---|---|
| | | I | II | |
| MiC-s duration (days) | | 5 | 4 | 9 |
| Volume of training effort | min / MiC | 600 | 400 | 1000 |
| | min/ training | 120 | 100 | 220 |
| Volume of training effort / MiC (%) | | 60 | 40 | 100 |
| Volume of specific training means | % | 33,3 | – | 33,3 |
| | min | 30 | – | 30 |
| TAISO, UKEMI/ MiC | min | 30 | 30 | 60 |
| Volume of technical-tactical means (%) | % | 66,7 | 100 | – |
| | min | 60 | 70 | 111,4 |
| TANDOKU-RENSHU | no of reps | 150 | 300 | 450 |
| UCHI-KOMI | no of reps | 150 | 300 | 450 |
| BUTSUKARI-GEIKO | no of reps | 150 | 160 | 310 |
| YAKU-SOKU-GEIKO | no of reps | 150 | 160 | 310 |
| NAGE-KOMI | no of reps | 100 | 100 | 200 |
| RANDORI | min | 10–15 | 10–15 | 15–25 |
| SHIAI | min | 15 | 15 | 20–25 |
| Total reps / TTT | no of reps | 440 | 500 | 940 |
| Relation of training efforts according to intensity areas (%) | minimal | 25.5 | 18.5 | 20.0 |
| | medium | 47.0 | 22.5 | 50.0 |
| | big | 17.5 | 10.0 | 15.0 |
| | maximum | 10.0 | 49.0 | 15.0 |
| Medium intensity of MiC-s (points) | | 5.2 | 5.8 | 4.8 |
| Ratio of effort per MiC-s (reps) | | 2200 | 2000 | 4200 |

**Table 3**

**Correlation of the indicators of effort parameters in elite judokas' pre-competitive training (n = 12)**

| Rho | Micro-cycles | | | | | Summary values |
|---|---|---|---|---|---|---|
| | I Introductory | II Model | III Regeneration | IV Specialized | V Keeping fit | |
| I introductive | | ***.895 | ***.935 | ***.972 | ***.914 | ***.838 |
| II Model | | | **.735 | ***.867 | **.721 | *.694 |
| III Regeneration | | | | ***.907 | ***.964 | **.801 |
| IV Specialized | | | | | ***.928 | **.796 |
| V Keeping fit | | | | | | **.792 |

Note. Nonparametric Correlation, Rho – Spearman Rank Correlation, *** – $p < 0.001$, ** – $p < 0.01$, * – $p < 0.05$; *These indicators refer to micro-cycles* (n = 12): 1) the micro-cycles duration (days), 2) the volume of training effort (min), 3) the volume of training effort (%), 4) the volume of general training ways (%), 5) the volume of special training means (%), 6–9) the relation of training effort according to intensity areas (%): minimal, medium, big, maximum, 10) the medium intensity of micro-cycles (points), 11) the proportion of effort on micro-cycles (no. of reps) and 12) the number of training battles, coaching and control.

connections between all the indicators of effort and the training means in each MiC of elite judokas pre-competitive training at $p < 0.001$, $p < 0.01$ and $p < 0.05$, which confirms that the combination of different components of the training increases the effect of the mutual influence of training efforts and improves the motor skills development and the technical-tactical mastery.

Taking into consideration the qualification requirements at the Olympic games and according to the timetable of the International Judo Federation, the judo players are required to participate in 10 international competitions at least (Grand Prix, Grand Slam, Masters, European and World Championships). Hence, it is necessary to structure the competitive stage as follows: the period of time is longer (9 months), including 10 pre-competitive mezzo-cycles. In structuring these mezzo-cycles (MzC), a special attention should be given to the regeneration micro-cycles (MiC), lasting 5 days.

The experimental method of training includes a concrete sequence of intensive and extensive training methods; the enhancement of the influence that the exercises exert on athletes' bodies was done by gradually increasing the exercises intensity based on the inclusion of means with higher training effects into the training process and also by raising the volume of extensive training resources.

The annual training plans and the training macro-cycle are early forms of planning and can be found in the description of the training to be carried out [8]. The effect of liquid losses during the training sessions of the competitive period on some biochemical values of the male Judokas competing in the U18 category was also investigated [5].

**Conclusions**

The experimental methodology for combining the training influences within the annual preparation cycle of elite judokas was implemented. The thorough analysis of the structuring strategy of the preparation process entailed the gradual increase of the effort basic parameters regarding the specialization activity. The rhythm of development of the capacity to execute high-intensity efforts exceeded initially the growth rate of the effort required by the competitive activity. This contributed to the increase of the physical training level and created optimal conditions for adapting and combining the means of specific and technical-tactical training to achieve the competitive tasks of maximum intensity.

An analysis and estimation of effort parameters during the competitive period of the pre-competitive mezzo-cycle was made regarding the efficiency of combining the different components of the training according to the principle of their separate and successive concentration in micro and mezzo-cycles of training within the annual training cycle of the elite judo players. The characteristics of the pre-competitive training methodology were identified as for the relationship of the training means content and the combination of effort parameters influences in the introductory, regeneration, specialized and keeping fit MiC-s.

The relationship of the weight of effort parameters was ensured by combining the means of specific physical training and technical-tactical training corresponding to training MiC within the competitive MzC. The results of the correlation of effort parameters of the elite judokas during the pre-competitive training highlights strong connections between the effort indicators and the content of the means, which confirms that the combination of different components of the training increases the effect of the mutual influence of training efforts and improves the motor skills development and the technical-tactical mastery.

The combination of training different components consistent with the principle of separate and successive concentrations in micro- and mezzo-cycles of judokas' training enhances the effect of the mutual influence of training efforts and improves the development of the motor skills and technical-tactical mastery, which validates the hypothesis proposed by this paper.

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# ОПТИМАЛЬНОЕ СОЧЕТАНИЕ ТРЕНИРОВОЧНЫХ ВОЗДЕЙСТВИЙ ПРИ ПОДГОТОВКЕ ЭЛИТНЫХ ДЗЮДОИСТОВ В ГОДОВОМ ЦИКЛЕ

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Целью исследования является разработка и научное обоснование оптимального соотношения различных компонентов подготовки элитных дзюдоистов на этапах годового тренировочного цикла. **Материалы и методы.** Исследование проводилось в мужской национальной сборной Республики Молдова по дзюдо с участием 24 спортсменов в возрасте от 18 до 25 лет. Исследование было направлено на разработку экспериментальных методов подготовки дзюдоистов в течение годового тренировочного цикла путем последовательного решения задач физической, технико-тактической, соревновательной и восстановительной подготовки. Предсоревновательный тренировочный мезоцикл (MzC) был расписан с учетом деления на 5 микроциклов (MiC-s), вычисления среднего значения ± SD и корреляции показателей тренировочного процесса MiC-s по Спирмену. Подробный анализ годового плана тренировок подчеркивает его структуру, включающую три этапа подготовки, 12 мезоциклов, а также подразумевающую взаимосвязь физической, технико-тактической и восстановительной подготовки. **Результаты.** Статистические расчеты демонстрируют (среднее значение ± стандартное отклонение) количество дней на микроцикл, а именно 3,6 ± 0,89 суток; общую продолжительность микроцикла – 280,35 ± 35,1 мин, общую продолжительность занятия – 80,77 ± 17,3 мин; общую продолжительность общефизической подготовки (ОФП) 24,51 ± 10,1 мин и специальной подготовки (СП) – 45,3 ± 56,3 мин. Что касается распределения нагрузки в течение микроцикла, то оно выглядит следующим образом: показатель усилий – 19,08 ± 2,5%; ОФП – 30,0 ± 9,9%, СП – 70,0 ± 9,9%, среднее значение СП – 129,34 ± 42,92 повторений, РАНДУРИ и ШИАЙ – 10 ± 5,0 мин. Также были проанализированы характеристики предсоревновательной подготовки элитных дзюдоистов и соотношение показателей параметров усилий в предсоревновательной подготовке. **Заключение.** Корреляционный анализ демонстрирует сильную

взаимосвязь между всеми показателями усилий и тренировочными средствами в каждом микроцикле предсоревновательной подготовки элитных дзюдоистов, что подтверждает, что сочетание различных тренировочных компонентов улучшает развитие моторики и технико-тактическое мастерство.

***Ключевые слова:*** *дзюдо, корреляция, показатели усилий, методология, планирование, результативность.*

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