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Studies on tests for assessing performance of middle distance female runners at the age of 15 – 17 in Vietnam

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Abstract

This paper was conducted aiming to select relevant indicators and tests for assessing training performance, from which to establish and use a standard system in practice for assessing the training performance for middle distance (800- 1500m) female runners at the age of 15-17 at the specialized training stage in Vietnam. Research methods employed in this study includes: desktop studies of secondary data and documents, key informant interviews, pedagogical examination, anthropometry, biomedical testing, and psychological examination methods on 50 middle distance female runners at the age of 15-17. As a result, this research has identified tests that are science-based, reliable and informative for applications in practice with the targeted age athletic teams at provincial and national levels.

Keywords: Training competency; performance assessment; middle distance

1. Introduction

The training level of middle distance (800- 1,500m) runners is a combination of multiple factors, which regulate the degree of changes in all aspects of an individual athlete in a particular activity. This ability is basically formed and developed under the impact of physical exercise amount, and is expressed through a runner's high or low ability.

Studies and evaluation of the training level of athletes in general and the mid- distance (800-1500m) female runners at the age of 15-17 in particular should be conducted on an integrated and holistic viewpoint of all the constituent elements.

In reality, however, the evaluation of training performance of the middle distance runners at the specialized stage in Vietnam is mainly conducted based on professional capacity of athletes, results of runners in youth championships, and through experience of professionals. After an intensive training period of 6-12 months, if there are evident improvements in technical – tactical capability, fitness, performance, and tactical awareness of the runners, they are kept to continue training. Nonetheless, a science-based system of evaluation indicators has not been developed and applied.

An in-depth literature review of relevant documents and publications was conducted on monitoring and evaluation of performance of athletes, particularly the mid-distance runners at the specialized training stage such as: Aulic (1982) ^[2], Hoang Manh Cuong (1994), Nguyen Dai Duong (1997) ^[6], Nguyen The Truyen *et al.* (2002) ^[8], Nguyen The Truyen *et al.* (1999), Le Hong Son & Nguyen Tuan Anh (2012). Most of the authors consider the followings as the important factors in evaluation of training performance of young runners:

- Elements of mobility (physical fitness level).
- The physiological factors (the influence of the movement amount on the functions of body organs in the body: Circulatory system, respiration, development level of of the motor system, etc.).
- Morphological factors (height, weight, arm length, leg length, etc.).
- Psychological relevance (psychological strength, willpower effort, etc.).

The above publications have also provided some indicators, tests and standards for measurements of training performance based on different scientific methods.

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However, the formulated indicators and standards cannot be applied mechanistically for different groups and locations. Besides, there has been no standard system for evaluation of the young mid-distance runners at the specialised training stage.

This study aims to select relevant indicators and tests for assessing levels of training, from which to establish and use a standard system in practice for assessing the training levels for middle distance (800- 1500m) female runners at the age of 15-17 at the specialized training stage in Vietnam.

2. Research Methodology

The entire research process was conducted from October 2013 to October 2015 at the National Sports Training Centers in Hanoi, Da Nang and some training centers in provinces and cities in Vietnam. The research employed the following methods:

1. Desktop studies of literature through reviewing and synthesizing professional documents and published research work on examination and assessment of training level of mid- distance (800- 1500m) runners.
2. Individual interviews: conducted with 24 experts, coaches, and lecturers of sport universities nationwide on the use of tests to examine and assess the training level of mid- distance (800- 1500m) female runners in practical training.
3. Pedagogical examination method: testing on 50 mid-distance female runners through physical and technical – tactical skills tests, including: 30m high-speed running, 100m low-position start running, 600m running, 3000m running, triple jump, back-shot put, 800m running, and 1500m running.
4. Anthropometric method: Measuring the morphological parameters (height, weight, Quetelet index (g/cm), foot length index A (%), etc.) on 50 mid- distance female runners.
5. Biomedical examination method: Measuring biomedical indicators (relative vital capacity (ml/kg), relative VO₂max (ml/kg/min), Heart work (HW)) with the use of a Japanese heart rate meter PU711 and a Cortex Meta Max 3B system on 50 mid- distance female runners.
6. Psychological examination method: This method is used to assess psychological characteristics as well as the effectiveness of physical, technical and psychological

training for young mid- distance runners through psychological tests such as: Single reflection time (ms), Landolt checking (bit/s).

Data were subject to statistical analyses using Statisc Pro 1.0 and SPSS software version 20.

3. Results and Discussions

3.1 Selecting indicators and tests to assess performance of mid- distance female athletes (ages 15-17) at the specialized training stage

Based on the desktop studies of the current status of performance evaluation for middle distance runners at the National Sports Training Center, provincial training centers, and clubs under the Departments of Culture, Sports and Tourism throughout the country, 25 indicators and tests for evaluating performance of the targeted group. The selected tests meet the above mentioned requirements regarding the pedagogical aspect. These tests enable to identify general and professional competencies that constitute to the performance of mid-distance athletes (800m, 1500m). The tests belong to the following groups: morphological, functional – psychological, and professional factors (Table 1):

- Morphological group (07 indicators);
- Functional - psychological group (07 indicators);
- Professional factors group (11 tests):

Based on the above identification, individual interviews were conducted with 24 coaches and experts of selected sports centers nationwide. Results of the interviews on assessment of training performance of mid-distance runners at the age of 15- 17 are presented in Table 1 show that:

When examining a group of tests used to assess performance of middle distance runners, the majority of coaches agreed that the assessment should be comprehensive through the following groups of factors: morphological, functional - psychological and other professional factors employed in this study. The interview results showed that the morphological group (95.83% selected), Functional - psychological group (91.67% selected), Professional factors group (100% selected, and all agreed that this professional factors group is very important).

Table 1: The survey results of using tests to assess performance of mid-distance female athletes at the age of 15 - 17 in Vietnam (n = 24)

No	Interview content	No. of people chosen		Ranking by levels of importance							
				Very important		Important		Necessary		Unimportant	
		No.	%	No.	%	No.	%	No.	%	No.	%
I. Groups Of Tests Used											
1.	Morphological group	23	95.83	18	78.26	2	8.70	2	8.70	1	4.35
2.	Functional - psychological group	22	91.67	16	72.73	5	22.73	1	4.55	0	0.00
3.	Professional factors group	24	100.00	24	100.00	0	0.00	0	0.00	0	0.00
II. Used Indicators And Tests											
Morphological factors group											
1.	Height (cm).	15	62.50	6	40.00	5	33.33	3	20.00	1	6.67
2.	Weight (kg)	14	58.33	5	35.71	6	42.86	3	21.43	0	0.00
3.	Quetelet (g/cm)	22	91.67	17	77.27	3	13.64	2	9.09	0	0.00
4.	Leg length index A (%)	20	83.33	15	75.00	2	10.00	2	10.00	1	5.00
5.	Leg length C/leg length H index	16	66.67	6	37.50	4	25.00	4	25.00	2	12.50
6.	Leg length B – leg length A index	15	62.50	8	53.33	5	33.33	1	6.67	1	6.67
7.	Ankle/Achilles tendon length index	16	66.67	8	50.00	5	31.25	3	18.75	0	0.00
Functional - psychological factors group											
8.	Relative vital capacity index (ml/kg)	19	79.17	14	73.68	4	21.05	1	5.26	0	0.00

9.	Relatively VO ₂ max index (ml/kg/min)	18	75.00	10	55.56	7	38.89	1	5.56	0	0.00
10.	Heart work index (HW)	22	91.67	14	63.64	4	18.18	3	13.64	1	4.55
11.	Single reflection (ms)	18	75.00	10	55.56	4	22.22	2	11.11	2	11.11
12.	Landolt checking (bit/s)	19	79.17	13	68.42	4	21.05	0	0.00	2	10.53
13.	Complex reflection (ms)	13	54.17	6	46.15	3	23.08	2	15.38	2	15.38
14.	Mental strength	16	66.67	6	37.50	4	25.00	4	25.00	2	12.50
Professional factors group											
15.	30m high speed running (s)	23	95.83	20	86.96	3	13.04	0	0.00	0	0.00
16.	100m running with low-position start (s)	23	95.83	14	60.87	5	21.74	3	13.04	1	4.35
17.	300m running (s)	14	58.33	5	35.71	6	42.86	3	21.43	0	0.00
18.	Long jump (m)	14	58.33	7	50.00	6	42.86	1	7.14	0	0.00
19.	600m Running (m:s)	22	91.67	13	59.09	9	40.91	0	0.00	0	0.00
20.	Cooper Test (m)	17	70.83	6	35.29	4	23.53	4	23.53	3	17.65
21.	3000m running (m:s)	20	83.33	15	75.00	2	10.00	2	10.00	1	5.00
22.	Triple jump (m)	11	45.83	6	54.55	3	27.27	1	9.09	1	9.09
23.	Back-shot put (m)	13	54.17	5	38.46	4	30.77	2	15.38	2	15.38
24.	800m running (m:s)	24	100.00	24	100.00	0	0.00	0	0.00	0	0.00
25.	1500m running (m:s)	24	100.00	24	100.00	0	0.00	0	0.00	0	0.00

For assessment of training performance of middle-distance runners at the specialised training stage, the majority of respondents selected the following indicators and tests

▪ **Morphological elements group (02 indicators)**

1. Quetelet index (g/cm)
2. Leg length index A (%)

▪ **Functional-psychological factors group (05 indicators)**

3. Relative vital capacity index (ml/kg)
4. Relative VO₂max index (ml/kg/min)
5. Heart work index (HW)
6. Single reflection (ms)
7. Landolt checking (bit/s)

▪ **Professional factors group (08 tests)**

8. 30m high speed running (s)
9. 100m running at low-position start (s)
10. 600m running (m:s)
11. 3000m running (m:s)
12. Triple jump (m)

13. Back- shot put (m)

14. 800m running (m:s)

15. 1500m running (m:s)

Most of the respondents selected the above tests, and same time ranked them at the important level in assessing training performance for female middle distance athletes (800m, 1500m) at the specialised training stage. The results showed more than 75.0% of respondents selected, in which more than 50% ranked those indicators and tests as “very important”.

3.2 Determining the informativeness of the indicators and tests for assessment of performance of mid-distance female runners (age 15-17) at the specialised training stage

For accurate assessment of the informativeness of the system of selected indicators and tests on the targeted group, a analysis was conducted to test the correlations between the indicators and tests with the performance of the targeted athletes through the young mid-distance running championship in Vietnam in 2014. Results are shown in Tables 2. and 3.

Table 2: The test results for assessing performance of mid-distance female runners at the age of 15-17

#	Indicators and tests	Test results ($\bar{x} \pm \delta$)		
		15 (n = 17)	16 (n = 15)	17 (n = 18)
1.	Quetelet index (g/cm)	320.27±8.13	326.96±8.27	333.64±8.41
2.	Leg length index A (%)	55.07±2.45	55.42±2.38	55.77±2.31
3.	Relative vital capacity index (ml/kg)	59.56±1.45	60.95±1.80	62.33±2.14
4.	Relative VO ₂ max index (ml/kg/min)	55.32±3.73	58.15±3.92	60.98±4.11
5.	Heart work index (HW)	5.55±0.35	5.29±0.33	5.02±0.31
6.	Single reflection (ms)	185.56±10.28	176.84±9.80	168.11±9.31
7.	Landolt checking (bit/s)	51.73±2.66	54.03±2.78	56.33±2.90
8.	30m high speed running (s)	3.45±0.10	3.37±0.10	3.29±0.10
9.	100m running with low- body position start (s)	13.23±0.31	13.00±0.30	12.76±0.30
10.	600m running (m:s)	1.39±0.04	1.36±0.04	1.33±0.03
11.	3000m running (m:s)	11.05±0.28	10.75±0.29	10.45±0.30
12.	Triple jump (m)	5.40±0.33	5.76±0.35	6.12±0.38
13.	Back-shot put (m)	8.56±0.44	8.91±0.46	9.26±0.48
14.	800m running (m:s)	2.34±0.06	2.30±0.06	2.25±0.06
15.	1500m running (m:s)	5.20±0.12	5.11±0.12	5.01±0.12

Results in Tables 2 and 3.3 shows that most of the selected indicators and tests showed strong correlations with performance of the target group with $R^2 > 0.7$ at $P < 0.05$. These indicators and tests can be used to predict future

performance. The system of indicators and tests can also be applied in evaluation of performance of the target group at the specialised training stage.

Table 3: Determining the correlation between the tests for assessment training level of mid-distance female athletes (age 15- 17) with their competition performance

#	Indicators and tests	Correlation coefficient (R ²)		
		15 (n = 17)	16 (n = 15)	17 (n = 18)
1	Quetelet index (g/cm)	0.743	0.743	0.828
2	Leg length index A (%)	0.747	0.818	0.835
3	Relative vital capacity index (ml/kg)	0.852	0.839	0.803
4	Relative VO ₂ max index (ml/kg/min)	0.828	0.804	0.815
5	Heart work index (HW)	0.781	0.788	0.805
6	Single reflection (ms)	0.784	0.809	0.823
7	Landolt checking (bit/s)	0.801	0.738	0.822
8	30m high speed running (s)	0.811	0.709	0.820
9	100m running at low-body position (s)	0.803	0.774	0.852
10	600m running (m:s)	0.884	0.713	0.835
11	3000m running (m:s)	0.874	0.788	0.872
12	Triple jump (m)	0.816	0.844	0.868
13	Back-shot put (m)	0.811	0.837	0.874
14	800m running (m:s)	0.807	0.817	0.855
15	1500m running (m:s)	0.709	0.783	0.822

From the above analyses, this study has identified an informative system of indicators and tests for continuing evaluation of their reliability, including three groups with 15 indicators and tests as presented.

3.3 Assessing the reliability of indicators and tests in

evaluation of training performance of mid-distance female runner (age 15-17) at the specialised training stage

For assessing the reliability of the test system, the research repeated the tests twice under the same procedure and method. The first tests were conducted at the first and the third week of April 2014. Results are shown in Table 4.

Table 4: Assessing the reliability of the test system for evaluation of training level of Vietnamese mid-distance female runners (age 15 – 17)

#	Indicators and tests	Age 15 (n = 17)		Correlation coefficient (R ²)	Age 16 (n = 15)		Correlation coefficient (R ²)	Age 17 (n = 18)		Correlation coefficient (R ²)
		1st	2nd		1st	2nd		1st	2nd	
		$\bar{x} \pm \delta$	$\bar{x} \pm \delta$		$\bar{x} \pm \delta$	$\bar{x} \pm \delta$		$\bar{x} \pm \delta$	$\bar{x} \pm \delta$	
1	Quetelet index (g/cm)	320.27±8.13	320.33±8.14	0.993	326.96±8.27	327.02±8.31	0.982	333.64±8.41	333.71±8.48	0.984
2	Leg length index A A (%)	55.07±2.45	55.04±2.44	0.991	55.42±2.38	55.39±2.46	0.972	55.77±2.31	55.74±2.47	0.981
3	Relative vital capacity index (ml/kg)	59.56±1.45	59.52±1.45	0.876	60.95±1.80	60.91±1.49	0.864	62.33±2.14	62.29±1.52	0.875
4	Relative VO ₂ max index (ml/kg/min)	55.32±3.73	55.45±3.74	0.864	58.15±3.92	58.29±3.93	0.872	60.98±4.11	61.13±4.12	0.897
5	Heart work index (HW)	5.55±0.35	5.55±0.35	0.862	5.29±0.33	5.29±0.33	0.823	5.02±0.31	5.02±0.31	0.861
6	Single reflection (ms)	185.56±10.28	185.82±10.29	0.841	176.84±9.80	177.08±9.81	0.804	168.11±9.31	168.35±9.33	0.832
7	Landolt checking (bit/s)	51.73±2.66	51.69±2.66	0.832	54.03±2.78	53.99±2.78	0.826	56.33±2.90	56.29±2.89	0.801
8	30m high speed running (s)	3.45±0.10	3.45±0.10	0.897	3.37±0.10	3.37±0.10	0.810	3.29±0.10	3.29±0.10	0.823
9	100m running at low-body position start (s)	13.23±0.31	13.22±0.31	0.861	13.00±0.30	12.99±0.30	0.843	12.76±0.30	12.75±0.30	0.821
10	600m running (m:s)	1.39±0.04	1.39±0.03	0.879	1.36±0.04	1.36±0.03	0.863	1.33±0.03	1.33±0.03	0.816
11	3000m running (m:s)	11.05±0.28	11.04±0.26	0.801	10.75±0.29	10.74±0.25	0.814	10.45±0.30	10.44±0.24	0.831
12	Triple jump (m)	5.40±0.33	5.41±0.33	0.806	5.76±0.35	5.77±0.35	0.807	6.12±0.38	6.13±0.38	0.807
13	Back-shot put (m)	8.56±0.44	8.55±0.44	0.853	8.91±0.46	8.90±0.46	0.887	9.26±0.48	9.25±0.48	0.844
14	800m running (m:s)	2.34±0.06	2.35±0.14	0.855	2.30±0.06	2.30±0.14	0.877	2.25±0.06	2.26±0.13	0.855
15	1500m running (m:s)	5.20±0.12	5.21±0.12	0.827	5.11±0.12	5.12±0.12	0.822	5.01±0.12	5.02±0.12	0.841

Results in Table 3.4 shows that all 15 tests have been affirmed their informativeness for the target group at the ages of 15, 16 and 17 years old with strong correlation coefficients ($R^2 > 0.8$ at $P < 0.05$). Accordingly, it can be concluded that the system of indicators and tests is reliable, feasible and relevant for the target group in Vietnam at the specialised training stage.

4. Conclusions

This study has identified and established a system of indicators and tests, assuring reliability and high informativeness level for assessing performance of mid-distance female runners (age 15-17) at the specialised training stage. The system includes 15 indicators and tests, covering morphological, functional – psychological and professional factors:

- Morphological group (02 indicators).
- Functional - psychological factors group (05 indicators).

- Professional factors group (08 tests).

By determining the correlation between the results of the tests and the achievement, determining the correlation between the two time tests, the results of the study proved that the 15 selected tests are sufficient reliability, notification, could be used to test and assess the level of training of female athletes running middle-distance age 15-17 on training in depth specialization process.

By assessing the correlations between the results of different tests with competition performance of the target group, this study has proven that 15 tests selected show reliability and informativeness. The system can be used for testing and evaluation of performance of the mid-distance female runners at the ages of 15-17 in Vietnam at the specialised training stage.

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