

## PERFECTION OF BADMINTON PLAYERS' SPEED-POWER FITNESS WITH THE HELP OF TRAINING MEANS' VARIABLE MODULES

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**Abstract.** *Purpose:* to determine effectiveness of badminton players' speed power fitness program's perfection at stage of specialized basic training with different variants of training means modules' combination. *Material:* in experiment badminton players of 15-17 years' age (from 1<sup>st</sup> sports grade to master of sports) participated. The sportsmen were divided into three experimental groups (10 persons in each). The trainings were being conducted during 24 weeks by different variants of program. *Results:* we created different complexes of exercises, combined in three modules (every of each lasted eight week micro-cycles). Every module has more expressed meaningful parts (1 – speed, 2 – power, 3 – jumping). All modules were combined in program of badminton players' speed power fitness perfection. For every experimental group we worked out distinguishing variant of modules' combination in program (first variant – 1-2-3 modules; second – 2-3-1; third – 3-1-2). General duration of program was 24 week micro-cycles. *Conclusions:* we recommended some variants of variable modules' combination for badminton players' speed-power fitness perfection. With it, we can regard total influence on the following: speed-power endurance, work with support on own body, quick movements of different body links.

**Key words:** testing, program, combining, result, increment, comparison.

### Introduction

Perfection of structure and content of competition functioning in badminton points at increasing importance of sportsmen's speed-power fitness, which influences on efficiency [7, 8, 10, and 11]. Specialists note that speed-power abilities are decisive factor in fulfillment of technical-tactic actions and their efficiency [1, 3, 6, 9, and 12].

Recent time there have been fulfilled a number of researches on badminton sportsmen's training [6, 12, 13]. Among them there are works, devoted to methodic of attacking strike training; control over sportsmen's special motor fitness with the help of flexible automatic system (on example of badminton); increase of speed characteristics, considering lability of nervous system and speed power fitness of junior female badminton players (12-16 years' age) [2, 4, 5, 13, 15]. Analysis of literature sources permitted to determine that elucidation of speed-power training problems does not meet modern requirements to badminton players' fitness [2, 3, and 6].

It permitted to say about contradiction between modern requirements to speed-power fitness in badminton and insufficient substantiation of theoretical and methodic principles of elite badminton players' special physical fitness. All these witness about importance of the offered by us research.

*The purpose of the research:* is to determine effectiveness of badminton players' speed power fitness program's perfection at stage of specialized basic training with different variants of training means modules' combination.

### Material and methods

*Participants:* in experiment badminton players of 15-17 years' age (from 1<sup>st</sup> grade to master of sports) participated. The sportsmen were divided into three experimental groups (10 persons in each) according to localization of training functioning. The sportsmen's parents gave written consents for their children's participation in the research. The program (protocol) of the research was approved by outdoor games department of the university.

*Organization of the research:* the researches were carried out on the base of CJSSOR<sup>1</sup> "Meteor" (Dnepropetrovsk), CJSS<sup>2</sup> at Pedagogic state academy of building and architecture (Dnepropetrovsk), Kharkov regional higher educational establishment of physical culture and sports (Kharkov) and SHS<sup>3</sup>.

For verification of variable modules we conducted comparative pedagogic experiment. Different complexes of exercises, combined in three separate modules (each of eight weekly micro-cycles' duration) were created. Every module has more expressed meaningful parts (1 – speed, 2 – power, 3 – jumping). All modules were combined in program of badminton players' speed power fitness perfection. For every experimental group we worked out distinguishing variant of modules' combination in program (first variant – 1-2-3 modules; second – 2-3-1; third – 3-1-2). General duration of program was 24 week micro-cycles. Control measurements of speed-power fitness were fulfilled at the beginning and after trainings in every module. For control we used means, tested at previous stages of the research [5]. In the present article we give only changes in fitness according to the results of the whole program (24 micro-cycles).

<sup>1</sup> – CJSSOR – children-junior sports school of Olympic reserve; <sup>2</sup> – CJSS – children-junior sports school;  
<sup>3</sup> – SHS – school of highest sportsmanship (note of translator)

*Statistical analysis:* processing of empirical data was conducted on the base of determination of normal distribution by Shapiro-Wilka criterion (n=10). It permitted to use Manna- Witny criterion (n=10) for determination of distribution's confidence with critical level of confidence  $p \leq 0.05$ .

### Results of the research

At previous stages of the research it was fulfilled the following: 1) substantiation of complex control of badminton players' speed-power fitness at stage of specialized basic training; 2) pedagogic observation over the level of speed-power fitness; 3) theoretical substantiation of pedagogic experiment program [3, 4, 5, 6, 19].

In this article we present substantiation of effectiveness of the offered by us approach to perfection of badminton players' speed-power abilities. It envisaged determination of effectiveness of training modules' previously substantiated combinations. Objective duration of badminton players' speed power fitness perfection included 24 training micro-cycles. These micro-cycles were combined in 6 meso-cycles (2 meso-cycles for realization of one training module) in preparatory period of training macro-cycle.

The need in implementation of variability in badminton players' training process is connected with two main factors. The first is beginning of special purpose training influences and demand in response (adaptation) of organism. The second is connected with provisioning of comprehensive training influences on sportsmen's organism. Its purpose is avoiding of training process's monotonous character.

Let us regard effectiveness of all variants of training modules' combinations (see table 1). The first variant of program envisaged the following combination of modules: module 1 ("speed"), module 2 ("power"), module 3 ("jumping"). Such combination of modules, in general, pointed at the following results. By majority of control exercises there were positive shifts in badminton players' speed-power fitness from 6.27 to 15.06% at  $p \leq 0.05-0.01$ . Such positive changes happened by results of control exercises "Skipping (times)", "Moving between two lines 2x5 meters, face forward, back – backward (sec.)", "Pressing ups in lying position during 15 sec. (times)", "Throwing of filled ball (2 kg) from standing initial position, by one arm (m)". For other variant of variable modules' combination distinctions were found (see table). By most of exercises we found increments of mean group results. For this group of program's variant we determined the highest level of confidentiality ( $p \leq 0.01$ ) – control exercise "Skipping" (7.10%).

By results of this variant's realization we found no confident distinctions in three control exercises. Control exercises "Long jump from the spot by two legs", "Torso rising in sitting position during 30 sec." and "Change of feet position in lunge during 15 sec." resulted in positive but not confident changes (2.26–6.24% at  $p > 0.05$ ).

The highest increment in this variant of program was observed in exercise for speed-power endurance (Pressing ups in lying position during 15 sec.) – 17.23% ( $p \leq 0.05$ ).

The last variant of training means' combination envisaged the following series: module 3 ("jumping"), module 1 ("speed") and module 2 ("power") (see table).

Realization of third variant of modules' combination showed that their combination, volume and intensity manifested in different ways.

**Table.** Effectiveness of first variant of training means' modules combination for badminton players' speed-power training at stage of specialized preparation (n=30)

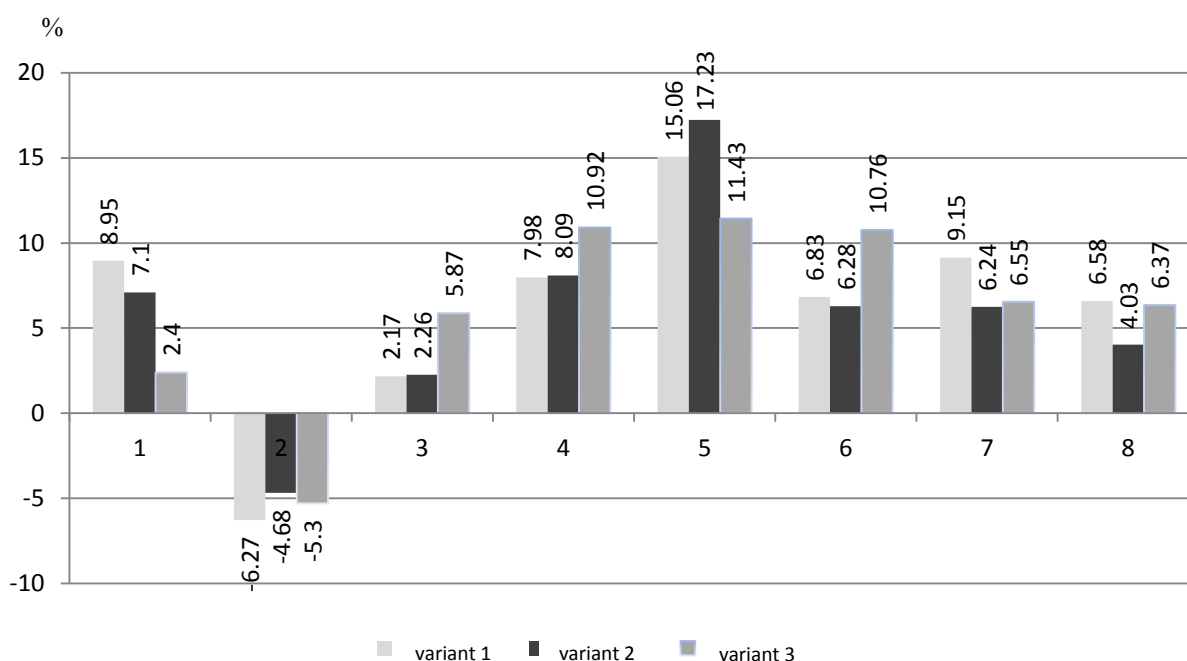
Control exercise	Variant 1 (n=10)				Variant 2 (n=10)				Variant 3 (n=10)			
	Initial data	Final data	Difference between indicators absolute	p (U)	Initial data	Final data	Difference between indicators absolute	p (U)	Initial data	Final data	Difference between indicators absolute	p (U)
Skipping (times)	51.2 ±4.48	55.9 ±5.62	4.7	≤0.01 (16.5)	48.6 ±2.08	52.0 ±1.6	3.4	≤0.01 (17)	51.5 ±2.9	52.7 ±2.7	1.2	>0.05 (39.5)
Moving between two lines 2x5 meters, face forward, back –	3.28 ±0.27	3.05 ±0.10	0.23	≤0.05 (25)	3.16 ±0.12	3.01 ±0.122	-0.15	≤0.05 (24)	3.36 ±0.19	3.17 ±0.09	-0.19	≤0.01 (24.5)

backward (sec.)												
Long jump from the spot by two legs (cm)	244.8 ±7.0	250.1 ±6.9	5.3	>0.05 (32.5)	235.5 ±8.9	240.6 ±4.84	5.1	>0.05 (38.5)	232.8 ±8.56	246.3 ±6.7	13.5	≤0.01 (16.5)
Moving on court during 15 sec. (quantity of passed points)	12.9 ±0.9	13.9 ±0.74	1.0	≤0.05 (24.5)	13.1 ±0.92	14.1 ±0.36	1.0	≤0.05 (23.5)	12.2 ±0.52	13.5 ±0.5	1.3	≤0.01 (10)
Pressing ups in lying position during 15 sec.	19.6 ±2.68	22.3 ±2.18	2.7	≤0.05 (22)	19.4 ±1.72	22.8 ±2.92	3.4	≤0.05 (23)	19.8 ±2.44	22.0 ±2.2	2.2	>0.05 (28)
Throwing of filled ball (2 kg) from standing initial position, by one arm (m)	12.93 ±1.15	13.75 ±0.82	0.82	>0.05 (31.5)	12.61 ±1.43	13.33 ±1.00	0.72	≤0.05 (26.5)	12.07 ±0.59	13.36 ±0.68	1.29	≤0.01 (12)
Torso rising in sitting position during 30 sec. (times)	26.7 ±3.3	28.9 ±2.72	2.2	>0.05 (33,5)	28.0 ±3.0	29.5 ±1.6	1.5	>0.05 (37)	25.2 ±1.88	26.8 ±1.64	1.6	>0.05 (30)
Change of feet position in lunge during 15 sec. (times)	31.7 ±2.44	33.7 ±1.58	2.0	>0.05 (30)	33.5 ±2.6	34.7 ±2.1	1.2	>0.05 (39)	37.6 ±2.72	39.8 ±1.76	2.2	≤0.05 (25)

Notes:  $p \leq 0.05$  at  $U_{cr} \leq 27$ ;  $p \leq 0.01$  at  $U_{cr} \leq 19$ .

By results of third program's variant we found positive confident increment of mean group result of control exercise "Change of feet position in lunge during 15 sec." (6.37%,  $p \leq 0.05$ ). In most of control exercises this variant showed its effectiveness by results' increment in the range of from 5.30 to 10.76% ( $p \leq 0.05-0.01$ ). It permits to recommend it for application in practice of badminton players' training: solution of tasks of speed-power fitness perfection.

One of the most important components of our research was formation of possibility of our program different variants variable application. That is why, for achievement of it we conducted comparative analysis of all such modules (see fig.).



**Fig.** Comparative effectiveness of combination variants of speed-power training means' modules in badminton players' training process at stage of specialized basic training (%):

- 1 – Skipping (times);
- 2 – Moving between two lines 2x5 meters, face forward, back – backward (sec.);
- 3 – Long jump from the spot by two legs (cm);
- 4 – Moving on court during 15 sec. (quantity of passed points);
- 5 – Pressing ups in lying position during 15 sec.;
- 6 – Throwing of filled ball (2 kg) from standing initial position, by one arm (m);
- 7 – Torso rising in sitting position during 30 sec. (times);
- 8 – Change of feet position in lunge during 15 sec. (times).

By indicators of control exercise “Skipping” in first and second variants we observed to some extent higher effectiveness (8.95 and 7.1%) comparatively with third variant of variable modules' combination. It should be noted that advantage of the first variant has more expressed positive increments of results in exercises “Moving between two lines 2x5 meters, face forward, back – backward” (6.27%), “Torso rising in sitting position during 30 sec.” (9.15%).

The second variant of variable modules' combination more expressively influenced on muscles, involved in work. By structure and meaning such work corresponds to control exercise “Pressing ups in lying position during 15 sec.” (17.23%). In other cases effectiveness of this variant is connected with average indicators of more expressed signs of pluses or minuses of training effect.

Third variant of variable modules' combination influenced most of all on indicators in control exercises “Moving on court during 15 sec.”, “Throwing of filled ball (2 kg) from standing initial position, by one arm” (10.92 and 10.76% accordingly). Separately it is necessary to note resulting influence in exercise “Change of feet position in lunge during 15 sec.”. In this exercise positive shifts approximately of the same level were achieved by two program variants (first– 6.58% and third – 6.37%).

### Discussion

The received data permit to speak about obtaining of new scientific result in realization of sportsmen's training system's principles [7, 9, 10, 14, and 18]. It concerns variability principle of training loads' content in training process at stage of specialized basic training.

The received data also supplement the available in scientific literature information about orientation of different speed power training means' groups' influence and their combination in appropriate programs [16, 17, 20, 22, and 23]. For example the accents in the first program variant ensure perfection of muscle groups, which are involved in work with little amplitude. With it, quick change of sportsman's position on court takes place, involving alternate work of upper and lower limbs.

It was found that in a number of exercises (“Long jump from the spot by two legs”, Throwing of filled ball (2 kg) from standing initial position, by one arm”, “Torso rising in sitting position during 30 sec.”, “Change of feet position in lunge during 15 sec.”) there were no confident positive results. The determined results showed that in this variant muscles’ work with loads is unsatisfactory. But it means that it is possible to change loads in realization of first program variant [7, 9].

It can be assumed that second variant of variable modules’ combination did not result in adequate adaptive changes in functional provisioning of sportsmen’s muscular work [2, 8, 12].

Realization of the third program variant proved some scientific data about high effectiveness of the program, providing optimal selection of training means [1, 9]. However, combination of variable modules by this variant witnessed the absence of confidence increments in the following control exercises: “Torso rising in sitting position during 30 sec.”, “Pressing ups in lying position during 15 sec.”, “Skipping” (2.40–11.43% at  $p > 0.05$ ).

The received results also proved specialists assumption that different combinations of training means have different localization of training effect [9, 12, 13, 21].

Thus, the received results permit to recommend some variants of variable modules’ combination for solution of training process’s targeted tasks oriented on perfection of badminton players’ speed-power fitness. With it, general influence on speed-power endurance, work with support on own body, quick movements of separate body links can be regarded.

### Conclusions

1. Realization of our program showed that in most of control exercises all variants gave positive increment ( $p \leq 0.05-0.01$ ). Though, first variant of variable modules’ combination (1–2–3) influenced better in exercises “Skipping” (8.95%); “Torso rising in sitting position during 30 sec.” (9.15%). Second variant (2–3–1) showed the best results in exercises “Pressing ups in lying position during 15 sec.” (17.23%). Third variant (3–1–2) was the most efficient in exercises “Moving on court during 15 sec.” (10.92%), “Throwing of filled ball (2 kg) from standing initial position, by one arm” (10.76%).

2. Some variants of variable modules’ combination can be recommended for perfection of badminton players’ speed-power fitness. With it, general influence on speed-power endurance, work with support on own body, quick movements of separate body links can be regarded.

*The prospects of further researches* imply determination of changes’ dynamic in badminton players’ speed-power fitness indicators at stage of specialized basic training.

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### Conflict of interests

The authors declare that there is no conflict of interests.

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