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EFFECT OF ASSISTED TRAINING ON THE SPECIAL RUNNING PREPARATION OF JUNIOR SPRINTERS FOR 100 AND 200 m

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Aim. To test the effect of the assisted training tools on the most important indicators affecting speed development and the results in 100 and 200 min junior sprinters. Particular tasks were chosen to test the effect of assisted training on the development of speed, maximum speed, and speed endurance. **Materials and methods.** The study included a group of 8 junior athletes and lasted seven weeks (the pre-competition mesocycle – 4 weeks; competition mesocycle – 3 weeks). The study focused on the assisted training tools having crucial importance for the results in 100 and 200 m. The effect of these tools on the development of speed, sprint, and speed endurance was tested by establishing the correlations between them. **Results.** The study revealed that using the 30 m series with assisted training promotedthe maximum speed and start acceleration. There was also a strong correlation between 30 m assisted speed and the result in 100 m, which indicated that this training tool improved both the starting acceleration and maximum speed development. Also, it was found out that the 200 m result depended on 30 m AST run and the 100 m time. **Conclusion.** The results showed that using assisted training tools promoted speed development by the improvement of the nervous and muscular capacity in young sprinters.

Keywords*: assisted training, 100 and 200 m sprint, maximum speed development, junior sprint athletes.*

Introduction

Speed development in sprints can be defined as a product of the stride length and stride frequency (SL and SF). Increasing the speed of a sprinter in any given phase of a race requires changing one or both variables (SF and/or SL), in a way not affecting neither of the two negatively [3]. The running phases were described and analyzed in detail in the literature by different authors [6, 21, 23, 25].

Sprint running efficiency requires an optimal combination of biomechanical variables dependent on technical execution and the positive impact of external factors [6, 7, 19, 25].

Generating higher speed in the start acceleration phase results in a better time. Along these lines, experts in short sprints are working hard to solve this problem. Some of them propose the implementation of resistant sprint training (RST) (or sled training), the weight of the sled changes according to athlete's weight [1, 5, 9–11, 16, 22]. Some authors [8, 12, 13, 22] studied the effects of other training methods, including pulling techniques (ropes) in sprint training, on the change in the kinematics of start acceleration, which had a positive impact on speed development.

Coaches are also interested in the effective use of assisted sprint training (AST) as well as in effect, it has on start acceleration and maximum running speed [3, 26].

Both specific training methods (RST and AST) are of considerable importance for sprint training: RST helps to cope with resistance thrust and AST – to achieve higher maximum running speed. According to Mero & Komi [17, 18], RST and AST develop the neuro-muscular potential of the athlete by triggering an additional number of muscle myofibrils as well as neuro-muscular innervation in the working muscles. In our studies [26], both RSP and AST were used to cope with stabilizing maximum running speed.

In training for speed development, one often reaches a level of speed stabilization (plateau), and reaching the next level of running speed is almost impossible. In our study [24], we established that in different training stages, SL and SF could be modified by using different running intensity. Inadequacy (lack of coherence) in the different stages of training programmes could cause worsening of rhythmic running structure and could cause problems with speed development. This allows to state that a precise dosage of training efforts during the different micro- and mesocycles is essential for reaching balance in the development of specific running preparation.

One of the current problems when working with young sprinters is speed development in the different phases of sprint events. This leads us to the use of assisted training in order to improve speed development by affecting both the SL and SF.

The objective of the present study was to assess the effect of assisted training tools on the indicators affecting speed development and results in 100 and 200 min junior sprinters. The following particular tasks were set:

– To analyse the effect of assisted training efforts as a part of the training techniques used for speed development.

– To establish the importance of assisted training techniques used for speed- and sprint endurance development.

– To reveal the effect of assisted training load on the training tools for speed development based on the correlations between them.

– To study the effect of assisted training tools on the development of speed and sprint endurance based on the correlations between them.

Material and methods

Participants

The study was carried out during the pre-competition mesocycle (4 weeks) and the competition mesocycle (3 weeks). A group of 8 youth and junior athletes with an average age of 17.2 years participated in the study. The data on athletes are presented in Table 1. The results in 100 m and 200 m are achieved at the end of the study. They are obtained by hand timing and 0.24 sec were added to make them comparable to electronic timing. Only the athlete VJ achieved the results at 100 and 200 m in official starts that coincided with the study period. The structure of weekly training programme is presented in Table 2.

Procedure

Assisted training is performed traditionally with a special device, which is an elastic rope with a diameter of 10 mm and a length of 50 m. The athlete places a waist belt with a rope attachment. Upon reaching the set draw strength and after a signal from the coach, the athlete runs the distance. Upon termination of the effective force of the rope during the running, it is released automatically. In the pre-race mesocycle (1st and 2nd microcycles) AST is included in the training process with 30 m standing start series. The rope is stretched by the coach through applying different levels of force (86–87 N, and 104–105 N) to achieve 102–103 %, and 108–100 % assisted running speed, respectively, for 30 m standing start. In 50 m standing start, the applied force was 104–105 N and 192–193 N for achieving 103–104 % and 108–100 % assisted running speed, respectively.

Assisted training efforts took place two times a week on speed training days, starting with 30 m run – standing start AST. After reaching satisfactory speed, the athletes moved on 50 m standing start AST. During the first training sessions, the assisted speed was not more than 103 % of the current maximum speed of a given athlete. After reaching the required adaptation to assisted running at 30 m the athletes stepped on to 50 m AST. During the 30 m runs speed can reach as much as 108–110 %, but during the 50 m runs speed should not be more than 103–104 %.

Table 1

Qualification characteristics of the studied athletes

Athletes (initials)	Indices								
	Height (cm)	Weight (кg)	Year of Birth	Result			Experience		
				100 m (s)	200 m (s)	Training (years)	Distance	Average result (s)	Result (m/s)
V. J.	176	62	2001	10.62	21.36	4	30 m	3.73	8.04
T. S.	184	68	2001	10.92	21.82	3	50 m	5.77	8.66
R. V.	178	65	2000	10.88	21.74	3	30 m AST[1)]	3.45	8.69
M. J.	178	62	2001	11.15	22.60	4	50 m AST[1)]	5.36	9.33
I. B.	186	64	2002	11.12	22.48	3	100 m	11.03	9.07
A. V.	179	65	2000	11.25	22.82	4	150 m	16.21	9.25
A. Z.	183	70	2000	10.98	22.16	3	200 m	21.31	8.96
G. D.	170	61	2002	11.36	23.04	2	300 m	34.74	8.64
Mean	179.25	64.63		11.04	22.25	3.25			

[1)]Assisted Sprint Training.

Table 2

Distribution of training tools in the pre-competition mesocycle (I, II, III and IV microcycles) and of assisted training runs in the competition mesocycle

Day	Type of training	Pre-competition mesocycle		Competition mesocycle
		I, II and III microcycles	IV microcycle	
Monday	Toning workout	Tempo runs – 85%, toning strength exercises		
Tuesday	Speed development	3×30 m – high frequency running; 2×30 m – series flying start; 2×30 m and 1×50 m – series standing start; 2×30 m – AST running; Total volume for speed training – 300–400 m	As the previous ones + AST running 1×30 m – (108–110 %) 1×50 m – (103–104 %)	As the previous ones + AST running 1×30 m – (108–110 %) + 1×50 m – (108–110 %)
Wednesday	Sprint and sprint endurance	Development of sprint and speed endurance		
Thursday	Strength development	Exercises with hurdles. Strength training		
Friday	Speed development	3×30 m – high frequency running; 2×30 m – series flying start; 2×30 m and 1×50 m – series standing start; 3×30 m – AST running	As the previous ones + AST running 2×30 m (108–110 %) + 1×50 m – (103–104 %)	As the previous ones + AST running 1×30 m + 2×50 m – (108–110 %)
Saturday	Speed and strength endurance	Development of speed endurance. Strength endurance		

Evidence by which one can see the speed barrier is hand miscoordination and measuring the stride length in the middle of the distance and in the last meters of the distance. The difference is a result of the quickly tiring neuro system and the muscles of the back part of the leg.

Results and Discussion

The analysis of the correlation matrix (Table 3) revealed the correlations between standing starts of 30 m and 50 m and the 30 m assisted run, expressed by high correlation coefficients (R = 0.92 and R = 0.91, respectively). Increasing the speed during start acceleration is of crucial importance both for reaching maximum speed and for the final result. Importantly, we noticed a significant correlation between the speed of 30 m AST and the result in the 100 m (R = 0.97) test. The high correlation coefficient proves the statement of several experts like [2, 4, 6] who noted the importance of the start and start acceleration phases as the main factor, affecting the final result. The second most important factor affecting the result in 100 m is the development of sprint endurance by running 150 m, expressed by the high correlation coefficient (R = 0.86). The 50 m standing start turned out to correlate with the same magnitude (R = 0.86).

The relationship between the two assisted training runs of 30 m and 50 m was also high (R = 0.835). It could be supposed that the 50 m AST run helps to reach assisted training speed of 108–110 % in the 30 m effort. Following this sequence in speed development is of considerable importance.

The close correlation between the results in 100 m and 200 m (R = 0.95) is well known. This relationship shows that the training of athletes should aim at participating in both sprint events. High results in the 100 m run help reaching high results in the 200 m run and vice versa.

The final results in 200 m are most influenced by 30 m AST speed, expressed by the significant correlation coefficient (R = 0.96). Probably the correlation between the abovementioned training techniques, start acceleration, and maximum speed has a positive impact on the 200 m run. Importantly, endurance development in 200 m and 100m demonstrates a strong relationship (R = 0.889). The third most important factor is the 30 m (standing start) run with the correlation ratio of R = 0.87. According to several experts [6, 14, 15, 20] start acceleration can influence the final result significantly, and according to our own experience, it is by 15–20 %. Here we should note that the wrong development of speed dynamics in start acceleration, especially in young sprinters, leads to unsatisfactory results.

Table 3

Relationships between the training tools used, expressed by a correlation coefficient

	30 m	50 m	30 m*	50 m*	100 m	150 m	200 m	300 m
30 m	1.000							
50 m	0.924	1.000						
30 m*	0.916	0.908	1.000					
50 m*	0.806	0.796	0.835	1.000				
100 m	0.838	0.860	0.971	0.793	1.000			
150 m	0.959	0.867	0.903	0.767	0.864	1.000		
200 m	0.873	0.824	0.963	0.791	0.954	0.889	1.000	
300 m	0.955	0.808	0.823	0.666	0.728	0.923	0.838	1.000

*assisted sprint training (AST).

One of the main issues in young sprinters' training is the development of speed endurance with runs longer than race distance. In our research, we included 300 m runs, which are very important for the success in 200 m, as demonstrated by the high correlation coefficient (R = 0.838). In the weekly programmes during pre-competition and competition weekly microcycles the development of sprint- and speed endurance are of crucial importance. This statement is proved by the relationship between 150 m and 300 m runs, expressed by the correlation coefficient (R = 0.923).

Conclusions

The analysis shows that the precise dosage of training effort in pre-competition and competition mesocycles and tuning the most appropriate quantity and quality of training efforts provide the base for achieving the necessary balance in the development of special running preparation. This represents an original method that can be used in the training programs for junior athletes.

The results allow making some inferences and recommendations.

1. Using assisted training 30 m runs helps the development of speed during start acceleration. Assisted training in 30 m runs also has a positive impact on running 30 m and 50 m (standing start) expressed by the high correlation coefficients.

2. The significant and high relationship between 30 m AST and the result in the 100 m dash shows that this training technique helps both improving start acceleration and developing maximum speed, which are of crucial importance for the result in 100 m.

3. The analysis revealed that 200 m result depends on 30 m AST run and on the 100 m time.

4. The close values of the correlation coefficients (R = 0.864) and (R = 0.889) of 150 m run regarding 100 m and 200 m, respectively, allow to conclude that sprint endurance development is a key factor for the result in both events.

5. The relationship between the series of 150 m and 300 m aimed at developing sprint- and speed endurance indicates the necessity of such type of effort, and its underestimation could lead to unsatisfactory results.

The research carried out by using AST efforts indicates that this type of training could help the speed development of junior athletes by improving the neuromuscular capacity of the sprinters.

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ВЛИЯНИЕ АССИСТИРОВАННЫХ ТРЕНИРОВОК НА СПЕЦИАЛЬНУЮ БЕГОВУЮ ПОДГОТОВКУ ЮНИОРОВ-СПРИНТЕРОВ НА 100 И 200 м

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Цель. Цель данного исследования – выявить эффективность инструментов ассистированных тренировок для улучшения наиболее важных показателей, влияющих на развитие скорости и результаты забегов на 100 и 200 м у спринтеров-юниоров. Эффективность ассистированных тренировок для развития скорости, максимальной скорости и скоростной выносливости была установлена с помощью специальных заданий. **Материалы и методы.** В исследовании принимали участие 8 спортсменов-юниоров. Продолжительность исследования составляла 7 недель, из которых 4 недели – предсоревновательный мезоцикл – и 3 недели – соревновательный мезоцикл. Исследование сосредоточено на инструментах ассистированных тренировок, имеющих первостепенное значение для результатов забегов на 100 и 200 м. Эффективность использования данных инструментов для развития скорости, максимальной скорости и скоростной выносливости была установлена за счет выявления корреляций между ними. **Результаты.** По результатам исследования было установлено, что забеги на 30 м с использованием инструментов ассистированных тренировок улучшили максимальную скорость и стартовое ускорение. Была выявлена статистически значимая корреляция между скоростью в ассистированном забеге на 30 м и результатами забега на 100 м, что подтвердило эффективность использования инструментов ассистированных тренировок как для развития стартового ускорения, так и максимальной скорости. Также было выявлено, что результаты забега на 200 м зависели от времени ассистированного забега на 30 м и забега на 100 м. **Выводы.** Результаты исследования продемонстрировали, что использование инструментов ассистированных тренировок способствовало улучшению скорости спортсменов за счет развития нервных и мышечных резервов юных спринтеров.

Ключевые слова: *ассистированная тренировка, забег на 100 и 200 м, развитие максимальной скорости, спринтеры-юниоры.*

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