

BIOKINEMATIC STRUCTURE OF TECHNIQUES WRESTLERS DURING PRE-BASIC TRAINING

Sinigovets S.V.

National University of Physical Education and Sport of Ukraine

Annotation. The theoretical aspects of freestyle wrestlers. Experimentally investigated the structural elements of techniques during pre-basic training. The study involved 28 young fighters. Held video computer analysis techniques. Identified biomechanical characteristics defined kinematic structure of the temporal and spatial-temporal characteristics of the basic techniques. Shown variability of the individual phases of the basic techniques. Structural dynamics of the resulting velocities of the individual body bioelement fighters showed characteristic changes depending on the mode and direction of the motor action. Found that the predominant contribution to the biokinematic structure of technical actions were resulting velocities torso of young fighters.

Keywords: freestyle wrestlers, biokinematic, structure, basic, technical, techniques.

Introduction

At present time in system of technical preparation in wrestling there exists sufficient argumentation of what techniques or motion actions shall be trained, but much worse is the situation with instructions how to realize it on high methodic level [4]. For successful solution of this task it is necessary to profoundly scientifically study the content of basic motion techniques' training in free style wrestling as well as to study its kinematic structure [8].

As it is known, technique in sport wrestling is a combination of operations, which is a resultant part of attacking, counter-attacking or defensive action (throw, knock down, shifting, overturn, covering etc.) [10].

According to classification of wrestling's techniques, which was developed by A.P. Kuptosov [6], their quantity and kinds are determined. In its basis there are movements of torso: forward bent; backward arching; forward-left or forward right twisting; to the left or to the right with holding of leg and arm in turn; to the left or to the right with holding of arm and neck by turn and so on.

As per R. Petrov [5], techniques have the following characteristics: effectiveness, reliability, variability. Effectiveness is determined by efficiency (quality of referees' marks, frequency of "touch" victories and etc.) and frequency of actual attempts. Reliability of technique is determined by frequency of evaluated attempts and real possibility of counter attacks' fulfillment. Actually, reliability of a technique depends on overcoming of hacking factors (changing of situation, of physical and psychic state of a wrestler, initial positions, external conditions). Variability of a technique is determined by possibility of varying of its fulfillments' means. The more such variants are, i.e. the wider is the range of its space, power, time and rhythmic characteristics, the higher variability of technique is.

Techniques have relatively steady structure, space, time, power and rhythmic characteristics. Structure of wrestling techniques means simultaneous and successive fulfillment of separate movement's elements in time as one complex action. Specific movements of torso in combination with the most frequent movements of arms (holds) and legs are the base of the structure.

Systemizing of scientific researches in the field of wrestling permitted to determine the structure of techniques, which, by the data of I.I. Alikhanov [1], S.V. Bagayev [2], G.S. Tumanian [7], Yu.A. Shakhmuradov IO.A. [10,11,12] includes the following phases of actions and movements:

- 1) preliminary (preparatory) actions (hold, entering of attacker from initial position in starting, making adversary to lose balance);
- 2) main actions (separation of adversary from the mat, final imbalance of him, turn, start of falling);
- 3) final actions (falling down, flight, landing).

Success of technique depends to large extent on quality of first phase's execution, preliminary actions, which are aimed at accumulation of required mechanical energy for further attacking actions. It has been proved that first phase is longer than the second and also it has been established that wrong entering in start position results in failure of throw. In the second phase most important actions are carried out, that is why it should be regarded a determinative one both from the point of view of efficiency and as an important principle of throw training's construction. The main aim of motion actions in this phase is successful realization of mechanical energy, accumulated in previous phase. Motion actions in the third phase are pointed at correction of realized mechanical energy for receiving of prize points, victory and so on.

Bio mechanical structure of technical actions in wrestling is variable, in connection with its variability and complexity, and has different time, space-time and dynamic characteristics. Owing to difference of structural elements of technical actions, it is necessary to study and form young wrestlers' optimal rhythmic components of them. Especially it is important with training of young wrestlers with basic techniques that served the basis for the present researches.

The researches have been carried out in compliance with scientific topic list of department of kinesiology of National university of physical education and sports of Ukraine. Problems of the work corresponds to subject "Improvement of means of tactic-technical preparation of qualified sportsmen with the help of modern measuring

technologies, analysis and movements' simulation means" of combined plan of SRW in the field of physical culture and sports for 2010-2014.

Purpose, tasks of the work, material and methods

The purpose of the research is to study specific characteristics of kinematic structure of free style wrestlers' techniques at the stage of preliminary basic preparation.

The task of the research: to study structural peculiarities of techniques in wrestling.

The methods and organization of the researches: in the work the following methods were used: analysis of scientific-methodic literature, generalization, systemizing, bio mechanical, video-computer analysis, methods of mathematical statistics.

For determination of time and space-time characteristics of basic techniques we used program complex of bio-mechanical video-computer analysis «BioVideo».

The researches covered 28 junior free style wrestlers CSCJSS specialized on martial arts, Kiyev, of SCJSS "Olimpiyets", Chernigov, of CJSS "Spartak", Nezhin. The wrestlers were 13-14 years old and related, as per qualification and program requirements of sports school, to the stage of preliminary basic preparation [3].

With the help of video-computer method there were analyzed techniques, which were improved by junior wrestlers on the stage of preliminary basic preparation, videlicet: Throw by turn with hold of arm and neck; throw by turn with arm hold on shoulder; Throw by turn with hold of hold and similar leg "mill"; knock down by pushing with hold of one or two legs. Time, space-time characteristics of junior wrestlers' bio links in sagittal plane, as per the model, depicted in fig. 1, were the base of bio-mechanical analysis.

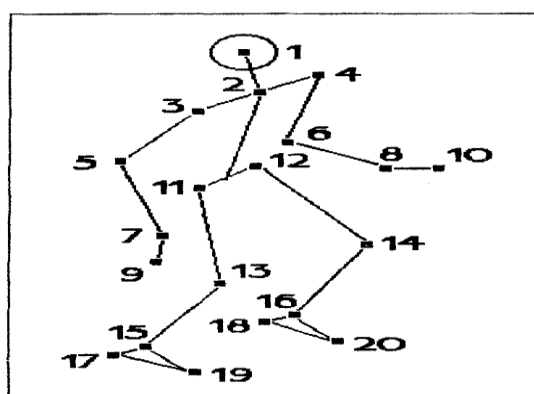


Fig.1. Diagram of human model by 20 points (I.V. Khmel'nitskaya, 2004)

Results of the researches

In the researches we presented the results of studying of structural elements junior wrestlers' techniques with using of time characteristics and resultant velocity of mass center (MC) of bio-links.

Results of studying of time structure of junior wrestlers' techniques confirm the data of researches of other authors, which are based on assumptions that the first phase is longer than the second. Mean indicators of first phase were within limits from 0.50 to 0.96 sec. and the second – from 0.33 to 0.50 sec., the third – were from 0.72 – to 1.05 sec. Percentage correlation of separate phases' duration in the structure of the studied techniques in preliminary actions was in the limits from 26.9 to 47.56%, in main actions – from 16.5 to 23.4%, while in resultant actions – from– 35.9 to 51.4% (see table 1).

Table 1

Time structure of basis techniques

Фазы	Time structure indicators	Techniques				
		Throw by turn with hold of arm and neck	Throw by turn with hold of arm on shoulder	Throw by turn with hold of arm and similar leg "mill"	Knock down by pushing with hold of leg	Knock down by pushing with hold of two legs
1 phase	Duration, sec	0.96	0.50	0.75	0.63	0.70
	Duration, %	47.56	26.90	39.86	29.93	31.24
2 phase	Duration, sec	0.33	0.41	0.40	0.49	0.50
	Duration, %	16.50	21.66	21.25	23.42	22.18
3 phase	Duration, sec	0.72	0.96	0.73	0.98	1.05
	Duration, %	35.94	51.43	38.88	46.65	46.58

Results of study of resultant velocities' structural dynamics of junior wrestlers separate bio-links with fulfillment of basic techniques witness about characteristic changes depending on the method of fulfillment and direction of motion actions (see table 2).

With analyzing of kinetic structure of the studied techniques in preliminary actions indicators of resultant velocity of MC of head, torso and general MC were in limits from 0.52 to 1.52 m·sec⁻¹, and mean values of upper and lower limbs' links – from 0.50 to 1.41 m·sec⁻¹ and from 0.81 to 1.59 m·sec⁻¹. Mean values of velocities of the studied bio-links of first phase (V_{av. phase}) of basic techniques were in limits 0.63 to 1.41 m·sec⁻¹. In main actions the studied characteristics had the following values: head, torso, GMC – from 0.51 to 1.62 m·sec⁻¹; upper limbs – from 0.55 to 1.42 m·sec⁻¹; lower limbs – from 0.55 to 1.55 m·sec⁻¹.

Table 2

Mean statistic indicators of resultant velocity in (m·sec⁻¹) of body bio-links with fulfillment of techniques by free style junior wrestlers

Techniques	Phase	Head	Torso	GMC	Right shoulder	Left shoulder	Right forearm	Left forearm	Right hand	Left hand	Right thigh	Left thigh	Right shin	Left shin	Right foot	Left foot
Throw by turn with hold of arm and neck	1	0.60	0.52	0.56	0.30	0.65	0.36	0.69	0.32	0.66	0.61	0.92	0.58	0.83	0.61	1.30
	2	1.36	0.93	0.76	1.50	1.24	1.57	1.21	1.68	1.14	0.84	0.56	0.70	0.25	0.60	0.14
	3	1.04	1.12	0.97	1.61	0.97	1.77	0.83	1.56	0.99	1.01	0.90	0.59	0.60	0.49	0.67
Throw by turn with hold of arm on shoulder	1	0.57	0.54	0.57	0.70	0.60	0.98	0.68	1.14	0.77	1.00	0.82	0.99	0.92	1.10	1.15
	2	1.62	1.30	1.32	1.13	1.77	1.16	1.46	1.53	1.47	1.10	1.57	0.95	1.34	0.77	1.35
	3	1.02	0.73	0.52	1.13	0.75	1.11	0.90	1.16	0.99	0.53	0.56	0.37	0.37	0.65	0.41
Throw by turn with hold of arm and similar leg "mill"	1	1.15	1.52	1.51	1.61	1.20	1.49	1.04	1.31	0.84	2.08	1.63	1.89	1.45	1.50	0.99
	2	0.81	0.61	0.51	0.55	0.80	0.59	0.89	0.71	0.94	0.34	0.81	0.19	0.67	0.26	1.06
	3	1.27	0.78	0.70	1.20	0.89	1.30	0.96	1.37	1.09	0.74	0.53	0.89	0.82	1.14	0.93
Knock down by pushing with hold of leg	1	1.34	1.38	1.34	1.68	1.09	1.77	0.93	1.81	1.16	1.58	1.40	1.28	1.17	0.91	1.13
	2	1.31	1.21	1.32	1.15	1.53	1.32	1.60	1.38	1.52	1.25	1.29	1.86	1.27	2.29	1.34
	3	2.33	2.07	1.91	1.73	2.31	1.83	2.22	1.59	1.99	1.68	1.70	1.50	1.46	1.13	1.55
Knock down by pushing with hold of two legs	1	1.05	1.34	1.23	1.35	1.19	1.16	1.15	1.25	1.13	1.53	1.68	1.39	1.76	1.00	1.38
	2	0.98	1.12	1.14	1.01	1.17	0.93	1.28	0.97	1.25	1.37	0.89	1.35	0.55	1.66	0.24
	3	1.32	0.97	1.11	0.95	1.29	1.01	1.32	1.10	1.34	0.71	0.92	0.66	1.03	0.62	1.08

Mean values of velocities of the studied bio-links of second phase's techniques were from 0.65 to 1.44 m·sec⁻¹. Resultant actions were characterized by such mean values of separate bio-links' and parts of body velocities: head and torso, GMC – from 0.73 to 2.33 m·sec⁻¹, upper limbs – from 1.01 to 1.95 m·sec⁻¹, lower limbs – from 0.48 to 1.50 m·sec⁻¹. Mean values of velocities of the researched bio-links of third phase techniques were from 0.75 to 1.80 m·sec⁻¹.

Using of correlation analysis permitted to determine factorial structure of bio-links' resultant velocities of junior wrestlers in every phase of the studied technical actions. In analysis we used percentage contributions of indicators in general dispersion at the level not less than 8.0%.

In particular, with studying of the first phase of throw by turn with hold of arm and neck percentage domination belonged to resultant velocities of GMC – 8.27%, of left and right thighs, correspondingly 8.22 and 8.35%, of right forearm – 8.36% and torso- 8.12%. Analysis of correlation tables determined the following domination of contributions of resultant velocities of separate bio-links in general dispersion with fulfillment of throw by turn with arm hold on shoulder: right shin and thigh – 8.79% and 8.61%, GMC – 8.07%. With fulfillment of throw "mill" first

places in general dispersion were taken by velocities of GMC – 9.04%, right thigh and shoulder – 8.49 and 8.77%, torso- 8.39%, head – 8.11%. Knock downs with hold of one or two legs were characterized by such percentage distribution of velocities in general dispersion: GMC – 9.81%, left thigh – 8.63%, head – 8.3% with hold of one leg; shin, thigh and hand of right limbs – 8.2%, 8.12%, 8.16% accordingly, torso- 8.12%, head – 8.1% (see fig.2).

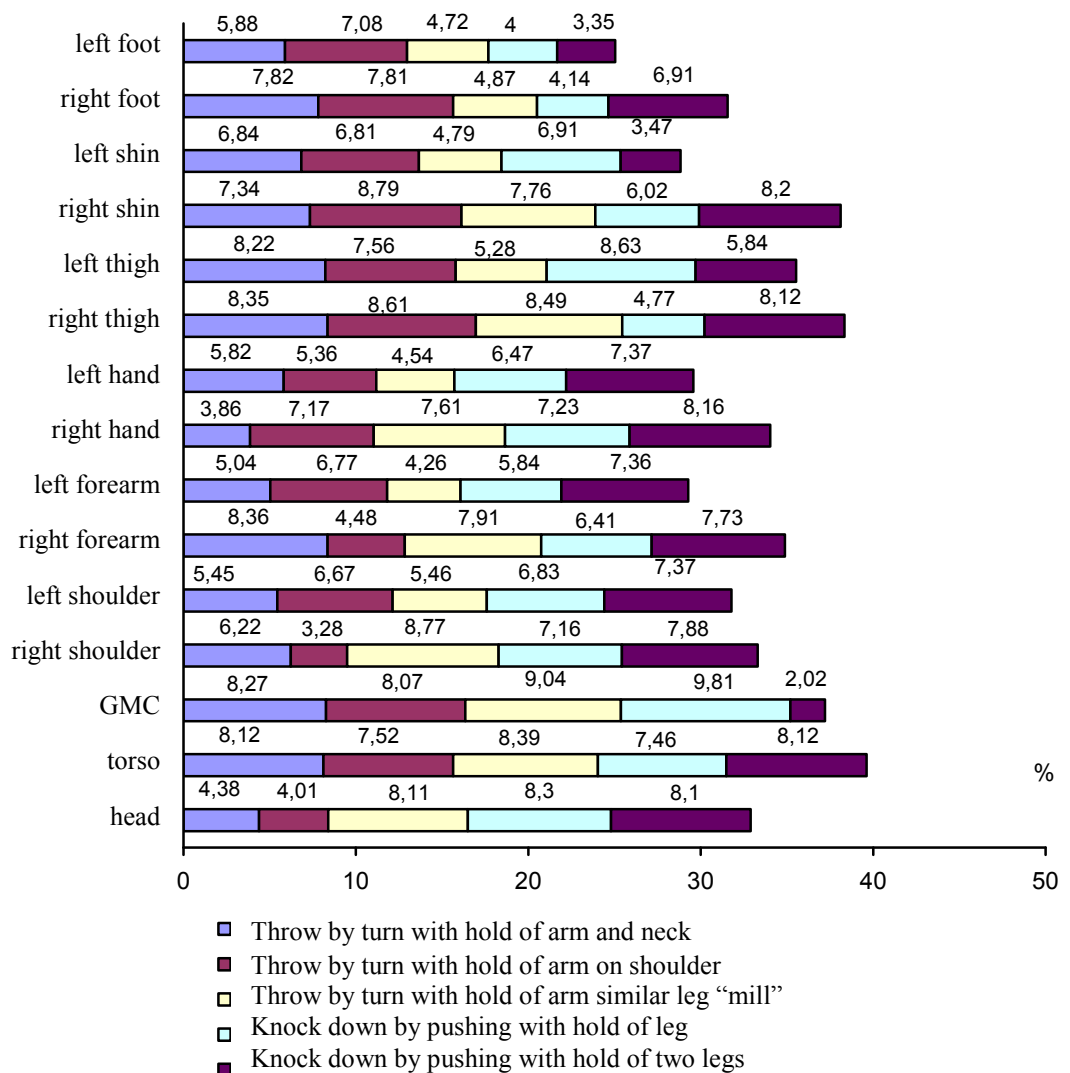


Fig.2 Distribution of contributions of resultant velocities of bio-links in general dispersion of first phase of techniques (preliminary actions) %

Dominating contribution of resultant velocities in factorial structure of second phase of the studied techniques belonged to the following distribution of percentage contributions into general dispersion: throw by turn with hold of hand and neck – left foot and right shin – 8.13% each of them, right thigh – 8.31% right shoulder 8.18%; throw by turn with hold of arm on shoulder – left shoulder 8.1%; throw by turn with hold of arm similar leg “mill” – GMC 8.87%, left and right hands correspondingly by 8.54 and 8.89%, left forearm, shoulder 8.1 and 8.65%, torso 8.56%; knock down by pushing with hold of leg– GMC 8.36%, right foot, shin 8.41 and 8.62%, torso 8.02%; knock down by pushing with hold of two legs: torso – 9.41%, left shoulder, forearm, hand, thigh -8.92%, 8.66%, 8.44%, 8.69%. (see fig.3).

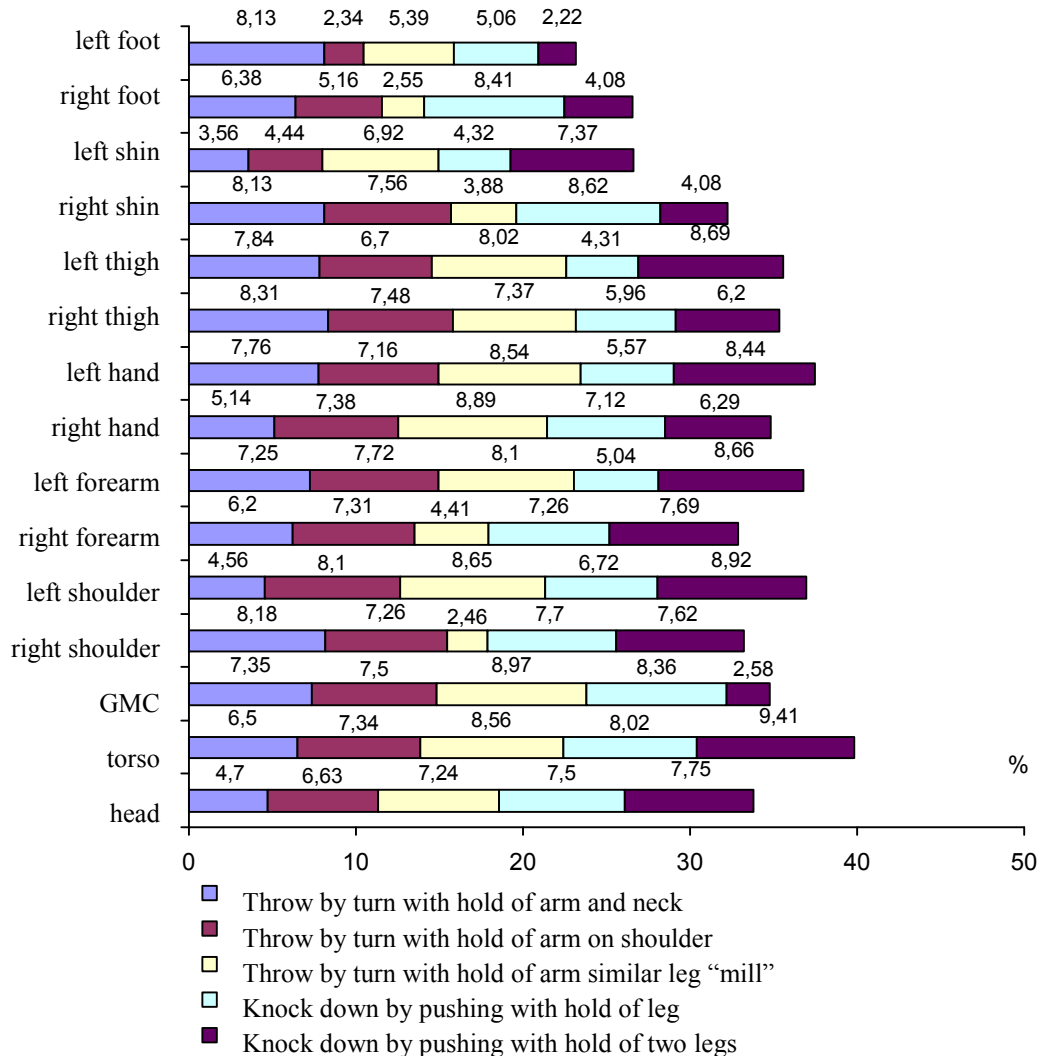


Fig.3 Distribution of contributions of resultant velocities of bio-links in general dispersion of second phase of techniques (preliminary actions) %

In resultant phase of techniques the following succession of percentage contribution of bio-links' velocities in general dispersion: throw by turn with hold of arm and neck бросок- right foot 8.37%; throw by turn with hold of arm on shoulder- GMC 8.86%, left shoulder, right shoulder 8.07 and 8.72%, torso 8.91%; throw by turn with hold of arm similar leg "mill"- GMC 8.53%, left hand, shoulder 8.61 and 8.55%, torso 8.48%; knock down by pushing with hold of leg- left thigh, hand 8.04 and 8.01% and left shoulder and torso by 8.07% each; knock down by pushing with hold of two legs- torso 8.17%, Left shoulder, forearm, hand- 8.1%, 8.09%, 8.02%, right forearm, hand- 8.04%, 8.13% (see fig.4).

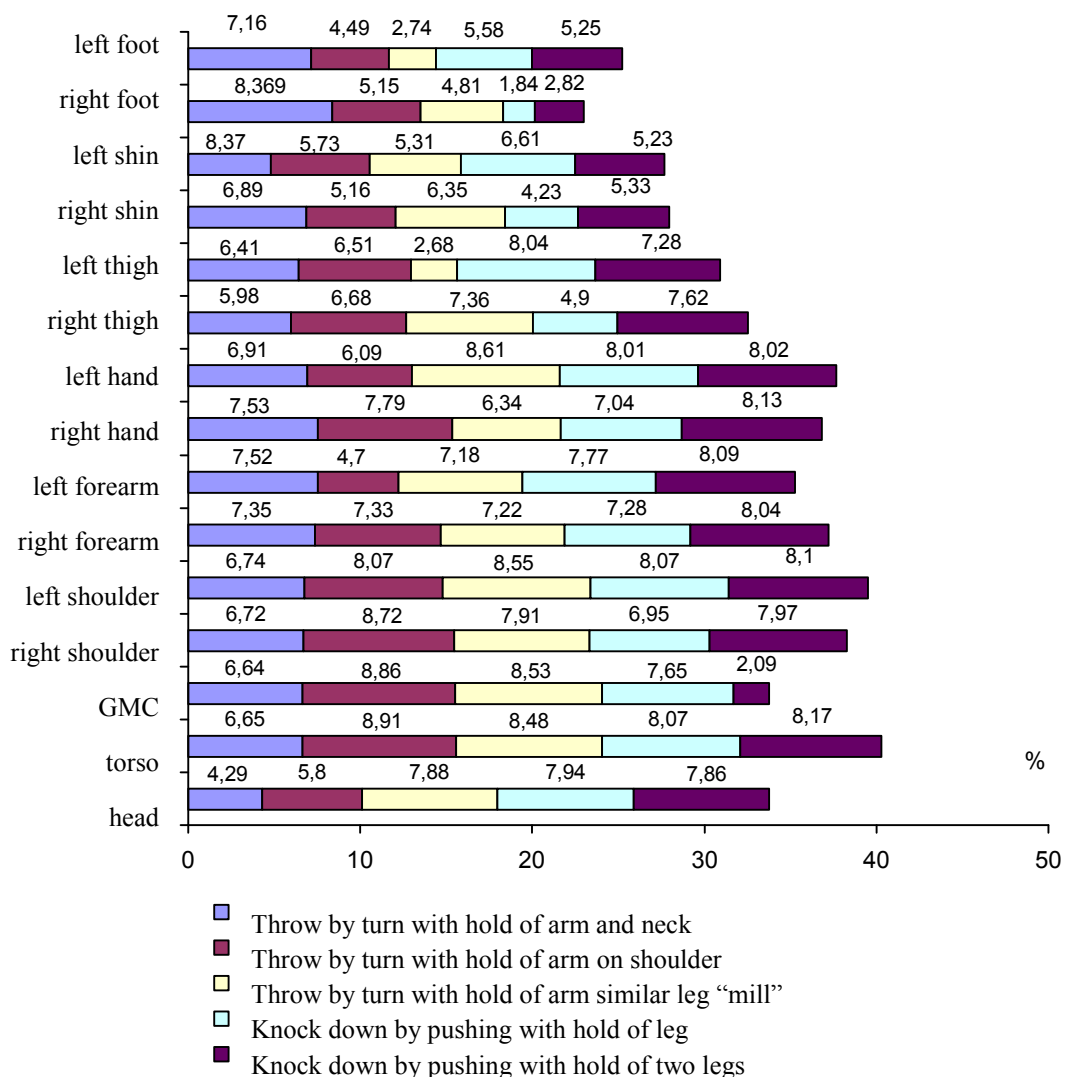


Fig.4 Distribution of contributions of resultant velocities of bio-links in general dispersion of third phase of techniques (preliminary actions) %

Summary

Results of the researches permitted to form basic principles of structure of techniques in wrestling, which have relatively steady structure, space, time, power and rhythmic characteristics and include the following phases of motion actions: preliminary (preparatory) actions (hold, entering of attacker in start position from initial, making of adversary to lose balance); main actions (separation of adversary from mat, final imbalance of him, turn, start of falling); final actions (falling down, flight, landing).

Studying of dynamic structure of free style wrestlers’ techniques on the stage of preliminary basic preparation witnesses about its variability and about ambiguity of its time characteristics in every studied throw, that permit to accentuate coaches’ attention on development of means of training process’s optimization, considering formation of automatism in every phase of motion actions.

Results of correlation analysis permitted to determine in kinematic structure of the studied techniques dominating contribution of torso’s resultant velocities in every phase.

The further prospects stipulate development of methodic recommendations on improvement of basic techniques of free style wrestlers on the stage of preliminary basic preparation, considering dynamics of kinematic characteristics in relation to their sport qualification and weight categories.

References:

- 1 Alikhanov I.I. *Teoriia i praktika fizicheskoi kul'tury* [Theory and practice of physical culture], 1984, vol.12, pp. 8–10.
- 2 Bagaev S.V. *Struktura atakuiushchikh tekhniko-takticheskikh dejstvij* [The structure of the attacking technical and tactical actions], Moscow, 1998, 16 p.
- 3 Latishev C.V., Shandrigos' V.I. *Vil'na borot'ba: choloviki, zhinki*. [Wrestling: men, women], Kiev, ACBY, 2011, 95 p.
- 4 Nevretdinov Sh.T., Podlivaev B.A. Osnovnye napravleniia tekhniko-takticheskoi podgotovki sportivnykh rezervov v vol'noj bor'be [The main directions of technical and tactical training of sports reserves in freestyle wrestling]. *Bor'ba sredi detej i molodezhi* [Fight among children and young people], Moscow, 1998, pp. 46–51.
- 5 Petrov R. *Sovershenstvovanie tekhniko-takticheskogo masterstva borcov* [Improving the technical and tactical skills of fighters], Sofiya, Medicine and physical culture, 1978, 272 p.
- 6 Kupcov A.P. *Sportivnaia bor'ba* [Wrestling], Moscow, Physical Culture and Sport, 1978, 424 p.
- 7 Tumanian G.S. *Sportivnaia bor'ba: teoriia, metodika, organizaciia trenirovki* [Wrestling: theory, methodology, organization of training], Moscow, Soviet sport, 1998, 279 p.
- 8 Tupeev Iu.V. *Fizicheskoe vospitanie studentov* [Physical Education of Students], 2010, vol. 1, pp. 106-108.
- 9 Khmel'nickaia I.V. *Bezkontaktnye metody izmereniia dvigatel'noj funkcii cheloveka* [Non-contact methods for measuring motor function of the human], Kiev, 2004, 52 p.
- 10 Shakhmuradov Iu.A. *Vol'naia bor'ba*. [Freestyle wrestling], Moscow, High school, 1997, 189 p.
- 11 Schmidt W.D., Piencikowski C.L., Vandervest R.E. Effects of competitive wrestling season on body composition, strength, and power in national collegiate athletic association division III college wrestlers. *Journal of Strength and Conditioning Research*, 2005, vol. 19, pp. 505-508.
- 12 Vardar S.A., Tezel S., Ozturk L., Kaya O. The relationship between body composition and anaerobic performance of elite young wrestlers. *Journal of Sports Science and Medicine*, 2007, vol. 6, pp. 34-38.

Information about the author:

Sinigovets S.V.: sinigovets@mail.ru; National University of Physical Education and Sport of Ukraine; Fizkultury str. 1, Kiev, 03680, Ukraine

Cite this article as: Sinigovets S.V. Biokinematic structure of techniques of wrestlers during pre-basic training. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.7, pp. 62-69. doi:10.6084/m9.figshare.737766

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedagogy.org.ua/html/arhive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 25.05.2013
Published: 30.07.2013