

# CHRONOLOGICAL AGE OF ALPINE SKI MEDAL WINNERS IN THE 2015-2018 OLYMPIC CYCLE

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HRONOLOŠKA STAROST ALPSKIH SKIJAŠA I SKIJAŠICA  
OSVAJAČA MEDALJA U OLIMPIJSKOM CIKLUSU 2015-2018.

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## ABSTRACT

*Personal motivation, as well as engagement in alpine skiing, brought the authors to inspect the differences in average chronological age of alpine skiers, and to present the results to the professional public, in order to improve planning and programming of the training process. The paper analyzed the average chronological age of medal winning professional alpine skiers in the World Cups in the 2015-2018 Olympic cycle. The following alpine disciplines were analyzed: Slalom (SL), Giant Slalom (GS), Super-G (SG), Downhill (DH) and Alpine Combination (AC). The obtained results indicate that there was a significant difference in the average chronological age between male and female competitors. The results of the present study show that there were differences in GS, SG, DH, and AC, where male skiers are on average older than female skiers. Conversely, there was no significant difference between male and female skiers in SL. The results of this study could aid coaches and experts in future years of individual management of sports careers of male and female skiers.*

**Key words:** alpine skiers, age, competitions, alpine disciplines.

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## INTRODUCTION

Moving on snow has always been a challenge, more or less pleasant, which a person, depending on the time in which he lived, solved in different ways. Basically, skiing is lowering and crossing the falling line with skis, left and right turns at higher speed (Savić, & Stijepović, 2019). Alpine skiing is a complex sport of high intensity, from the category of acyclic polystructural sports (Koprivica, 2002). Skiing is a sport that is constantly evolving and improving, and in which we are involved from a different needs and motives perspective (entertainment, leisure, competitions, work). In contemporary conditions, the influence of science and technology in the sport of skiing is constantly growing, especially in terms of design and equipment, mechanics and aerodynamics, diagnostics and training planning. This points us to the fact that skiing definitely has a perspective, as well as to the fact that skiing has turned into a global sport and recreational activity, because it has experienced a great expansion in recent years. Today, alpine skiing competitions are a great attraction, especially competitions in the World Cup. The races take place from autumn to late spring in 8 disciplines: Slalom (SL), Giant Slalom (GS), Super-G (SG), Downhill (DH) and Alpine Combination (DH or GS and SL), Team Parallel (TP), Parallel Giant

Slalom (PGS), Parallel Slalom (PSL). Each of these disciplines has certain characteristics according to the international rules of the World Ski Federation (FIS). Moreover, skiing is a high intensity sport, where races last on average from 30 to 160 seconds and where isometric and eccentric muscle contractions are dominant. Contemporary competitive skiing, like most other sports, requires a high degree of specialization for certain competitive disciplines (Matković, Ferenčak, & Žvan, 2004). Therefore, the elite competition results depend on good diagnostics, training plan, mental readiness of competitors, appropriate training content selection, application of appropriate load, which are in compliance with periodization and competition calendar (Savić, Stojanović, Stojiljković & Jorgić, 2013).

The aim of this study fully defines the content and indicates the framework of the given tasks and goals, therefore appropriate statistical procedures could clarify the main goal of the present study. The chronical age of the athletes and the elite sports results have only been partially researched in similar studies and other sports. In the field of skiing, there are relatively few papers with a similar research problem, which is the reason why the authors decided to conduct this study. Furthermore, it complements

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the existing research problem with the new material, new comments and conclusions, and emphasizes the importance in the context of practical application in the training process. In the following text, we listed some of the studies regarding this topic.

Authors, Hancock, Adler & Côté (2013) in their study consider the effect of relative age (RAE) of athletes through different social contexts and emphasize the importance of the theoretical model (RAE). Authors Baker, Janning, Wong, Cobley, & Schorer (2014) also point out the term of relative age effect (RAE), which we will not apply in its original form in this study, since we did not take into account the exact date of birth of competitors in the competition season, but only the year of birth. In this regard, we used the term relative age of competitors (RAC). In a similar study, the authors of Müller, L., Müller, E., & Rashner, (2016) pointed out the fact that relatively older skiers are more successful in alpine races. Contrary to these findings, Bjerke, Pedersen, Aune, & Lorås, (2017) indicate the existence of a reverse relative age effecting skiers (RAE). Therefore, younger skiers achieved better results in competitions than older skiers.

Findings of similar research by Müller, L., Müller, E., Hildebrandt, & Raschner, (2016) clearly show the significant impact of biological maturity status on the selection process of youth alpine skiers depending on the level of

competition. It seems that relatively younger athletes have a chance to compete only if they have matured early. Neumayr, Hoertnagl, Pfister, Koller, Eibl, & Raas, (2003), dealt with the anthropometric characteristics of skiers with reference to their age, where they connect them with the researched characteristics. The process of growth and development, as well as the process of aging, are manifested by numerous changes in the structure and function of the individual, so the best period for achieving elite sport results is up to 30 years.

Scientific thought in modern society in the field of skiing is mostly based on achieving elite sport results. This study was methodologically set up so that it does not deal with causal relationships, but only analyzes, discusses and concludes on the differences between the arithmetic means of the relative age of alpine skiers and medal winners at the world's largest competitions. We have observed the practical values of such research interdisciplinary, because we are of the opinion that it is necessary. Such analysis can provide us some new information on the value of elite sport and its further development. The problem is implied in the increase and decrease of average chronological age in certain alpine disciplines and throughout competition seasons, and the differences across gender. The hypothesis of the present study indicates the fact that there are

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significant differences between male and female skiers who won medals in major competitions.

Based on the target sample of medal-winning alpine skiers and in certain alpine disciplines, a specific research goal has been set. The aim of the present study was to compare the differences in the relative age of the respondents by disciplines and therefore contribute to everyday practice, and provide recommendations to trainers to create their long-term goals and training plans. Therefore, the contribution could be towards practical application, and the ability to generate new theories and hypotheses.

### METHODS

In the present study, the targeted sample was employed (Stojiljković, Bratić & Sporiš, 2020), and selected on the basis of a specific characteristic of interest for this research - medal winners at the world's the most important competitions, therefore the interpretation of gathered data could be significant for practical

### RESULTS

To test the hypothesis that there was a statistically significant difference in the chronological age of the competitors, the T test for independent samples was applied. In Table 1, we can observe that the results of the Kolmogorov-Smirnov test (.09 - .22) are within the critical values, therefore, the assumption of normal distribution was met. The range of chronical age is scattered, therefore from the aspect of chronological age, this sample was not homogeneous. Moreover, based on the coefficient of variation, we can observe that there was a significant variation in the age of the competitors.

use. The targeted sample in this study was derived from a representative sample of alpine skiers and can serve to generalize the results of the alpine skier population. The results from the tables and graphs are descriptively treated and interpreted. A descriptive method was used, as well as the method of analysis and critique. The conclusions were established on the same basis.

The parameters of descriptive statistics, minimum and maximum, range, standard deviation, coefficient of variation, and Kolmogorov-Smirnov test were used to describe the continuous variable. To test the hypothesis that there is a statistically significant difference in the chronological age of the competitors, the independent samples t-test was applied. In the discussion and analysis of the obtained results, the comparison with the median was abandoned due to the great coincidence of the obtained results, especially when it comes to the tendencies of the average age by seasons and disciplines. All statistical analysis were carried out using Statistica 8 (StatSoft Inc., Tulsa, OK).

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**Table 1.** *Descriptive statistics of male and female Ski World Cup medal winners (age).*

Event	Gender	N	M	Min.	Max.	Range	Std.Dev.	Coef.Var.	KS
Slalom	Male	117	27.59	20	35	15	3.94	14.29	.11
	Female	111	26.61	20	34	14	4.55	17.10	.17
G Slalom	Male	96	27.17	21	37	16	3.70	13.62	.14
	Female	98	26.16	19	34	15	3.12	11.92	.14
Super G	Male	81	29.72	23	37	14	3.883	13.07	.09
	Female	90	27.53	23	34	11	2.92	10.60	.16
Downhill	Male	108	30.72	24	38	14	3.61	11.75	.11
	Female	89	28.08	22	35	13	3.49	12.43	.14
AC	Male	27	28.74	22	36	14	4.12	14.33	.22
	Female	24	26.08	22	32	10	2.96	11.36	.14

**Legenda:** N – number of cases; M – mean; Std. Dev. – standard deviation; Min. – minimum; Max. – maximum; Range – range of results; Coef. Var. – coefficient of variation; KS – Kolomogorov-Smirnov test.

In Table 2, we have applied the independent T test to find that there were statistically significant differences in the chronological age of male and female competitors in Giant Slalom (M = 27.17, SD = 3.70; M = 26,16, SD = 3.12;  $t(192) = 2.04$ ,  $p = 0.042$ ), Super G (M = 29.72, SD = 3.88; M = 27.53, SD = 2.92; ;  $t(169) = 4.18$ ,  $p < 0.001$ ), Downhill (M = 30.72, SD = 3.61; M = 28.08, SD = 3.49; ;  $t(195) = 5.19$ ,  $p < 0.001$ ), and Alpine Combination (M = 28.74, SD = 4.12; M = 26.08, SD = 2.96;  $t(49) = 2.61$ ,  $p = 0.012$ ). There was no statistically significant difference between the examined subsamples in Slalom

(M = 27.59, SD = 3.94; M = 26,61, SD = 4.55;  $t(226) = 1.74$ ,  $p = 0.084$ ).

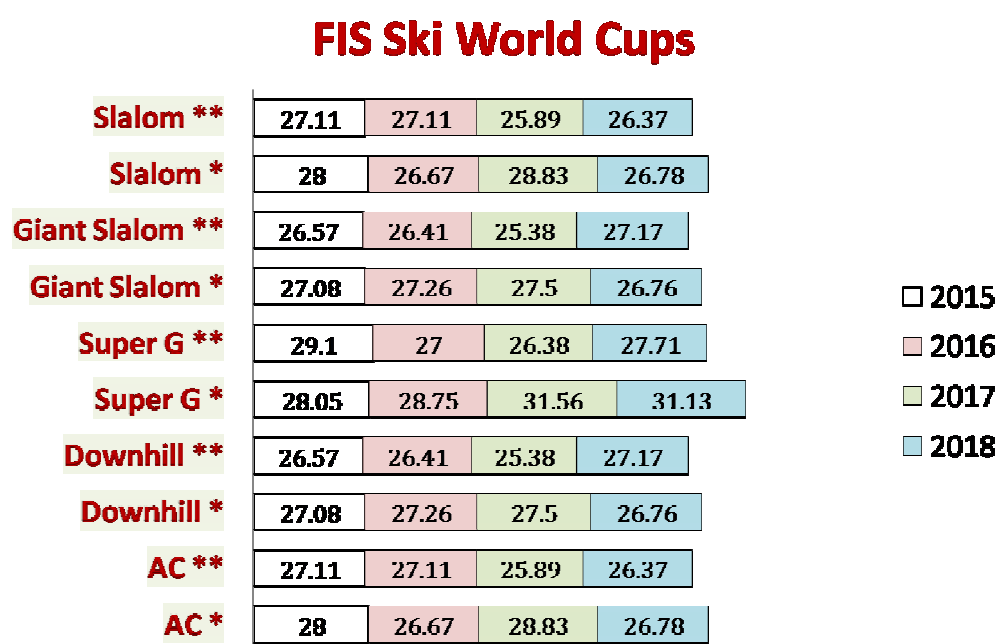
We can be 95% sure that there is a real difference between the mean values of the examined groups in Giant Slalom CI = [0.03, 1.97], Super G CI = [1.15, 3.21], Downhill CI = [1.64, 3.65], and Alpine Combined CI = [0.62, 4.70]. Moreover, the effects size was interpreted according to Hopkins (Hopkins, 2010), where the values of the effect size are low for Slalom and Giant Slalom. (Es = .11; Es = .15), and moderate for Super G, Downhill, and Alpine Combined (Es = .30; Es = .30; Es = .35).

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**Table 2.** The mean age difference between Ski World Cup medal winners (male vs female), Independent Samples Test.

Event	t - value	Mean diff.	95% CI	Effect size (r <sup>2</sup> )	p - value
Slalom	1.74 (226)	0.98	[-0.13, 2.09]	0.11	0.084
G Slalom	2.04 (192)	1.00	[0.03, 1.97]	0.15	<b>0.042</b>
Super G	4.18 (169)	2.18	[1.15,3.21]	0.30	<b>0.000</b>
Downhill	5.19 (195)	2.64	[1.64, 3.65]	0.35	<b>0.000</b>
AC	2.61 (49)	2.66	[0.62, 4.70]	0.35	<b>0.012</b>

**Legend:** t – value – value of t test; 95% CI – Confidence intervals (lower and upper bounds); Mean diff. – Mean difference between groups; Effect size (r<sup>2</sup>) – Effect size expressed as correlation coefficient; p – value – statistical significance.



**Legend:** \* - male competitors; \*\* - female competitors.

**Figure 1.** Mean age of medal winners at FIS Ski World Cups

The graphical representation in Figure 1 shows the average values of the chronological age of skiers by disciplines and competition seasons in the World Cup, which were the most frequent competition in the 2015-2018 Olympic cycle. It is important to note, that there was a decreasing trend in both categories in Alpine combination (AC) and Slalom (SL), that is younger medal winners in recent years, due to the fact that the entry categories in the FIS are primarily competing in the technical disciplines (SL and GS). Only in GS we can observe a slight increase in age (from 28.05 to 31.13).

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### DISCUSSION

The obtained results in the present study clearly give the basic descriptive indicators of the average age of the medal winners in the alpine ski disciplines (SL, GS, SG, DH, and AC), i.e., provide a basis for comparisons, discussion, and concluding remarks. With a general retrospective, we can observe that the obtained values oscillate according to competitive disciplines, which indicates the justification of this study. The lowest average age was observed among female competitors (26.08) in AC, and the highest (30.72) among skiers in DH. Due to frequent victories (80% of races) and / or winning medals of individual competitors (Marcel Hirscher, Henrik Kristoffersen, Alexis Pinturault, as well as skiers Lindsey Vonn, Mikaela Shiffrin, Petra Vlhova, Federica Brignone, etc.), the average years in one season did not change significantly, but the numbers grew through the seasons due to the aging of aforementioned competitors. Moreover, the results of the present study indicate that there are significant differences in the average age of competitors in all alpine disciplines, except in Slalom, where male competitors are on average chronologically older than female competitors. The results of this study should, however, be considered with some caution, given the fact that several factors in addition to age determine the medal winner, or affect the overall result. In most cases, the result depends on subjective

factors, individual technical and tactical abilities, mental strength, psychophysical readiness of athletes. However, the result in skiing often depends on other unpredictable factors: quality of equipment, technical malfunction of equipment, poor track inspection, ski dropouts, fall of rivals, "riding" gates, start errors, drop-loss of pole, sudden adverse weather conditions, high starting number, etc. However, the career of ski competitors has significantly extended over time. For example, from 1967 to 1971 the average age of medal winners was 20.7 for females, and 24.3 for males. The results of the study conducted by Neumayr, Hoertnagl, Pfister, Koller, Eibl, & Raas, (2003), showed an increasing trend in the average age of female and male skiers. In 1993, female and male Swiss skiers were on average 25 and 26 years old, respectively. Moreover, in the 1999/2000 season, female and male skiers were on average 25.2 and 27.6 years old, respectively. Finally, from 2009 to 2013 female and male skiers were on average 25.8 and 28.7 years old, respectively. Evidently, there was an extension in alpine ski career, for both female and male skiers.

Furthermore, it should be noted, that there were statistically significant differences in average age between male and female skiers in all speed disciplines (GS - 27,17 and 26,16; SG - 29,72 and 27, 53; DH - 30,72 and 28, 08, respectively), except in Slalom as a technical

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discipline (27.59 and 26.61). Moreover, Müller, L., Müller, E., & Rashner, (2016) emphasize that mostly older skiers are generally more successful in alpine racing. Contrary to these findings, Bjerke, Pedersen, Aune, & Lorås, (2017) pointed out the fact that younger skiers generally achieved better results in competitions than older skiers. Therefore, it should be noted, in addition to chronological age, that other previously described factors can significantly affect the top sports result (individual technical and tactical abilities, mental strength, psychophysical readiness of athletes, equipment quality, technical equipment malfunction, poor track inspection, ski dropouts, fall of rivals, "riding" gates, start errors, drop-loss of the pole, sudden adverse weather conditions, high starting number, etc.). Similar results and a tendency to extend the sports career for a few more years were found for fast disciplines, and maintenance or a slight decline for technical. This could be an important guideline for ski coaches in planning the long-term training process (long-term development planning for youth or several Olympic cycles for older competitors). It could be important to take these results into account when planning an elite sports form. The results

obtained in this study could potentially aid coaches and sports experts in the long-term individual management of the sports career of skiers. Ski experts work with different age categories, both male and female skiers, and therefore such process is hard, complex and responsible, however it provides great satisfaction Živanović, Savić, Milojević, & Milutinović, (2003). Sports in the twenty-first century was characterized as a period of new sporting frontiers and results. Modern sports principles exist on the basis of professionalism and earning profit. Throughout history, sport was developed and attracted attention with the constant tendency to increase sports results and win as many medals as possible. The background of today's elite sport is a well-organized sports industry in which a lot of profit is invested and from which a lot is earned (Savić, Randjelović, Stojanović, Stanković, & Šiljak, 2017).

The new technological challenges of the ski industry are related to lighter and faster torsion-resistant skis - "calm" in turns of different radii, but also to a combination of shorter and longer skis in the training for beginners (Stojanović, Savić, Stjepović, & Lilić, 2017).



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### CONCLUSION

The results of the present study indicate a trend of extending skiing careers for male and female competitors in the context of elite sports results, i.e., medal-winning performance at the World Cups, compared to the last two decades. Moreover, a significant difference was found in the average age of male and female competitors, where male skiers are on average significantly older in all disciplines, except in the Slalom. Based on these results, we could conclude that the sports career, in terms of elite results, is significantly longer for male skiers. Conversely, there was a declining trend in the average age of skiers in the SL and GS in the period from 2015 to 2017. However, the modern framework of alpine skiing could be reflected through several important spheres: social, elite sport result,

media, marketing, health, philosophical and personal, each of which, in its own manner promotes and improves skiing and the accompanying sports industry (material sphere). Therefore, it was difficult to determine which of them is the most important and it is necessary to observe them interdisciplinary, because only from this standpoint they can provide valuable scientific contribution. The present study considered the elite sport result only from average age perspective, however, it should be noted that other valuable unobserved factors, could be quite beneficial for medal-winning performance. Therefore, future studies should explore this matter in depth, in order to draw more adequate conclusions.

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### SAŽETAK

*Lična motivacija, kao i angažovanje i rad u skijanju naveli su autore da istraže razlike u prosečnoj hronološkoj starosti skijaša i skijašica kao i da stručnoj javnosti prezentuju rezultate u cilju uspešnijeg planiranja i programiranja trenažnog procesa. U radu je analizirana prosečna hronološka starost profesionalnih alpskih skijaša i skijašica, osvajača medalja na Svetskim kupovima, u olimpijskom ciklusu 2015–2018. Analizirane su sledeće alpske discipline: Slalom SL, Vleleslalom GS, Super G SG, Spust DH i Alpska kombinacija AC. Dobijeni rezultati ukazuju da postoji statsitički značajna razlika u prosečnoj hronološkoj starosti između skijaša i skijašica. Pri tome, može se uočiti da postoje značajne razlike u disciplinama GS, SG, DH i AC, gde su skijaši stariji u proseku od skijašica. Nasuprot tome, u disciplini SL nije bilo značajnih razlika u hronološkoj starosti skijaša i skijašica. Rezultati ovog istraživanja mogu pomoći trenerima i stručnjacima u višegodišnjem individualnom upravljanju sportske karijere skijaša i skijašica.*

**Ključne reči:** *skijaši, skijašice, godine starosti, takmičenja, analiza, alpske discipline.*

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