

BASIC DISTINCTIONS IN FACTOR STRUCTURE OF THE SPECIFIC WORKABILITY OF 13-14 YEARS OLD SYRIAN WATER POLO PLAYERS UNDER THE CONDITIONS OF ONE AND TWO CYCLE PLANNING OF THE YEAR TRAINING SESSIONS

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Abstract

Its main objective is the organization and implementation of the sport preparation for one year period within the frame of two vs. mezzo-cycles of the growing up water polo players in Syria, where the level of the game is lower in comparison with the leading world countries. Thirty young water polo players from Syria, aged 13-14 are the subject of the study, divided into two groups: experimental one (15 boys) and a control one (15 boys). Both groups have undergone 9 tests the specific workability. Education and training program is developed for the complex preparation of the growing up water polo players (13-14 years old) from Syria. The results received were processed by the following mathematical-statistical methods: variation analysis and factor analysis. There are differences in the factor structure of the specific workability of the growing up Syrian water polo players while these are in direct dependence on the applied methodology of the year preparation.

Key words: *water polo players, factor structure, specific workability, year training sessions*

Introduction

One of the most important factors determining the effectiveness of the in-game activity of water polo players and the sport result, is the level of their swimming and special preparedness, the so-called complex preparedness, which covers both the various ways of moving into the water and the special swimming skills (with and without a ball) (Gamansky, 1981; Želyazkov, 1986; Dopsaj & Matković, 1994; Dopsaj & Matković, 1998; Smith, 1998; Matković & al., 1999; Falk & al., 2004; Aleksandrović & al., 2007; Lozovina & al., 2007; Dopsaj & al., 2007; Hraste & al. 2008). The issue of establishing the interaction between the swimming and special preparation is particularly topical for both the initial preparation and junior period (Šimenc & al., 1997; Dopsaj, 2004; Dopsaj & al., 2007) when the success is very often dependent on some of the additional requirements related to the individual and age particularities, defining the specific workability of the growing up athletes (Račev, 1999; Okičić, 1999; Želev, 2002; Bratuša, 2003; Dopsaj & al., 2003a; Dopsaj & al., 2003b; Dopsaj, 2004).

The year preparation of the growing up water polo players in Republic of Syria has not been an object of scientifically reasoned planning up to now on the reasons of various natures.

The distribution of training means has been made within the frame of one year cycle which has neither assisted the effectiveness of the training sessions, nor corresponded to the world practice. Proceeding from what has been said hereinabove, our expectations in relation to the present study can be formulated by the following working hypothesis: "Factor structure of the specific workability within the frames of the so-called bi-cycle year planning differs from the one for the one-cycle planning of the preparation and improves the effectiveness of the educational and training work with the growing up (13-14 years old) Syrian water polo players". The basic indications of the specific workability of the growing up water polo players are the topic of the study.

Methods

Sample

Thirty young water polo players from Syria are the subject of the study. For the purpose of the study, the competitors are divided into two groups: experimental one (nominated as A) and a control one (B). Fifteen boys (13-14 years old) from "Muhafaza" sport club (Damascus, Syria) are listed into the experimental group. The duration of their sports experience is 2 years ± 6 months.

The training sessions of the group took place in "Al Feiha" 50 m swimming pool in the same city. The control groups lists 15 boys at the same age and with the same duration of sport experience from "Maisalun" sport club (Damascus, Syria). The training sessions of that group took place at the same swimming pool. For solving the objective and tasks of the study, the participants in both the experimental and control groups have undergone tests (two times – in May and October 2006) according to 9 indications of the specific workability.

Sport-pedagogical testing

The water polo players observed were tested for the needs of the study according to 9 tests characterizing specific workability (Table 1.).

Table 1. *List of the tests*

Nº	Test
1.	50 m Crawl /sprint/
2.	3x25 m Crawl
3.	4x50 m Crawl
4.	200 m Crawl
5.	50 m Breaststroke
6.	25 m Dribbling
7.	5x5 m shuttle swimming
8.	Vertical jumps *
9.	Combined game test

* jumps with both arms up/10 times/; all units = seconds; accuracy = 0.1

Depending on the information provided, the tests have been differentiated into two groups.

Group I: Tests from 1 to 5 are usually implemented in the sports practice for evaluating the swimming abilities (quickness, speed endurance and strength endurance) (Konstantinov, 1986; Platonov & Vaycehovskiy, 1988). **Group II:** Tests from 6 to 9 are used for evaluating the specific in-game skills (with and without a ball), (Želečev, 2002; Želyazkov, D., 1985; Dopsaj & al., 2007). The methodological requirements upon holding the tests refer to the following: **Test 1 – Swimming sprint 50 m crawl (s)** High-speed abilities of the competitors (under anaerobe-lactate regime of providing energy) are evaluated. Performed by a start. **Test 2 – Swimming 3x25 m crawl (s)** Quickness of swimming (under anaerobic-alactate regime of providing energy) is evaluated. Performed by a start from the water. The segments are swum by maximum speed and intermediate rest of 2 min. The best time is recorded from swimming all the three segments. **Test 3 – Swimming 4x50 m crawl (s)** Specific endurance (under anaerobic-glycolytic regime) is evaluated. Performed by a start from the water. The segments are swum by maximum speed in regime of 1 min. The results from the 4 segments are summed up.

Test 4 – Swimming 200 m crawl (s) Speed-strength endurance (under aerobe-anaerobe regime of providing energy) is evaluated. Held in standard environment in 50 m. swimming pool (by a start). **Test 5 – Swimming 50 m. breaststroke (s)** Swimming is held in standard environment in 50 m. swimming pool (by a start); used to evaluate the technique of the specific in-game ways of swimming ("eggbeater" at horizontal and vertical position, moving by breaststroke scissor, side swimming, etc.). **Test 6 – 25 m dribble with a ball (s)** Special technical skills related to moving with the ball are evaluated. Held in standard environment in 50 m. swimming pool (by a start from the water). **Test 7 – 5x5 m. shuttle swimming (s)** Technique of the special ways for in-game swimming (swimming with the head upright, stopping, turning, and changing the direction and a start) is evaluated. The test is held in a space of 5 m., limited by two corridors. Crawl swimming is applied (5 segment x 5 m) within the width between the corridors by touching the rope prior turning to the other direction. Time is counted from the start signal till the last touch of the corridor. **Test 8 – Vertical jumps with both arms up – 10 times (s)** Technique of the special ways for in-game swimming ("eggbeater", raising both arms up and jumping) is evaluated. The test is held from the goal line, facing the door. Ten vertical jumps are performed by touching the upper line of the door by both hands. Time is counted from the start signal till the last touch. **Test 9 – Combined game test (s)** The special ways of the technique for moving by water polo crawl, dribbling with the ball while moving, throwing, turning and changing the direction upon swimming crawl and back crawl are evaluated. The competitor starts with the ball at a distance of 14 m towards the door by water polo crawl (up to the line of the 6th meter), shoots into the door and goes back to the starting position. If the ball does not enter the frame of the door but is beat back by the goal keeper, time measured is increased by 5%. When the ball is out of the door, 10% are added to the time. All the tests are held in the standard environment of a 50 m swimming pool.

Pedagogical experiment

Education and training program is developed for the complex preparation of the growing up water polo players (13-14 years old) from Syria. Its main objective is the organization and implementation of the sport preparation for one year period within the frame of two mezzocycles (the so-called bi-cycle year planning). The distribution of the training sessions in each of the two macro-cycles (in periods and cycles) is presented in Table 2.

The participants in the experimental group were subjected to the effect of this training program within the frame of the period under study (March 2006 – March 2007). The education-training contents (in stages, periods and cycles) and the training schemes applied are coordinated with the age particularities and the level of the sport-technical preparedness of the young Syrian water polo players.

Statistical methods

The results received were processed by the following statistical methods: 1) Variation analysis – for disclosing the average values and variety of the indications observed of the specific workability. The following statistic parameters were calculated: X - an arithmetical mean value; S – average quadratic deviation; V – the least value measured; Max – the highest value measured.

2) Factor analysis – for disclosing the factor structure of the specific workability of 13-14 years old Syrian water polo players. The initial correlation matrixes have been processed by the method of the main components followed by Varimax orthogonal rotation. The following criteria and parameters have been considered for the identification and the arrangement of the factors: a) the percentage of the initial dispersion of the phenomenon (α) under study, explained by each factor, b) the degree of disclosure (manifestation) of the respective indication in the general factor structure, information about which is borne by the h² values; c) factor weight of each indication as of the respective factor and its direction (sign) which disclose the strength and character of the interrelation (positive or negative) between the indications of the separate factor.

Results

Table 2. Schedule for two-cycle year planning of the preparation

(GP = general preparation, SP = special preparation, CO = competitive, OV = overall, TP = transitional period)

Macro cycles	I 01. 03. – 08. 07. 06.			II 09. 07. – 15. 11. 06			OV	TP
	Preparative			Preparative				
	GP	SP	CO	GP	SP	CO		
Mezocycles	01.03.-30.04.	01.05.-15.06.	16.06.-08.07.	09.07.-08.09.	09.09.-15.10.	16.10.-15.11.	01.03-15.11.	16.11.-01.03.
Weeks	8	6	3	8	5	4	34	14
Training days	48	36	18	48	30	24	204	32
Days off	8	6	3	8	5	4	34	66
Competition days	-	-	6	-	-	6	12	-
Training hours	72	54	27	72	45	36	306	48
Swimming training (hrs.)	32	20	8	38	17	10	125	12
Physical preparation (hrs.)	30	8	2	16	4	2	62	24
In-game preparation (hrs.)	10	14	8	10	12	12	66	12
Tactical preparation (hrs.)	-	12	10	8	12	12	54	-

Table 3. Factor percent (TV) and cumulative (CV) for the experimental group first cycle A1

	TV	CV
1	31.0	31
2	25.9	57
3	21.7	79
4	9.7	88
5	7.5	96
6	2.1	98
7	1.4	99

Table 5. Factor percent (TV) and cumulative (CV) for the experimental group second cycle A2

	TV	CV
1	34.2	34
2	28.7	63
3	17.0	80
4	8.2	88
5	6.8	95
6	3.2	98

Table 4. Factor weights for the experimental group during the first cycle A1

Var	F1	F2	F3	F4	F5	F6	F7
1	-0.22	0.84	0.25	-0.08	-0.07	0.23	0.35
2	0.15	0.02	-0.77	-0.12	0.36	0.01	0.39
3	-0.85	0.17	-0.00	0.26	0.20	-0.14	0.32
4	-0.96	0.08	-0.02	0.07	0.16	-0.15	-0.00
5	-0.19	0.33	-0.21	0.04	-0.17	0.17	0.87
6	0.12	0.23	0.93	0.18	0.02	0.15	-0.01
7	-0.19	-0.05	0.19	0.96	-0.02	-0.05	0.02
8	0.29	0.07	0.11	0.02	-0.93	0.13	0.13
9	0.42	0.31	0.20	-0.09	-0.20	0.76	0.22

Table 6. Factor weights for the experimental group during the first cycle A2

Var	F1	F2	F3	F4	F5	F6
1	0.95	-0.18	0.02	0.07	0.15	0.20
2	-0.05	0.04	-0.97	-0.14	-0.17	0.04
3	0.18	-0.92	-0.11	-0.14	0.17	0.12
4	0.07	-0.96	0.12	-0.18	-0.04	-0.07
5	0.46	-0.28	-0.50	0.22	0.02	0.49
6	0.25	0.01	-0.07	0.28	0.21	0.90
7	0.16	-0.07	0.17	0.05	0.95	0.17
8	0.09	0.32	0.14	0.88	0.05	0.30
9	0.51	0.54	0.14	0.07	0.30	0.41

Table 7. Factor percent (TV) and cumulative (CV) for the control group during the general preparation period B1

	TV	CV
1	67.0	67
2	16.1	83
3	6.3	89
4	3.6	93
5	2.6	96
6	2.0	98

Table 8. Factor weights for the control group during the general preparation period B1

Var	F1	F2	F3	F4	F5	F6
1	0.59	-0.03	0.38	0.11	0.39	0.25
2	0.36	0.11	0.42	0.14	0.79	0.14
3	0.46	0.15	0.59	0.10	0.37	0.17
4	0.26	0.04	0.92	0.10	0.25	0.11
5	0.44	0.46	0.19	0.10	0.17	0.71
6	0.67	-0.05	0.38	0.44	0.33	0.27
7	0.44	0.59	0.26	0.48	0.35	0.11
8	-0.02	0.99	-0.01	-0.01	0.01	0.13
9	0.89	0.12	0.26	0.08	0.24	0.22

Table 9. Factor percent (TV) and cumulative (CV) for the control group during the special preparation period B2

	TV	CV
1	66.7	67
2	17.9	85
3	6.2	91
4	3.7	94

Table 10. Factor weights for the control group during the special preparation period B2

Var	F1	F2	F3	F4
1	0.64	-0.09	0.62	0.31
2	0.49	0.14	0.48	0.13
3	0.42	0.19	0.60	0.19
4	0.29	0.07	0.93	0.10
5	0.40	0.50	0.22	0.72
6	0.81	-0.04	0.38	0.26
7	0.54	0.69	0.20	0.10
8	-0.09	0.98	-0.01	0.14
9	0.88	0.14	0.31	0.17

Factor structure of the specific workability at the experimental group

More detailed analysis is provided of the correlation structure by the means of the factor analysis. The results from the factor analysis provide additional information about the basic methodological requirements related to planning and management of the training process of the growing up water polo players. Five-six factors are needed in all correlation matrixes in order to explain more than 95% of the dispersion. Other possible limitation for the choice of the factors is to make use only of such having their own values (Eigenvalues).

Usually, approximately equal or higher than 1 while their importance is determined on the base of Keiser's criteria. The results from the processing of the initial correlation matrixes for the experimental group in the first cycle are presented in Tables 3. and 4. Seven factors have been drawn, explains 99.32% of the initial dispersion.

That rather high percentage of the dispersion explained is also indicative of the complete factor coverage of researching the general and special swimming preparation with the growing up water polo players. **Factor 1** – explains 30.96% of the initial dispersion. Two of the selected indicators are entered in it (Test 3 – 4x50 m crawl and Test 4 – 200 m crawl), distinguished by the highest values of their factor weights. The analysis of the indicators entered in that factor allows the same to be defined as **specific endurance of the water polo players**; **Factor 2** – explains 25.90% of the initial dispersion. **Speed abilities** are disclosed. It is evident from the high factor weight of indicator No. 1 – Test 1 (swimming 50 m crawl); **Factor 3** – explains 21.72% of the initial dispersion. This factor is presented by the indicators: Test2 (3x25 m crawl) and Test 6 (25 m dribble with a ball), which are of high factor weights respectively: - 0.77 and 0.93. That factor can be defined as **technique of moving within the field of play with a ball, upon which the quickness of swimming effects negatively**. **Factor 4** – explains 9.74% of the initial dispersion. It discloses the **technique of the special means for the in-game swimming without a ball** (in-game crawl, start, turning around, change of the direction). This is evident from the high factor weight of the indicator – Test7 (shuttle swimming 5x5 m). **Factor 5** – explains 7.45% of the initial dispersion. It can be defined as strength of the lower limbs and "eggbeater" capabilities. This is evident from the high factor weight of the indicator No. 8 (10 dismounts with both arms). **Factor 6** – explains 2.12% of the initial dispersion. Presented by one indicator only – Test9 (combined in-game test) of factor weight 0.76. This factor can be defined as **in-game skills with and without a ball**. **Factor 7** – explains 1.43% of the initial dispersion. That factor is presented by indicator No. 5 (50 m breast) with high factor weight of 0.87. The factor can be defined as the **technique of the specific in-game ways of swimming**. The result we have received from the processing of the initial correlation matrixes for the experimental group during the second cycle are presented in Tables 5. and 6. The analysis of the tables shows that the factor structure of the general and special swimming preparation during the second cycle is a little bit different from the first one.

Under the second testing, the number of the factors is decreased to 6, explains the initial dispersion by 98.05%. Factors 1 and 2 are exchanged and are increased for their factor weights and the percentage of explanation from the initial dispersion following the application of two-cycle planning of the preparation of the experimental group. As to factor 3 – it is observed that following the experiment, the latter discloses the maximum speed only – Test 2 and factor weight (0.97). Factors 4 and 5 are exchanged and have similar factor weights of the same indicators. Factors 6 and 7 from the first cycle drop off in the second one and a new factor appears which discloses the **dribbling skills**. This is evident from the high factor weight (0.90) of the indicator - Test 6 (25 m dribble with a ball). From the factor analysis for the experimental group during the first and the second cycle we can limit the factors to three in number, which provide most clear interpretation of the dispersion. These factors are: **specific endurance, speed abilities, quickness of moving within the field of play with and without a ball**.

Factor structure of the specific workability for the control group

The results we have received from the initial correlation matrixes for the control group during the general preparation period are presented in Tables 7. and 8. Six factors have been drawn; explain 97.59% of the initial dispersion. The rather high percentage of the explained dispersion is as well indicative about the complete coverage of the factors on studying the general and special preparation of the growing up water polo players. **Factor 1** – explains 66.95% of the initial dispersion. It covers 1 of the selected indicators (Test9 – combined in-game test) which is distinguished by the highest value of its factor weight. The analysis of the indicator entered in that factor allows the same to be defined as **in-game skills of the competitors with and without a ball**. **Factor 2** – explains 16.06% of the initial dispersion. The **strength of the lower limbs and the “eggbeater” technique** is disclosed. This is evident from the high factor weight of the indicator - Test 8 (10 dismounts with both arms). **Factor 3** – explains 6.31% of the initial dispersion. This factor is presented by the indicator - Test 4 (200 m crawl) which is of high factor weight: 0.92. That factor can be defined as **strength endurance**. **Factor 4** – explains 3.62% of the initial dispersion. Discloses the **technique of the specific means for in-game swimming without a ball**. This is evident from the high factor weight of the indicator – Test 7 (shuttle swimming 5x5 m). **Factor 5** – explains 2.63% of the initial dispersion.

Can be defined as the **maximum speed of the competitors**. This is evident from the high factor weight of indicator – Test 2 (3x25 m crawl). **Factor 6** – explains 2.02% of the initial dispersion. Presented by one indicator only – Test5 (50 m breast) with factor weight 0.71. Can be defined as **technical abilities to implement the special means for in-game swimming**. The results we have received from the initial correlation matrixes for the control group during a special preparation period are presented in Tables 9. and 10.

Discussion and conclusion

The analysis of the tables shows that the factor structure of the general and special preparation during the second cycle is a little bit different from the first one. Under the second testing the number of the factors is decreased to 4, explains the initial dispersion by 94.41%. It is observed for factor 1 that throughout the special preparation period of the control group, the in-game skills with and without a ball, it disclosed the skill to swim with a ball; this is evident from the high factor weight of the indicator – Test 6 (25 m swimming with a ball). As to factors 2 and 3, no change is observed – neither about the percentage of explanation from the initial dispersion nor about their factor weights during the second testing. Factor 6 from the first test (general preparation period) has moved with the same value of its factor weight and percentage of explanation from the initial dispersion. From the factor analysis for the control group during the general preparation period and the special preparation one, the factors can be limited to three which provide for most clear interpretation of the dispersion. There factors are: **swimming skills with and without a ball and the strength of the lower limbs and the in-game “eggbeater” technique**. The analysis made provides the reason to state that there are differences in the factor structure of the specific workability of the growing up Syrian water polo players while these are in direct dependence on the applied methodology of the year preparation. Under one-cycle planning of the preparation of the Syrian water polo players, the basic factors of the training process are the swimming skills with and without a ball, the strength of the lower limbs and the specific in-game “eggbeater” technique. The basic factors of the training process under the two-cycle planning of the preparation are the specific endurance, speed abilities and quickness of moving within the field of play with and without a ball. We believe that our study shall contribute to the optimization and up-date of the training process in the states where the level of water polo is inferior compared to the leading world

schools; by defining and accentuating on the basic factors of the training process depending on the applied methodology of the year preparation a high efficiency could be achieved. The study is directed to the optimization and update of the water polo training process with

the growing up water polo players both in Republic of Syria and the other countries where the level of the game is lower in comparison with the leading world countries by introducing an adequate and scientifically reasoned methodology for an all year round preparation.

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TEMELJNE DISTINKCIJE U FAKTORSKOJ STRUKTURI SPECIFIČNOG RADA KOD SIRIJSKIH VATERPOLISTA UZRASTA 13-14 GODINA U UVJETIMA JEDNOG I DVA PLANSKA CIKLUSA GODIŠNJE TRENAŽNE SEZONE

Sažetak

Glavni cilj je organizacija i provođenje sportskih priprema za jednogodišnji period u okviru dva protiv mezo-ciklusa vaterpolo igrača u razvoju u Siriji, gdje je nivo igre niži nego u vodećim zemljama. Trideset mladih vaterpolista iz Sirije, starih 13 i 14 godina su predmet studije, podijeljeni u dvije grupe: eksperimentalna (15 dječaka), i kontrolna (15 dječaka). Obje grupe su prošle 9 testova radnih sposobnosti. Obrazovni i trenažni program je razvijen za složenu pripremu vaterpolista u razvoju iz Sirije. Dobijeni rezultati su obrađeni slijedećim matamatičko-statističkim metodama: varijacijska i faktorska analiza. Postoje razlike u faktorskoj strukturi specifičnih radnih sposobnosti koji su u direktnoj zavisnosti od upotrijebljene metodologije godišnje pripreme.

Ključne riječi: vaterpolisti, faktorska struktura, specifični rad, godišnja periodizacija

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