PREDICTING THE FINAL TIME IN SLALOM BASED ON THE TIME OF THE FIRST AND SECOND RACE

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SUMMARY

Prediction of final race time in slalom based on the time achieved in first and second race is a paper with a purpose and a primary goal to address the attention to relevant factors that determine final result in alpine skiing, and all that based on exact indicators gained under exact and strictly controlled rules of FIS. The mentioned example is about slalom discipline. Due to the fact that the result is a primary goal, the asked question is: Does the final result depend more on time achieved in first or in second race?

Precise and direct answer is given in the conclusion of the paper. The conclusion is formed on the basis of precise results gained in the World Cup race. The race took place in Zagreb, Sljeme, 2010. Gained results indicate a conclusion that a total time in slalom is in a high positive correlation with achieved time in first race. Multiple correlation coefficient and multiple determination coefficient of first and second race compared to total time is high and statistically significant in example $R = .67$, $R^2 = .45$, $p \leq .001$. Standardized predictive values of Beta in Table 7 give the right to conclude that achieved time in first race is more significant, or have more influence on the final result comparing to the time achieved in second race, in example $Beta_1 = .55$, and $Beta_2 = .40$. Assuming that general conditions of competitions are approximately same, the reasons of bigger influence of first than the second race should be looked for in tactics of coaches and competitors. The reasons for changing of tactics for the first and for the second race are determined by the FIS rules. Among other things, rules state that right for participating in second race have only first 30 participants from the first race. The natural conclusion is that the first race, or ride, is without any calculations and by principle "all or nothing". The tactic of second race is significantly different. The race must successfully end, even with risk of insignificant improve, or even failure. Of course, the weather can influence on better or worse result. In accordance with the law of possibility the influence of weather is evened, or annulled.

Key words: alpine skiing, slalom, prediction, correlation, discrimination.

INTRODUCTION

Alpine skiing is a sport that is a special event, pleasure and satisfaction of the audience and the general public. The moment of achieved victory or a good sport performance is a great satisfaction and pleasure for the competitors, parents, coaches, and coaching staff. Surely, that in any competitive sport, including skiing, sport performance highlights in the foreground. So the eternal question is: How to win and achieve a better sport performance? The coaches, parents and the other professional or partly professional persons related to alpine skiing are thinking in this way.

For these reasons, and especially including of professionalism in sport, more often there are various algorithms, equations and formulas specifications of success in sport (Bilić & Mijanović, 2008; Mijanović, 2004). No matter that it is at present impossible to achieve great success without the involvement of science, it remains to empirical science and a lot of unclear and inexplicable, or partially clear and explained: What are the reasons and the factors that impeccably determine sport performance? Surely it is unrealistic

to expect that someone will find a formula without error, how to get the exact sport's result, but it will be found by using empirical formula and science with a small error is quite obvious. One of the main reasons for the eternal mistake of predicting sports results is evidently present a virtual number of factors and the factors are being changed in time and space. Some formulas that were valuable ten years ago, or even less, are no longer valid, or they are, but under different circumstances, factors and coefficients of prediction are substantially changed. It is good in some way. Well, if it is not the case, sport and sport's resultes would turn to the scientific laboratory, the coaches would become trainers, sportsman would become guinea pigs, and chemists and laboratory technicians would write prescriptions how to get to sports results. It can be assumed how the athletes, coaches, parents, public and other entities would react on it.

Experiment usually goes ahead of science, experiment inspires the scientists, the study confirms and improves the Empire, gives her guidance regarding to improving of quantity and quality. The moment when that experiment i.e. the practice, does not confirm the formula, that moment, the formula stop to be valid.

The subject of this study is alpine skiing, slalom disciplines. The problem is the attempt of exact visualization of influence of achieved time in first and the second race on the final result. The aim of study is in logical causality with the problem and the subject, which was to measure the correlation and prediction ot the results of the first and second race with the final result.

Based on past experience, ie. empirical, the hypotheses could be that the results of the first and second race have a positive correlation and prediction of the final result in slalom. At the same time cannot be assumed that the intercorrelation and individual prediction of the first and second race time is at the same time total i.e. the final result.

Those who are directly in competition skiing, i.e. athletes and coaches, feel the problem rather curious that the final results of the slalom is more dependent on one or two races. This was an issue or problem has already been explicated as the primary goal of this paper.

For an accurate and scientifically acceptable answer to the above question racing in the slalom World Cup was used. For those who are less familiar with this it should be said that the World Cup is only for the best competitors from all over the world, regardless of ethnic belonging, as opposed to the Olympics and World Championships, where the best competitors do not take part, but the best in the country, or nation. For this reason the race for the World Cup are generally higher quality than racing at the World Championships and Olympics.

In this case it is about three variables related to the time achieved in the first race, second race and the final time is the sum of both achieved times. To notice, that is the case of a composite variable consisting of the sum of the results of two races. (Official Bulletin of Men's Slalom 06/01/2010, 2010)

The meaning that this is the biggest range of competition, implying that they meet the strictest criteria and valid proposition of FIS alpine skiing. So those are some precise and strict rules that must be met, i.e. by the organizer. It is known that even a small deviation from the established criteria, can postpone the competition, or if held, can be undone at the individual, or general level. The mentioned race was held and verified by the officials from the International Ski Federation FIS.

In order to better monitor the results basic features of track where the race was held should be emphasized.[1]

RESULT AND DISCUSION

Rules of the FIS include electronic and manual measurement of the maximum guarantee validity, reliability, discrimination and objectivity. At the gained results the error does not exist or if does, it is negligible.

After examining the basic statistics, the average in the first race was much better than the average in the second race (Table 1). It should be noted that the length of the course, attitude and number of gate was the same. If we looked at general conditions, i.e. quality of paths and trails or difficulty, it could be said that they have been even better in second race. A huge difference in the average time should be attributed to the competition rules. Eligible to take part in second race were only 30 first competitors from the first race. Also the standard deviation as a measure of variation is also significantly higher in the second race. On the basis of measures of dispersion and coefficient of normal distribution to be noted that after the second race two sub-groups were formed. A group of competitors who fought to retain the leadership position

[1] Place and time of the race held in Croatia, Zagreb-Sljeme, on February 2010. Start 982 meters, 762 meters target, altitude 220 m, the number of gates 68/67). The number of competitors in the first race was 75, and 30 other winners from the first race. Total number of athletes who have successfully completed both races was 27. Start of the first race was at 15.15. The second race starts at 18.30 hours. The quality of tracks and other facilities were in compliance with all FIS rules that apply to race in the World Cup.

of the existing loans and a group of those who found themselves in position for the first time has a place in the World Cup. Tactic of second group is significantly different from the tactic of the first group. Priority for competitors from second group is that they must successfully complete the race, that provides a place in the World Cup, and includes safe and slow driving.

TABLE 1
Descriptive statistics

Racing	*N*	*MIN*	*MAX*	*M*	*SD*
First race	27	53.91	55.98	55.1304	.52627
Second race	27	55.18	62.25	59.4052	1.46978
Total score	27	1:53.31	1:57.55	1:54.9067	1.11427
Valid N (listwise)	27	—	—	—	—

Legend: ***N*** – number of observed slalom participants; ***MIN*** – the best time (minimum value); ***MAX*** – the worst time (maximum value); ***M*** – mean; ***SD*** – standard deviation.

The results in Table 2 confirm the results from Table 1. As to be seen from the correlation matrix, correlation linear coefficient between the first and second race was -.030 which confirms this background statement on the large-present calculation and the different tactics. From statistical point of view the correlation is insignificant and very low, or zero. At the same time and the expected correlation between the first race, or final, score is quite high at .0539 which is certainly statistically significant at the level of error $p \leq .01$. Certain that second race should be associated with the final result, but the connection is as shown substantially lower than the first, in the case of correlation coefficient is .0383. The probability of error was $p \leq .05$.

TABLE 2
Correlation matrix

	First race	Second race	Total score
First race	1.000	-.030	**.539**[2]
Second race	-.030	1.000	**.383**[1]
Total score	**.539**[2]	**.383**[1]	1.000

[1] Correlation is significant at the .05 level (two-tailed)
[2] Correlation is significant at the .01 level (two-tailed)

Overall picture of the final results complement and confirm the results in Table 3. Kolmogorov-Smirnov test and related statistical indicators already seen in Table 1 unambiguously clear and precisely show that correlation asymptote and empirical function is very high at .968. Namelly it is the distribution that is consistent with normal or Laplas-Gauss function. This statement does not apply to the results achieved in the second race. Lack of normality in the distribution of total time variable was because of the result, or time from second race.

The difference of means between the first and second race is shown in Table 4. The difference over 4 seconds between the arithmetic mean is very high, not only with the Sport and competition standpoint, but also statisticaly. For comparison, the worst result placed person in the first race in the second race was 55.98 seconds, and the best score in the second run was 55.18 seconds. Among other indicators confirm the fact that the second race was "peaceful" so overall strategy was to be finished, or that placement must be achieved.

The results of regression analysis are shown in Tables: 5, 6, and 7. It is a multiple regression analysis where the criterion variable have been represented by the total time of the first and second race. Predictor of variables was the time of first and second race. Tables 5, and 6 show and confirm that the joint prediction of time of the first and second race was statistically significant with an error probability $p \leq .001$.

TABLE 3

One-Sample Kolmogorov-Smirnov Test

		Racing		
		First race	Second race	Total
N		27	27	27
Normal Parameters[a,b]	*M*	55.1304	59.4052	154.9067
	SD	.52627	1.46978	1.11427
Most Extreme Differences	Absolute	.095	.187	.177
	Positive	.063	.142	.177
	Negative	-.095	-.187	-.081
Kolmogorov-Smirnov Z		.493	.927	.922
Asymp. *p* (2-tailed)		.968	.301	.363
Exact *p* (2-tailed)		.949	.266	.324
Point Probability		.000	.000	.000

[a.] Test distribution is Normal.
[b.] Calculated from data.

Legend: ***N*** – number of observed slalom participants; ***M*** – mean; ***SD*** – standard deviation; ***p*** – statistical significance.

TABLE 4

T-test for dependent sample

Racing	*t*	*df*	*p* (2-tailed)	Mean Differneces	Lower	Upper
First	544.355	26	**.000**	55.13037	54.9222	55.3386
Second	210.017	26	**.000**	59.40519	58.8238	59.9866

Legend: ***t*** – *t*-value; ***df*** – degrees of freedom; ***p*** – statistical significance.

TABLE 5

General regression parameters

Model	R	R^2	R_c^2	Std. Error
1	.671[a]	.450	.404	.86017

[a.] Predictors: (Constant), first race, second race

Legend: ***R*** – multiple correlation coefficient; R^2 – determinantion coefficient; R_c^2 – corrected determination coefficient; ***Std. Error*** – standarda error of estimate;.

TABLE 6

Analysis of variance - ANOVA

	Model	Sum of Squares	*df*	Mean Square	*F*	*p*
1	Regression	14.524	2	7.262	9.815	**.001**[a]
	Residual	17.757	24	.740		
	Total	32.282	26			

[a.] Predictors: (Constant), first race, second race
[b.] Dependent Variable: total score

Legenda: ***df*** – degrees of freedom; ***F*** – *F*-ratio; ***p*** – statistical significance.

The results and times achieved in the first race have had larger and statistically significant prediction on total time as it already observed based on correlation matrix. Predictive value of non-standardized and standardized regression coefficients and their statistical significance is shown in Table 7.

TABLE 7
Standardized and non-standardized regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
		B	Std. Error	Beta		
1	(Constant)	72.599	19.139		3.793	**.001**
	First race	1.167	.321	.551	3.639	**.001**
	Second race	.303	.115	.399	2.535	**.015**

Legend: **B** – beta coefficient; ***t*** – *t*-value; ***p*** – statistical significance.

CONCLUSION

The obtained results indicate that the total time in slalom is in a positive and high correlation with those achieved in the first race. Achieved time during the second race is not correlated with the total time. The coefficients of multiple correlation and coefficient of multiple determination of first and second race with the time were quite high and statistically significant in this example: $R = .67$, $R^2 = .45$, $p \leq .001$. Individual standardized regression coefficients of Beta, or predictive value of time in the first and second run are high and statistically significant with a probability error of less than 1%.

Practice shows that the sports results cannot be viewed unilaterally, particularly cannot be predicted on the basis of the statistics no matter how appropriate and exact. The conclusion implies that a serious scientific generalization is possible, but with a certain possibility for error.

Surely, that the practice and experience in competitions are confirmation of received statistics, and statistics is the confirmation of practices and events on the ground. This paper stirs up the thinking and opens up a host of other important issues when it comes to competition in alpine skiing. It is known that two or three lap times are measured. The question is which lap time mostly affects the final result. Whether the predictive value of first and second race lap time is the same or similar? Finally, is it optimal to have two races in slalom, or is it sufficient just one, or whether it would be reasonable to make a third one, were top 15 based on the results of the first two races would be eligible to take part. Informal goal and the assumption is that this paper will be useful and interesting for primarily coaches and competitors who experience the best alpine skiing problems. Experienced coaches and athletes on the basis of empiri perceive the importance, influence and connections of first and second race with the final result and without statistics. Statistics cofirmes or rejects the validity of thinking of coaches, athletes and coaching staff. Statistical indicators, as they are, are obtained based on precise measurements and as such are not questionable. Different conclusions are possible because the coaches and athletes observe, see, comprehend and evaluate on their way not only statistics, but also achievements in skiing.

REFERENCES

Bilic, Ž., & Mijanovic, M. (2008). The influence of transit time to the total time in the slalom. *Acta Kinesologica*, *2(1)*, 52–56.

Mijanović, M. (2004). The structure of the relevant factors in alšine skiing. *Ski magazin*, *11*, 60–63.

Official Bulletin Men's Slalom 06/01/2010. (2010). Zagreb/Sljeme: Audi FIS Sky World Cup "Vip Snow Queen Trophy" 2010.

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