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Competitive effectiveness in 50 km skiing marathon at winter Olympic Games and World Championships during the whole period of their organization (since 1924 till 2019)

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Abstract: The research is dedicated to "record" results analysis among the winners of the competitions in 50 km skiing marathon at the Olympic Games (WOG) and World Championships (WCh) during the whole period of their organization (since 1924 till 2019). The main objectives of the research are connected with a long-term dynamics study of sports-technical results in elite racing skiers at 50 km distance with classical and free style, the winners' age-related characteristics estimation and rating and competitive estimation of the countries, which participated in skiing marathon at the Olympic Games and World Championships. Research methods. Information sources analysis and summarizing, the dynamics of sports-technical results analysis and estimation among elite racing skiers, the winners of the OG and WCh at 50 km marathon distance with classical and free style and also their age-related characteristics and a ranking competitive estimation of the countries-participants; method of mathematical statistics. Results. The main results of the research are the following: we revealed the increasing dynamics of the amount of the countries, which participated in WOG in skiing marathon: I WOG (1924) - 8 countries, XIII WOG (1976r) -14, XXIII WOG (2018r) - 27; we made a ranking estimation according to the amount of medals, won by the athletes at WCh and WOG at 50 km distance during the period since 1924 till 2019: Sweden – 62 medals (among them 26 gold medals); Norway – 49 medals (among them 20 gold medals); Finland – 47 medals (among them 15 gold medals); Russia – 27 medals (among them 5 gold medals); we revealed general increasing tendency of a long-term dynamics of competitive speeds, shown in classical and skating styles, among the winners of the marathon: specified rate of the annual speed increase in classical style at WOG is 0,042 m/s (0,59%), at WCh - 0,036 m/s (0,54%), in free style at WOG is 0,044 m/s (0,58%), at WCh -0,031 m/s (0,42%); we defined age-related characteristics of racing skiers, who form the elite of this discipline. During the period since 1924 till 2019 ("era" of wooden skis use) the average age of the winners at 50 km distance was $29\pm1,6$ years old (V – 5,5%), during the period since 1976rtill $2018 - 26,9\pm2,6$ years old (V - 10,1%). Conclusion. The research results help to predict the development of marathon Olympic distance and define the tendency in the existing training methods development for the nearest future.

Keywords: the Olympic Games, World Championship, elite racing skiers, competitive effectiveness, dynamics of sports-technical results.

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INTRODUCTION

World records in ski race disciplines are not registered, as competitive efficiency of skiers depends on many factors. They don't let preserve constant conditions of higher sports results registration [2]. However, in these conditions it is extremely important to understand and estimate the tendencies of sports-technical results development in ski race. Several research works are dedicated to this problem [1,3,4,6]. The results of these research works are methodical recommendations

for sports achievements prediction and their use for target-oriented sports training programs creation and realization. However, there are almost no research works, which estimate competitive activity of the elite racing skiers at 50 km distance race. In this connection it is interesting to analyze winners' "record" results at 50 km skiing marathon competitions at the Olympic Games (WOG) and World Championships (WCh) within the whole period of their organization (since 1924 till 2019). Skiing marathon can be defined as an extreme

RUSSIAN JOURNAL OF PHYSICAL EDUCATION AND SPORT Volume 15 No.2 2020

kind of competitive activity. It demands an athlete's long-term (for about 2 hours) work with maximum physical, energetic and psychic abilities demonstration [4]. "Extreme" character of the discipline doesn't allow including it into the programs of important competitions more than once-twice during the competitive period. In World Cups programs during the periods of WOG and WCh organization this discipline is almost excluded. Thus, such specificity provides special training, which gives maximal result at WCh and OG. The Olympic champion at 50 km distance in 2018 became Finnish athlete Iivo Niskanen. He had not high rating in that season: the 14th place in overall standings, the 24th place in sprint standings, the 13th place in distance standings. The World champion in 2019 at skiing marathon became Norwegian Hans Christer Holund. He had the 3rd result according to the results of the season in distant disciplines, in sprint standings he wasn't among 90 athletes, who had the points and in overall standings he took the 6th place. It shows that their training and competitive activities were realized according to the principle of profile training, it means taking into account target competitive activity [4].

The urgency of our research is in the fact that for the first time we consider speed indices of the competition winners in skiing marathon (50 km distance) at WCh and WOG within the whole period of their organization (since 1924 till 2019), their agerelated characteristics and rating and competitive estimation of the countries. They took part in the skiing marathon and the representatives of which became the winners at OG and WCh.

MATERIALS AND METHODS

The main objectives of the research are connected with a long-term dynamics analysis and estimation concerning sports-technical results of elite racing skiers, the winners at OG and WCh at marathon distance 50 km with classical and free style and their age-related characteristics and rating and competitive estimation of the countries at skiing marathon during OG and WCh.

The main information source during the sports effectiveness study among world- class racing skiers was the official site FIS – https://www.fis-ski. com/. We studied the competitive practice of 69 elite athletes-the winners and prize-winners (men) at 50 km distance at WOG and WCh during the whole historical period of their organization since 1924 till 2019. In general there were held 52 WCh and 23 winter Olympiads within the mentioned period. We analyzed 60 competitions protocols, 183 individual sports-technical results, shown during the competitions with classical and free styles. Moreover, we defined age-related indices of athletes-the winners of WOG during the period since 1924 till 2019.

RESULTS AND DISCUSSION

The main International competitions are winter Olympic Games (WOG) and the World Championships (WCh). The first WOG (together with WCh) were held in 1924 in Chamonix (France). For the first time Russian skiers took part in the 20th World Championship in 1954 in Falun (Sweden). In general within this historical period 23 Olympiads and 52 World Championships were held.

During almost 90 years of winter Olympic Games organization (1924-2019) the amount of countriesparticipants in 50 km discipline among men increased from 8 at the 1st Games till 27 at the 23rd Games, 3,5 times increase. The dynamics of the amount of countries, the representatives of which take part in skiing marathon, increases. The main reason of the increase is the increased popularity of ski race in many countries of the world (Fig. 1). Prestigiousness of the victory in skiing marathon is the "final part" of the achievements in ski race.



discipline

RUSSIAN JOURNAL OF PHYSICAL EDUCATION AND SPORT Volume 15 No.2 2020

It is interesting to see the rating of the countries, the athletes of which became the prizewinners of skiing marathon (Table 1).

The most informative criterion of the national teams rating is general amount of the won medals and taking into account the number of different awards [2,5].

The greatest number of medals at 50 km distance during the period since 1924 till 2019 took

the athletes of national team of Sweden – in general 62 medals (26 gold, 19 silver and 17 bronze medals). The second place belongs to Norway – 49 medals (20 gold, 10 silver and 19 bronze medals) and the third place – the national team of Finland – 47 medals (15 gold, 20 silver and 12 bronze medals). The athletes of Russia take the 4th place with 27 medals (5 gold, 12 silver and 10 bronze medals) (Table 1).

Table 1 – The number of medals, won by the athletes from different countries-participants at WCh and WOG at 50 km distance during the period since 1924 till 2019

	World Championship			The Olympic Games			Total			
Countries	Gold	Silver	Bronze	Gold	Silver	Bronze	Gold	Silver	Bronze	Total
Sweden	19	13	12	7	6	5	26	19	17	62
Norway	13	8	14	7	2	5	20	10	19	49
Finland	11	14	9	4	6	3	15	20	12	47
Russia	2	8	5	3	4	5	5	12	10	27
Italy	2	1	2	1	1	1	2	2	3	7
Germany	1	2	3	2	1	0	3	3	3	9
Switzerland	0	1	1	0	0	2	0	1	3	4
Kazakhstan	0	0	2	1	0	0	1	0	3	3
Estonia	0	1	0	0	1	0	0	2	0	2
Austria	0	0	1	0	0	2	0	0	3	3

winners and prize-winners in 50 km discipline received two medals. The table takes into account all received awards

The first native World champions in ski race at 50 km distance became Vladimir Kuzin (Falun, Sweden, 1954), one more gold medal of the World Championship took Nikolai Zimyatov (Lake Placid, the USA, 1980). Nikolai Zimyatov also won the first Olympic gold medal in this discipline (Lake Placid, the USA, 1980). Further the Olympic champions become Michael Ivanov (Salt Lake City, the USA, 2002) and Alexander Legkov (Sochi, Russia, 2014).

Russian skiers were backward Scandinavian skiers, especially in gold medals rating.

It is connected with the fact that the first participation of the Russian athletes in WCh was only in 1954 and the debut of taking part in OG was in 1956.

Distance speed analysis among the winners of skiing marathon at WOG and WCh during the whole historical period of their organization helps to follow the evolutional way of this discipline development, conditioned by several factors. In classical style in the dynamics of competitive speed we can define two great historical periods (Fig. 2). The first is characterized by speed increase at WCh till 1987 and the Olympic Games till 1994. Speed during this period increased more than by 50%. The second period (till nowadays) can be characterized as stable one, in which speed, shown by the winners at WCh was lower than at OG and which proves distinct priority in training athletes for the Olympic Games.

The important event was at the XV th Games (Calgary, Canada, 1988), when the separation of the disciplines was introduced according to the style of moving: classical and free style (skating). Use of skating style technique had several reasons: at the beginning of the 70-s the "era" of wooden skis finished. They were replaced by plastic skis, skiing tracks were prepared by special technique, on the basis of modern materials and technologies skiing equipment was improved, the technologies of skis preparing appeared, which took into consideration the competitive style, individual; characteristics of the athlete and outer conditions of competitions organization.

RUSSIAN JOURNAL OF PHYSICAL EDUCATION AND SPORT Volume 15 No.2 2020

Fig. 3 presents the dynamics of speed among the winners in free style at 50 km distance at WCh and WOG during the period since 1988 till 2019. In general 10 World Championships and 5 Olympic Games were held in free style. In the dynamics of the distance competitive speed we see its increase, in the average yearly speed increase within the studied period in free style at WOG was 0,044 m/s (0,58%), at WCh – 0,031 m/s (0,42%). In comparison with classical competitive style we come to the conclusion that technique and tactics development of the competitive "skating" style and special equipment development, including the technology of skies preparation, which provide maximal high characteristics of sliding, condition the increasing trend of competitive speed at the stage of another Olympic cycle.



dates (years)



м/c-m/s

V, м/с на ОЗИ – V, m/s at WOG V, м/с на ЧМ – V, m/s at WCh

Полиноминальная (V, м/с на ОЗИ) – Polynomial (V, m/s at WOG)







Fig. 4. Dynamics of the winners' age at WOG at 50 km distance during the period since 1924 till 2018

Since 1924 till 1972 ("era" of wooden skis use) the average age of the winners at 50 km distance among men was $29\pm1,6$ years-old (V-5,1%). The oldest winner at this distance was Swede Sixten Jernberg (35 years-old) at the IX Games, which were held in Innsbruck (Austria, 1964).Since 1976 till 2018, as there appeared plastic skis and skating steps were introduced, age range of winners in skiing marathon was $26,9 \pm 2,6$ year-old (V-9,6%), the exception became the winner in 2006 Giorgio di Centa (Italy) – 34 years-old (picture 3).The received results prove the average age decrease among the winners at marathon distance. Within the studied period (1924-2018) the average age of athleteswinners was $28,5\pm 2, 9$ years-old.

CONCLUSION

The main results of the research are the following:

- we revealed the increasing g dynamics of the countries-participants amount at WOG in skiing marathon: : I WOG (1924) – 8 countries, XIII WOG (1976r) –14, XXIII WOG (2018r) – 27;

- we made a ranking estimation according to the amount of medals, won by the athletes at WCh and WOG at 50 km distance during the period since 1924 till 2019: Sweden – 62 medals (among them 26 gold medals); Norway – 49 medals (among them 20 gold medals); Finland – 47 medals (among them 15 gold medals); Russia – 27 medals (among them 5 gold medals);

- we revealed general increasing tendency of a long-term dynamics of competitive speeds, shown in classical and skating styles, among the winners of the marathon: specified rate of the annual speed increase in classical style at WOG is 0,042 m/s (0,59%), at WCh – 0,036 m/s (0,54%), in free style at WOG is 0,044 m/s (0,58%), at WCh – 0,031 m/s (0,42%);

- we defined age-related characteristics of racing skiers, who form the elite of this discipline. During the period since 1924 till 2019 ("era" of wooden skis use) the average age of the winners at 50 km distance was $29\pm1,6$ years old (V - 5,5%), during the period since 1976r till 2018 - $26,9\pm2,6$ years old (V - 10,1%).

The results of the research would help to make a reasonable prediction for marathon Olympic discipline development and also define the tendency in the development of the existing methods of athletes training for the nearest future.

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