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Analysis of the training of 17-18-year-old male powerlifters with cerebral palsy

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ABSTRACT

The present study had a pedagogical experiment design. The participants of the study were 17-18-year-old male powerlifters with cerebral palsy. The participants were selected and allocated into two groups: Group A and Group B. Both the groups were homogenous in terms of physical and mental state of training. Pre-test and post tests were conducted for physical qualities and mental states of the participants. During the annual experiment, powerlifters in groups A and B performed different training programs with various ratios of specific and non-specific loads. In group A, the ratio was 60% - 40%, while in group B was 70% - 30%. Upon completing the annual experiment, a better ($p<0.05$) level of physical qualities (speed, speed-strength and static endurance) and mental state of training (neuropsychic resistance, success motivation and motivation to avoid failures) was identified in participants of group A. Therefore, we recommend to use specific and non-specific loads in a ratio of 60% - 40% when training 17-18-year-old male powerlifters with cerebral palsy.

KEYWORDS

Annual cycle; Cerebral palsy; Powerlifting athletes; Mental states; Specific and non-specific loads.

1. INTRODUCTION

According to the global statistics, every tenth child is either born disabled or becomes disabled in the successive years of his or her life. There are multiple factors responsible for this lifelong disability among neonates and children which include man-made disasters, constant decline

in the quality of food products, infectious and hereditary diseases, deteriorating environmental life conditions, alcoholism and drug addiction (Al-soub, 2012; Chiu et al., 2010; Khasan, 2012).

Cerebral palsy (CP) is prevalent in more than 15 million people across the globe and has been listed as one of the difficult disease to treat (Arkhipova, 2003; Evseev, 2016; Hicks et al., 2003). Based on the anatomical structures, Cerebral Palsy has been classified as Monoplegia i.e. involvement of one extremity, Diplegia i.e. significant dysfunction of both lower extremities and minor damage to both upper extremities, Hemiplegia i.e. dysfunction in the one side of the body (arm and leg), paraplegia i.e. dysfunction in the two extremities, Triplegia – dysfunction in the three extremities, Tetraplegia or Quadriplegia i.e. dysfunction in the all four extremities. In cerebral Palsy, there is involvement of the cortical areas which control human movements (Badalyan, 2003; Nechaeva & Syromolotov, 1988; Punciman et al., 2015; Schiariti et al., 2015).

Long-term experience of the foreign and domestic medicine has shown that the use of medications practically does not cause any significant improvements in the health status of people suffering from the cerebral palsy. Similarly, in the past decades it has been established that physical culture and sports has induced more improvements in their physical symptoms in comparison to the medications. (Alsoub, 2012; Khasan, 2012; Hicks, et al, 2003; Kim et al., 2012; Moreau, Hothouse, & Marlow, 2013; Punciman, et al, 2015).

One of the most easily accessible populations affected with musculoskeletal disorders, involved in the field of Paralympic sports is of the power lifters (Evseev, 2016). If in the theory and methodology of training healthy athletes in powerlifting, almost all the main provisions are experimentally substantiated, then they have just begun to be developed among disabled powerlifters (Platonov, 2015; Szafraniec et al., 2020). At the same time, it seems especially important to identify the optimal structure and content of the annual training cycle – the main structure of the training process for powerlifters with cerebral palsy (Sladkova, 2003; Szafraniec, et al., 2020).

Among the pool of strength related and speed-strength related sports, many experts have recommended the ratio of specific and non-specific training with respect to the ratio of age of the participant to the specific remedies and of non-specific remedies in the annual training cycle. The recommended ratios are: 10-11 years old (30-32 % of specific remedies and 68-70 % of non-specific remedies), 12-13 years old (34-36 % of specific remedies and 64-66 % of non-specific remedies), age 14-15 years old (38-40 % of specific remedies and 60-62 % of non-specific remedies), age 16-17 years old (45-50 % of specific remedies and 45-50 % of non-specific remedies), age 17-18 years old (55-60 % of specific remedies and 40-45 % of non-specific remedies) (Belsky, 2000; Bompa & Haff, 2009; Dvorkin & Slobodyan, 2005; Khasan, 2012; Maksimenko, Alkindi, Fatyeyev, 2005;

Maksimenko, & Bocharov, 2007; Maksimenko, Maksimenko & Vasilchenko, 2011; Maksimenko, 2012; Maksimenko, Voronkov & Zhilina, 2016). Based on the extensive review of literature sources, it was found that there is need to substantiate and implement a training program for the population of paralympic athletes (power lifters) within the age group of 17-18 years with the aim to provide an effective increase of versatile physical fitness and an expansion of the stock of their motor skills and abilities. The implementation of such training programs will contribute to the growth of players by helping them in achieving their highest goals. A study was conducted on the individuals diagnosed with cerebral palsy involved in athletics throwing and football by (Khasan, 2012) and (Al-Soub, 2012). In this study, researchers tested the efficiency of players by using the ratio of specific and non-specific loads in the annual training cycle of athletes-throwers. The results of their study revealed that, the ratio in group A was 60%:40% whereas in group B the ratio was 50%:50%. A higher level of physical, technical and psychological competence was also identified among athletes of group A, who performed 60 % of specific and 40 % of non-specific loads.

In the annual pedagogical experiment conducted by Al-Soub, 2012 with the participation of football players with ICP effects, two variants for distribution of physical loads were tested. In Group A, the ratio between specific loads and non -specific load was 55%:45%, whereas in Group B, the ratio was 50%:50%. The findings of their study revealed that a significant difference was found in the physical and psychological competence between both the groups, in the favor of Group B.

In connection with the above, before our study, the objective was formulated – to substantiate the appropriate ratio of specific and non-specific means of training in the annual program of powerlifting for 17-18-year-old young men with cerebral palsy with musculoskeletal disorders.

2. METHODS

The present study had a pedagogical experiment design. The participants of the study were 17-18-year-old male powerlifters with cerebral palsy. The participants were selected and allocated into two groups i.e. Group A and Group B. Both the groups were homogenous in terms of physical and mental state of training. Pre-test and post tests were conducted for physical qualities and mental states of young men (Al-soub, 2012; Evseev, 2012; Khasan, 2012; Gogunov & Mattyanov, 2004; Platonov, 2015). Quickness among participants was assessed by the number of claps made by them in forward and behind the back in 10 seconds. Speed-strength qualities were determined by the results of throwing a medicine ball weighing 1 kg. Participants were asked sit comfortable on a chair. Followed by this, they were instructed to throw the ball by keeping their hands, holding the ball

behind the neck. They were told to throw the ball in forwards and backward directions. The diagnostics of strength readiness was carried out by measuring the strength of both hands and cumulative figures of absolute and relative strength of five hand muscle groups of the strongest and weakest arm (Beckman, Connick, & Tweedy, 2017; Belsky, 2000; Hussain et al., 2014; Maksimenko et al., 2005; Marilia, Anna & Antonio, 2005).

The cumulative figures of the absolute strength of five hand muscle groups included strength characteristics of flexors and extensors of the shoulder joint, flexors and extensors of the forearm muscles, and strength of hand and fingers. To determine the values of the relative strength, the absolute strength indicators were divided by the athlete's body weight. B. M. Rybalko's method and dynamometer designed by V. M. Abalakov were used for testing the level of strength readiness (Belsky, 2000; Evseev, 2016; Maksimenko et al., 2005).

Among athlete-beginners, the result was recorded by the method of bench pressing (Platnov, 2015). The endurance testing was done in the young men by analyzing the parameters of static endurance of the strongest and weakest hand, while measuring the holding time of force, which was 80 % from the maximum possible force (Nechaeva & Syromolotov, 1988).

Assessment of the mental state of the young players was done using the methods for determining neuropsychic resistance (Anastasi & Urbina, 1997; Badalyan, 2003) and personality diagnostics for success motivation and motivation to avoid failures (Anastasi & Urbina, 1997; Gogunov & Mattyanov, 2004). The data obtained in the course of the study were processed by the generally accepted methods of mathematical statistics.

In the present study, the power lifters of groups A and B performed a different ratio of specific and non-specific loads. In group A the ratio was 60% of specific and 40% of non-specific loads, whereas in group B the ratio was 70%:30%, i.e. 70% of the specific loads and 30 % of the nonspecific loads. The specific loads included special and preparatory exercises with weights (with a barrel, weight pieces, dumbbells), as well as exercises on the special strength stimulators. In the non-specific load, general physical training, which included exercises such as exercises on the parallel bars, exercises with a partner, and aerobic training to improve the activity of cardiovascular and respiratory systems. During the experiment, 120 training sessions were held in each group; apart from that the number of barbell lift in group A was 2411.5 times, whereas in group B the number was 2656.7 times. In group A the time spent on using general specific training was 91.2 hours, whereas in group B it was 82.1 hours.

3. RESULTS

Table 1 represents the data of young power lifters. A significant difference was found in the level of physical fitness, speed, speed-strength qualities and static endurance between group A and group B with ($p<0.05$) in favor of group A. A significant difference was also found in hand strength and total indicators in strength of five muscle groups for both hands between group A and group B with ($p<0.05$) in favor of group A. A statistically non-significant difference was found in the bench pressing between group A and group B, with $p>0.05$. A statistically significant difference was found in the mental states of the players between group A and group B ($p<0.05$) in favor of group A. Thus, the data on neuropsychic resistance in group B were 4.49 points, and in group A 5.67 points ($p<0.05$). A significant difference was also found in indicators for success motivation, as well as for motivation to avoid failures, between group A and group B ($p<0.05$) in favor of group A.

4. DISCUSSION

In the course of the annual experiment it was possible to fully implement the principle substantiated by many teachers, which provides for the orientation of pedagogical influences not only on weakening the physical and mental disabilities of children with health impairments, but on the active development of their cognitive activity, mental processes, physical abilities and moral qualities (Hicks, 2003; Alsoub, 2012; Badalyan, 2003; Chiu,2010; Evseev, 2016; Khasan, 2012; Hussain, 2014; Moreau, 2013; Runciman, 2015). This principle received international recognition. It was in the current study on the model of the Paralympic Games (Nechaeva, 1988; Platonov, 2015). Based on the findings of the present study, researchers identified optimal parameters of physical activity in the annual cycle of powerlifting for young men with musculoskeletal disorders which accounted for 60 % of specific and 40 % of non-specific devices. The implementation of such a training program allowed the trainees not only to significantly increase their physical condition but also to considerably improve the indicators of mental states, which is very important for adaptation in the society of people with cerebral palsy (Gogunov, 2004; Nechaeva, 1988; Runciman, 2015; Sladkova, 2003).

Table 1. Sports results and indicators of physical fitness and mental status among young male powerlifters (n=28): Group A and B at the beginning and end of the annual experiment ($\bar{x}$ – average value)

Target values	Initial data					Final data				
	Group A		p	Group B		Group A		p	Group B	
	$\bar{x}$	m		$\bar{x}$	m	$\bar{x}$	m		$\bar{x}$	m
Body weight, kg	61.7	0.35	>0.05	59.5	0.42	62.8	0.38	>0.05	61.9	0.41
Claps in front and behind the back in 10 seconds, quantity	18.15	0.23	>0.05	19.07	0.25	23.16	0.21	<0.05	20.14	0.26
Throwing a medical ball while sitting from behind the head forward, m	3.76	0.04	>0.05	3.91	0.06	4.52	0.03	<0.05	4.21	0.05
Throwing a medical ball while sitting over the head backwards, m	3.81	0.03	>0.05	3.90	0.04	4.38	0.03	<0.05	4.11	0.03
Hand strength of the strongest arm, kg	22.3	0.07	>0.05	22.6	0.08	30.8	0.09	>0.05	31.1	0.11
Hand strength of the weakest arm, kg	19.8	0.06	>0.05	20.1	0.05	27.5	0.08	>0.05	27.9	0.07
The total indicator of the strength of the five muscle groups of the strongest arm, kg:										
Absolute strength	134.6	4.05	>0.05	136.0	4.27	169.8	3.96	>0.05	172.9	4.29
Relative strength	2.18	0.02	>0.05	2.28	0.03	2.70	0.03	>0.05	2.79	0.04
The total indicator of the strength of five muscle groups of the weakest arm, kg:										
Absolute strength	127.5	3.87	>0.05	129.4	4.01	157.5	3.75	>0.05	161.3	3.84
Relative strength	2.06	0.02	>0.05	2.17	0.03	2.51	0.04	>0.05	2.61	0.03
Static endurance of the hand of the strongest arm, s	6.1	0.02	>0.05	6.3	0.04	11.4	0.02	<0.05	8.1	0.03
Static endurance of the hand of the weakest arm, s	5.7	0.01	>0.05	5.4	0.03	10.1	0.01	<0.05	6.9	0.02
Bench pressing, kg	34.37	2.01	>0.05	35.65	2.27	64.53	2.17	>0.05	66.91	2.11
Indicators of mental states, points:										
Neuropsychic resistance	3.48	0.01	>0.05	3.52	0.03	5.67	0.02	<0.05	4.49	0.04
For success motivation	7.34	0.02	>0.05	7.52	0.01	9.55	0.03	<0.05	8.12	0.02
For motivation to avoid failures	7.85	0.03	>0.05	8.11	0.02	11.69	0.01	<0.05	9.55	0.03

In conclusion, the results of the one-year pedagogical experiment confirmed the scientists' recommendations on the possibility of significantly improving physical and mental fitness of patients with musculoskeletal disorders, provided that they regularly take physical training including exercises from such an accessible sport as powerlifting. Also, the optimal program of powerlifting classes in the annual training cycle was substantiated for 17-18-year old young men with musculoskeletal disorder provided for the use of specific and non- specific loads in a ratio of 60% - 40%. Prospects for further research envisage the solution of few tasks, such as substantiation of the parameters and content of long-term training, the structure of meso- and microcycles of training, the development of pedagogical methods for monitoring the value of training loads, and the study of the impact of the competitive loads on the athlete's body with musculoskeletal disorders. Thus, on the basis of experimental studies, an appropriate ratio of specific and non-specific devices of training in the annual powerlifting program for 17-18-year old young persons with cerebral palsy has been substantiated.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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