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KINESIOLOGY

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Battery of tests to evaluate the level of movement ability in highly advanced wrestlers in the Polish national team

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Abstract

The level of movement ability constitutes the foundation of all kinds of training of wrestlers and becomes the source of their sporting success. The search for objective methods of evaluating such abilities has been going on for years. The attempts made so far have been rather unsuccessful and have found no practical application. Taking into consideration the above, **the aim** of this study was to: 1. Analyze the hitherto existing theoretical and empirical achievements. 2. Construct a set of attempts to assess the level of abilities necessary for wrestlers to achieve success. 3. Verify the set. 4. Implement the set in sport training - as an objective method of evaluating the level of motor abilities of advanced wrestlers.

Methods. Juniors and seniors in the Polish national team in classical and free style were the subjects. The research was carried out between 1981-2002, in various training periods. Each of the researches lasted 2-3 days and comprised a set of 15 (for seniors) and up to 23 attempts (for juniors), and included all necessary movement abilities, both physical (strength, speed, endurance) and movement coordination. Based on the results obtained from the 18 research sessions and conducted on 524 wrestlers, a “T” scale was established which enabled the transfer of the results obtained in the various units of measurement (kg, cm, s, degrees, number of repetitions) into points. This made it possible to evaluate every movement ability of the wrestlers, as well as to evaluate the total of all abilities and indicate their weak and strong points.

Conclusions: 1. The application of the method described above enabled an objective evaluation of the level of the particular movement ability of the wrestlers in the selected periods of their training to be made. Moreover, it enabled the determination of the leading and outstanding movement abilities, and consequently the profile and composition of these abilities to be established. On this basis individual training plans were established and the style of wrestling was constructed. 2. The use of the battery of tests for many years in the training of wrestlers of different levels of advancement enabled the establishment of normative indexes which rendered it possible to evaluate each and every movement ability in points, as well as allowing the transfer of the number of points into a 11 stage scoring scale (from excellent to poor). 3. Systematic and long term research enabled Polish wrestlers to go through training in which adequate proportions between the development of fitness abilities and movement coordination abilities were properly used. This fact, combined with a number of other properly carried out elements of training, and specifically training in the classical style, made it possible for our wrestlers to achieve great success in international arenas.

1. Introduction

The level of movement abilities is the foundation of all kinds of training preparing wrestlers for competitions. An inadequate foundation causes rocking of the whole “*edifice*” of the preparation. Then, at a certain stage of the competitor’s training, his technical, tactical, psychological and other kinds of preparation, may be “*shaken*”. The low level of movement abilities may be the cause of an imperfect technique, and this

may result in an ineffective tactics. Hence, neglect of one of the floors of the “*edifice*” results in the lowering of higher level. Though all these preparations are interdependent as far as conditions are concerned, **the importance of the level of movement abilities is outstanding in the long-term preparation of the athlete, regardless of the sport discipline.** The fact was reported many years ago, so much attention was devoted to the various components of the wrestlers’ motor abilities [Baić *et al.* 2003; Cabric

1976; Tumanjan 1984; Glaz 1987; Glaz, Starosta 1994; Starosta 1984, 2003, 2006, 2008; Starosta, Tracewski 1981, 2000, 2001; Sterkowicz, Starosta 2005]. In the vast majority of the publications, as well as during the training, much more attention was devoted to fitness abilities rather than to coordination ones. This was disclosed when establishing methods of evaluation wrestlers' movement abilities. Out of the many hitherto presented propositions, only few of them have been put into practice so far. They were used to evaluate the changes in the level of movement abilities. The special record holder in this field was the tests battery of tasks of own invention [Starosta 1984; Starosta, Tracewski 1981, 2000, 2002] which has assisted coaches for over 21 years (from 1981 to 2002). Hence, it is worth considering what caused lengthy practical use in the training of Polish national team wrestlers. The work herewith is a task to provide a reply to the question. Therefore, the aim of the work was to: Therefore, the aim of the work was to:

1. Present the principles of constructing a battery of tests.
2. Present the features of the battery of tests
3. Present evaluation and diagnostic values of the battery.
4. Work out the a scale "T" for the tests battery.
5. Present an abridged version of the battery.

2. The principles of constructing a tests battery

The preparation of the battery was preceded by an analysis of the hitherto national and international output in this field. The work concerned the theory of sport and wrestling, as well as the experience acquired during the training of wrestlers. The work was carried out in close co-operation with the best coaches of wrestling in Poland. Moreover, the work was the result of an initiative of the representatives of the Polish Wrestling Association (mainly of coach of the Polish National Team, J. Tracewski). Next, the team elaborating the set was given the task to prepare a list of movement abilities indispensable for wrestlers to achieve considerable success, and then to establish the hierarchy of their importance.

The list was not only confined to the accepted then [Starosta, Tracewski 1981, 2000, 2001] classical physical e.g. fitness abilities (strength, speed, endurance), but also included extensive movement co-ordination (co-ordination abilities). At that time it was one of the major departure in the promoted theories of sport training. This sort of departure would not have been possible if not the high position of a group of experts and wrestlers, particularly those of classical style, in the international arena. Only, **from the perspective of the last 21 years (1981-2002), one can assess how important and**

valuable has this departure been. It is regrettable it applied only to wrestling! It might have had a crucial impact on the long-term and nearly continuous series of success of the wrestlers in the international arenas!

When creating the battery of tests it was established that the following conditions should be fulfilled: 1. It should reflect the specificity of wrestling, that is, it should comprise the evaluation of all motor abilities needed by the wrestlers in order to achieve considerable success. 2. It should include items which have met the demands in the hitherto training, and which possess a high index of reliability. 3. The number of attempts evaluating a particular ability should be adequate to its importance in the hierarchy (table 1). The higher its position in the hierarchy, the more tests should evaluate it. From the methodological point of view it was a new **approach towards the construction of the battery of tests evaluating the level of movement abilities**. 4. Attempts should be available for every wrestler regardless his age, weight category, sport advancement (class). 5. The battery should include tests not requiring special equipment, as a result, the ones that might be used in every club. 6. They should have at least two variants: for younger juniors and juniors and for seniors. The first one should involve a considerable higher number of tests requiring a demonstration coordination abilities (general and special). 7. The tests battery should include a right proportion of tasks for evaluation fitness and coordination abilities resulting from H. Gundlach's concept [1970]. 8. The execution of certain tests should be precisely regulated so that they could ensure the objective acquisition of results. 9. In order to standardize the way of executing the attempts it should be necessary to elaborate a detailed instruction manual and to promote it among coaches of all the clubs.

The fulfilment of such a number of conditions was not easy. It became possible thanks to the close co-operation between scientist and coaches. The fact might have been decisive as far as the usefulness of the battery, and might have favourably affected its implementation in the training programmes of all Polish clubs.

3. The characteristics of the tests battery (tab. 1)

The tests battery was composed of two parts: the first one comprised general fitness tasks (tasks 1-14, each of them had its particular number), and the second - special fitness (tasks 15 - 23). Its division was agreed upon and it served a better clarity of the test. The

test involved 12 tasks for evaluation coordination abilities (mainly of synthetic or global character, that is the coordination of the whole body), and 11 tasks involving fitness abilities (the strength of various muscle group, general and special speed, various forms of endurance, jumping abilities and flexibility). In those times [Starosta, Tracewski 1981, 2000, 2001] **it was a novelty to expose coordination abilities in such a way. Presently, it constitutes a modern formulation of proportions which should be included in the battery of tests evaluating the level of movement abilities.**

The number of tests proposed to the wrestlers (seniors - 15 tasks), and particularly to juniors was quite large (up to 23), out of which 14 tests were for general fitness and 9 for special fitness. That is why the performance of the set was divided into 3 days. The inclusive of the tests battery was justified because it was conducive to a more comprehensive preparation of the wrestlers, among others, the constant development of indispensable movement abilities and technical elements (tests of special fitness), a variation of the training content (e.g. through preparing to execute tasks requiring acrobatic preparation). A complex approach to the preparation of the wrestler was applied by including tasks which would evaluate abilities relevant to a wrestler. The comprehensiveness of the tests battery was still more increased by the fact of including attempts applied earlier in the training of wrestlers (Denisiuk's and Ulatowski's tests) [Pilicz 1971; Szubra 1968], and by adding new tasks - of own invention (global movement coordination and jumping ability test of W. Starosta [1978, 2006], or the modified flexibility test [Starosta 1981]).

In view of theoretical considerations, and the analysis of practical experience it was difficult to decide which of the proposed tests would be the most diagnostic one. We assumed that the best way to evaluate each particular test would be through their execution. In this way, the value of the set was subject to testing in a larger group of wrestlers, and the collected material was subject to statistical analysis.

The diagnostic value of the battery was increased due to the unification (standardization) of the principles of the tests performance. Within these principles an important part was played by the standardization of the conditions, that is, the same part of the day when the tests were carried out, identical order of tests, a similar outfit worn by the wrestlers, the same content of the warm-up, etc.

A crucial element of the standardization was the identical order of the tests, different for the seniors, and different for the juniors. The majority of the tests was conducted by a station method. The

number of stations depended on the kind of tests, e.g. acrobatic tests for juniors did not require any stations at all. A reasonably equal division of load per day was also tests (the number of tests). The increasing fatigue in the third day of tests was also taken into account, thus planning a fewer number of tests. At the same time certain rules concerning the test execution were considered, for example the necessity to assess the level of coordination abilities before tests requiring endurance and strength. Jointly, because of organization issues, some of the tests were grouped: strength, acrobatic, special fitness.

4. The evaluating and diagnostic value of the battery of tests

Adding the points obtained in each of the particular tests enabled the identification of the level and movement abilities of each of the examined athlete. It also made possible to compare wrestlers of the same and different weight categories, as well as of their level of abilities in various tests and various training periods. However, it was not sufficiently discriminatory. There was a lack of reference of the value of collected results relative to some sort of universal scale, e.g. a verbal definition of the value of each of the obtained result. Therefore, the results were represented on a "T" point scale [Starosta, 1984], based on their arithmetic average and standard deviation, first five units of the movement abilities of the Polish population of wrestlers [Głaz, 1987; Starosta, 1984] was defined, and further on the number of units was increased to 11.

5. Establishing a point scale "T"- score

With the help of items forming a test, results in various measuring units were collected: in kilograms (in strength tests), centimetres (in backward bends and maximum vertical jump), in the number of repetitions (in pulling up on a bar, in twists), in points (in acrobatic tasks), in degrees (in maximum turn in a jump). The variety of the applied units of measurement rendered it difficult to compare the level movement abilities in each of the performed tests. Therefore, the standardization of these units, that is bringing it down to the common denominator and converting all the obtained results into points, became a necessity. It enabled the use of scale "T". As a result, after carrying out a series of 18 tests with 524 wrestlers of the Polish national team in classical and free style, during different training periods (preparation, start), and various stages of

sport training (younger juniors, juniors, seniors) a "T" scale was established for all the tasks of the tests battery. The scale was identical for both wrestling styles and for all the stages of sport training, as well as for different training periods.

The "T" scale allowed every value obtained in the attempts to be converted into points. In this way the level of every ability of the competitors (the higher the level - the more points scored) was possible to be evaluated. Summing all the points for all the abilities allowed a total evaluation of the wrestler's level of movement abilities. Based on the comparative point values it was possible to define the individual movement ability structure, and within that, to establish the leading and the least developed abilities, e.g. the strong and the weak sides of their movement abilities. It provided the basis of further development of those abilities indispensable to the wrestler and to the steering of their progress, and moreover, it allowed for a technical and tactical preparation based on the leading abilities. It enabled a real individualization of the entire preparation of the wrestler together with the modelling of his adequate style of fight.

Using the "T" scale it was possible to define objectively the partial level of movement abilities (in an test or tests evaluating the same ability), and the entire level of all the wrestlers (the total of all the results of all the tests), and then to show the differences in points between wrestlers of the same and different weight categories. The scale "T" allowed, in an objective way, to distinguish the fittest wrestlers in the group (leaders). In addition it enabled the establishment of a composition of abilities which would guarantee success, that is, the model of a champion's fitness in a particular weight category. Based on long-term research it was possible to define individual changes in the wrestlers' fitness in view of their sport career, as well as the most rational level of development of every specific ability (feature) in relation to others.

6. An abridged version of the tests battery

With the use of factor analysis of the results collected after various researches [Głaz 1987; Głaz, Starosta 1994; Starosta 2003, 2006, 2008] it was possible to identify tests that would provide the maximum information about the level of movement abilities of the wrestlers. An abridged version of the tests battery was created as a result of the factor analysis. The version, though, differed for wrestlers of classical style and for free style wrestlers, as well as for wrestlers at different stages of training. Some of the tests applied in all categories and were

included into the abridged version. The tests battery involved: runs with rolls/tumbles, pull ups on a bar, bending and stretching of arms with a support on bars, maximum weight throws on the breast, 20m. flying run, 1000 m. runs (after the change of the rules and the extension of the fight for another 5 min - 1500 m. runs were introduced).

Conclusions

1. Following the concept of H. Gundlach [1970] and its modification, a hierarchy of movement abilities in wrestling was elaborated, in which coordination abilities occupied one of the leading positions [Starosta, Tracewski 1981]. This was reflected in the battery of tests of general and special fitness of free and classical style wrestlers, in which evaluating the level of coordination had a considerable share (in seniors -28,6%, in juniors - 52,2%). **This might have positively affected later successes of the Polish wrestlers (among others the winning of 5 medals at the Olympic Games in Atlanta, including three gold ones).**

2. The test for juniors (23 tests) included 12 tests evaluating movement coordination abilities, and 11 assessing fitness abilities, whereas in the version for seniors out of the 15 - three dealt with first movement abilities. Such a form of exposing coordination abilities in those times was a sort of novelty.

3. **Applying a battery of tests as an objective method allowed an evaluation of the level of each particular movement ability of the Polish national team wrestlers in classical and free style in their long-term training cycle, as well as at various training periods.** The evaluation concerned wrestlers of various training stages (younger juniors, juniors, seniors).

4. The battery of tests made it possible to define leading and non-leading movement abilities, both coordination as well as fitness, thus, the profile or composition of these abilities. Based on the results of research, individual training plans were worked out, and styles of fights were constructed.

5. **Based on the material collected during 18 tests carried out with 524 high advanced wrestlers, a "T" scale enabling the transfer into points of results collected in different measuring units (kg, cm, s, degrees, number of repetitions) was elaborated.** It enabled an evaluation of every movement ability of the wrestler, as well as their summary evaluation, and the identification of his strengths and weaknesses.

6. The use of this method for many years in the training of wrestlers of various levels of

Tab. 1. Movement abilities required during the practice of a battery of tests of general and special physical fitness in high advanced wrestlers of Polish National Team [Starosta 1998]

No.	Name of test	Physical (fitness) Abilities					Coordination					abilities						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	Maximum turn in jump					+	+	+	+	+	+	+	+					
2	Zig-zag run, so-called envelope	+					+	+	+	+	+	+	+	+	+	+		
3	Run with Turnovem	+					+	+	+	+	+	+	+	+	+	+		
4	Pull-ups	+	+	+						+				+	+	+		
5	Arm bending and stretching with support on parallel bars	+	+	+						+				+		+	+	
6	Maximal load press in recumbent position			+													+	
7	Forward lean with rotation (with load)	+	+	+						+				+		+		
8	Maximal load snatch	+	+			+				+	+			+			+	
9	Lift of maximum load on chest	+	+							+								
10	Squat with maximum load			+														
11	Maximum high jump with boot feet	+	+			+				+	+	+				+		
12	30 m run with flying start	+	+													+		
13	1000 m run (1500 m)				+							+						
14	Trunk bending (back bench)			+		+										+		
15	Forward pass	+				+				+	+	+	+	+			+	+
16	Backward pass	+				+				+	+	+	+	+			+	+
17	Forward somersault in squat position	+				+				+	+	+	+	+			+	+
18	Backward somersault in squat position	+				+				+	+	+	+	+			+	+
19	Strive - so-called merr-go-round (roundabout)	+	+			+				+	+	+	+			+		+
20	Bridge from above upper, so-called bridge execution					+				+	+							
21	The catch (snatch) from the neck	+	+			+				+		+	+					
22	Bridge arrival (coming)	+				+						+	+					
23	Supples wrist with manikin	+	+	+		+	+			+	+	+	+	+		+	+	+

Physical (fitness) abilities:

1. Speed
2. Strength
3. Endurance
4. Flexibility
5. Jumping ability

Coordination abilities:

6. Adequate speed reaction
7. Balance preservation (maintenance)
8. Spatial orientation
9. Movement rhythmisation
10. Kinesthetic movements differentiation
11. Movements connection

12. Adaptation (combination, transposition)

13. Muscles relaxation

14. Movements symmetrisation

15. Movements suggestiveness

(expressiveness)

16. Cooperation

advancement, made it possible to work out standard indexes allowing for an evaluation in points of the level of each movement ability, as well as to **transfer points into an 11 degree marking scale** (from outstanding to poor). It was a special scale prepared for the population of the Polish wrestlers.

Long-term and systematic research enabled Polish wrestlers an involvement in the training in which appropriate proportions between the development of fitness and coordination abilities were applied. It led to many other correctly carried out elements of training, particularly in classical style, which enabled achieving great success in the international arenas in the years 1981–2002.

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Bateria testów dla oceny poziomu zdolności motorycznych wysoce zaawansowanych zapaśników

Słowa kluczowe: zdolności ruchowe, metody oceny, zestaw prób sprawności, zapasy w stylu klasycznym, zapasy w stylu wolnym, skala punktowa „T”, normy, skala ocen.

Streszczenie

Poziom zdolności ruchowych stanowi fundament wszystkich rodzajów przygotowania zapaśników i źródło ich sukcesów sportowych. Od lat trwają poszukiwania obiektywnych metod oceny tych zdolności. Dotychczasowe próby w tym zakresie należały do niezadowolających i nie znalazły powszechnego zastosowania. Uwzględniając powyższe, celem pracy było: 1. Przeanalizowanie dotychczasowego dorobku teoretycznego i empirycznego. 2. Skonstruowanie zestawu testów do oceny poziomu zdolności niezbędnych zapaśnikom do odnoszenia sukcesów. 3. Weryfikacji tego zestawu. 4. Wdrożenie zestawu do szkolenia sportowego - jako obiektywnej metody oceny poziomu zdolności ruchowych zaawansowanych zapaśników. Materiał badań stanowili: juniorzy i seniorzy kadry narodowej Polski w stylu klasycznym oraz wolnym. Badania prowadzono w latach 1981-2002 w różnych okresach treningowych. Każde z 50 badań trwało 2-3 dni i obejmowało zestaw od 15 (dla seniorów) do 23 prób (dla juniorów) uwzględniających wszystkie niezbędne zdolności ruchowe, zarówno kondycyjne (siłę, szybkość, wytrzymałość) jak też koordynacyjne. W oparciu o wyniki zebrane podczas 18 badań przeprowadzonych na 524 zapaśnikach opracowano skalę „T” umożliwiającą przeliczenie na punkty wyników zbieranych w różnych jednostkach (kg, cm, s, stopniach, liczbie powtórzeń itp.). Umożliwiło to ocenę każdej zdolności ruchowej zapaśnika, jak też sumaryczną wszystkich zdolności wskazując na jego słabe i silne strony. Wnioski: 1. Stosowanie omawianej metody (zestawu testów) umożliwiło obiektywną ocenę poziomu poszczególnych zdolności ruchowych u zapaśników w wybranych okresach treningowych. A ponadto, określanie wiodących i odstających zdolności, a więc profilu czy też kompozycji tych zdolności. W oparciu o nie opracowywano indywidualne plany treningu i konstruowano styl walki. 2. Stosowanie tej metody (zestawu) przez wiele lat w szkoleniu zapaśników różnego poziomu zaawansowania umożliwiło opracowanie normatywnych wskaźników pozwalających poziom każdej zdolności motorycznej ocenić w punktach, a także wielkości punktowe przeliczać na 11 stopniową skalę ocen (od wybitnej do złej). 3. Systematyczne i wieloletnie badania umożliwiły polskim zapaśnikom realizowanie treningu, w którym stosowano właściwe proporcje między rozwojem zdolności kondycyjnych i koordynacyjnych. Co łącznie z wieloma innymi prawidłowo realizowanymi elementami treningu, szczególnie w stylu klasycznym umożliwiło odniesienie dużych sukcesów na arenie międzynarodowej.