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"CARDIOLEADER" USE IN ACYCLIC TYPES OF SPORTS

V. I. Bondin

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"CARDIOLEADER" USE IN ACYCLIC TYPES OF SPORTS

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Methods of automated control are an important part of the pedagogical monitoring of sportsmen [3, 5, 6]. In this work we present results of the use of a cardioleader in acyclic (team) sports. /34*

In our investigations we solved the following problems: the application of the cardioleader method to conditions of acyclic movements in sportsmen; the development of informative and reliable cardioleader tests for monitoring the preparation of sportsmen.

The method: The cardioleader which has been developed [7] makes it possible to program the range of pulse rates, from the lower limit (PR_l) to the upper limit (PR_u). In training with the cardioleader the sportsman hears low tone signals if his pulse rate is lower than PR_l and high tone signals if his pulse rate $PR > PR_u$. The limits of the programmed PR zone are established in connection with training or testing, depending on the type of sport and the individual characteristics of the sportsman. A radiotelemetric system was used to monitor the precision of the cardioprograms.

The test method was based on an artificial conversion of acyclic training exercises to quasicyclic ones. For example, the soccer play-

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* Numbers in the margin indicate pagination in the foreign text.

er is instructed to perform a set number of test combinations several times over an assigned PR range. The number of goals and the time taken to perform the tasks were measured. In order to evaluate the technique of handling the ball, the sportsman performed a single test combination at an assigned tachycardia level, at first with the ball and then without it; the results were processed by the regression residual method [1].

Results and discussion: Eight cardioleader tests were selected and six of them may be recommended for practical application; they are described in Table 1.

The reliability of the tests was verified by repeated testing [8,9]. The reliability of two component tests (tests 1, 2, 6, 7 and 8 in Table 1) was evaluated for each component individually and for the test as a whole. In the latter case, the evaluation of the total test results was calculated as follows: $A_0 = c_t A_t + c_p A_p$ where A_t and A_p were the time and precision of the test components in a ranked expression and c_t and c_p were the weighted coefficients, taken to equal 1.

The reliability of the cardioleader tests was verified in two skilled teams and a junior team at the beginning and at the end of the preparation period (in February and in April). It was established that neither the qualification nor the age of the sportsman exerts a pronounced effect on the reliability coefficient. The limits and estimates of the reliability coefficients are shown in Table 2.

TABLE 1

CARDIOLEADER TESTS FOR EVALUATING THE SPECIAL PHYSICAL AND TECHNICAL PREPARATION OF THE SPORTSMEN

Test number	Sport	Programmed PR zone, beats/min.	Test assignment	Number of repetitions (n) or time taken to fulfil task	Test results	Evaluated feature
1	Soccer	150—180	Juggling the ball with alternate raising of left and right leg from center of field to penalty line with subsequent shot to goal and return to center field.	n=10	Time spent and number of goals	Special physical preparation and precision of shot
2	Soccer	180—210	Handling the ball around five posts, shot at the goal and return to the initial position.	n=4	Time spent and number of goals	Special physical preparation and precision of shot
3	Soccer	180—210	Shots at the goal from the penalty line with 5 meter approach	t-1 min.		
4	Soccer	150—180	Task at point 1 and after a rest a smooth run along the same trajectory without the ball	n=10+10	Regression residuals measured in correlation field	Technique of handling the ball
5	Soccer	180—210	Task at point 2 and after a rest a smooth run along the same trajectory without	n=4	with coordinates: time for task with ball, time without	Technique of handling the ball

TABLE 1

Test number	Sport	Programmed PR zone, beats/min.	Test assignment	Number of repetitions (n) or time taken to fulfil task	Test results	Evaluated feature
6	Soccer	180—210	the ball Task at point 1 and after a rest at point 2	$n_1=10$ $n_2=4$	the ball, time spent at task at points 1 and 2	Special physical preparation
7	Handball	150—180	Handling ball around 6 posts, shot to goal and return to initial position.	$n=10$	Time spent and number of goals	Special physical preparation and precision of shot
8	Handball	180—210	Throw to goal with approach from 9 meter line	$\frac{t}{1}$ min.	Number of throws and percent of goals	

TABLE 2
MAXIMUM AND MINIMUM VALUES FOR THE RELIABILITY COEFFICIENTS OF CARDIO-LEADER TESTS IN SOCCER

Test number	Component	Reliability coefficient		Reliability estimate [9]
		minimum	maximum	
1	Time	0,95	0,99	Excellent
	Precision	0,15	0,79	Poor
	General evaluation	0,61	0,89	Poor-acceptable
2	Time	0,82	0,93	Acceptable-very good
	Precision	0,08	0,63	Poor
	General evaluation	0,30	0,82	Poor-acceptable

TABLE 2

Test number	Component	Reliability coefficient		Reliability estimate [9]
		minimum	maximum	
3	General evaluation			Poor
4	General evaluation	0.54	0.64	Poor
5	General evaluation	0.52	0.70	Acceptable
6	150< PR <180	0.81	0.88	Excellent
		0.95	0.99	
	180< PR <210	0.82	0.93	Acceptable-very good

The question of the informativeness of the tests for team sports has traditionally been difficult to solve because the various roles of the players predetermine various approaches to monitoring their level of mastery [10].

We selected a method for evaluating the informativeness of a criterion for placing a sportsman in a given qualification group [2, 4]. In this case the informativeness of the criterion is identified with a "variable potential" test and the informativeness coefficient may be computed [4], for example, by the formula:

$$\frac{M}{m} - \frac{N}{n},$$

where m is the size of the more qualified group; n is the size of the less qualified group; M is the number of sportsmen from the more qualified group whose results are higher than the best result shown for the less qualified sportsmen; N is the number of sportsmen from the less qualified group whose results are higher than the worst results

for the more qualified sportsmen.

Table 3 shows the informativeness coefficients (variable potential) of three cardioleader tests computed from results of investigating the SKA and SKVO (Rostov-on-Don) soccer teams at the beginning and end of the training period.

TABLE 3
INFORMATIVENESS INDICES OF CARDIOLEADER TESTS WITH SKA TEAM PLAYERS FOR VARIOUS TRAINING PERIODS

Beginning of training period			End of training period		
Test 1	Test 2	Test 6	Test 1	Test 2	Test 6
0,67	0,33	0,67	1,00	0.75	1,00

With an increase in the preparativeness and qualifications of the players, their physical conditions approach some common value defined by the class of the team (Table 4). We propose to call the qualitative measure of the uniformity of the physical potentials of the team players the physical uniformity coefficient (u.c.):

$$\text{u.c.} = \frac{2}{\sqrt{n}}\sqrt{\sum_{i=1}^{n} D_i}, \qquad (35)$$

where D_i is the interindividual dispersion of results for players in a single team shown for each component in the battery of tests.

In the case in which the composite test consists of two compo-

TABLE 4
VALUES OF THE UNIFORMITY COEFFICIENTS FOR THE SKA AND SKVO TEAMS AT THE BEGINNING (FEBRUARY) AND END (APRIL) OF THE TRAINING PERIOD

Month	SKA			SKVO		
	Test 1	Test 2	Test 6	Test 1	Test 2	Test 6
February	2,96	3,30	3,71	2,26	2,35	2,13
April	2,26	1,55	1,93	1,72	1,68	1,50

Note. If we use a linear ten point scale to evaluate test results the limiting values of the uniformity coefficient are the same: 0 -- for ideal uniformity when the physical potentials of all the players are equal, 10 -- in the worst case when the interindividual variation in test results is greatest.

nents,

$$\text{u.c.} = \sqrt{2(D_1 + D_2)}.$$

It was established with statistical reliability during the pedagogical experiment that the regular use of cardioleader tests and training during the preparation period assures an additional increase in the special physical preparativeness indices. The cardioleader training and tests are organically woven into the training program and do not delay its natural progression; instead they concentrate it and make it more goal directed and effective.

Conclusions. /36

1. The cardioleader method is suitable for regulating training loads and tests for sportsmen in acyclic sports; its use increases the effectiveness of the training process.

2. The reliable and informative cardioleader tests are designed for monitoring the special physical preparation of the soccer players.

3. The degree of uniformity in the physical potentials of sportsmen may be evaluated from the physical uniformity coefficient for the team.

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