

INFLUENCE OF DISMOUNTS FROM BALANCE BEAM ON DIFFICULTY VALUE OF ROUTINE IN SENIOR CATEGORY ON EUROPEAN CHAMPIONSHIP IN BERN 2016.

Lucija Milčić, Kamenka Živčić Marković, Dan Lanc

Faculty of Kinesiology, University of Zagreb, Croatia

Abstract

Purpose of this paper was to determine the influence of most frequent dismounts from balance beam on performance difficulty value, in senior category at European Championship 2016. in Bern. Research was conducted on a sample of 51 female competitors in the Qualification competition. Dismounts from balance beam and faults in performance were evaluated through video material of the competition on behalf of three gymnast experts, national judge at HGS. D – score was used for technique and E – score for performance evaluation. Statistica 12 was used for data analysis. With employment of regression analysis with error level of 5% it was determined that dismounts of D and E difficulty value explain 51.9% of the variance of predictor variable of D – score, because the routine is also comprised of additional elements which form a whole. Double piked somersault of E difficulty value and dismounts with rotations around longitudinal axis of D and E difficulty value, were utilized in 37.25% cases, each, which can be contributed to attractiveness and prevalence of performance on other apparatus. Results have shown that E – score contributes to the final score of routine by 70%, because every difficulty value is monitored through whole performance and E – score evaluates performance and faults. Correlation coefficient between D – score and an E dismount is 0,69, because difficulty criteria of an element is an elementary part of D – score. There is a tendency between competitors to finish a routine with a more attractive element to impress the judges and audience and to raise the starting score.

Key words: *artistic gymnastics, dismounts, balance beam, D-score, E-score*

Introduction

Balance beam is an attractive apparatus of gymnastic all – around, on which, safety, balance and personal style are shown through routine. Contents and grading of routine is prescribed by Code of Points (FIG, 2013). On European Championship 2010., it was seen that junior competitors perform less elements and that only a few use harder acrobatic elements to increase the value of routine (Miletić et al., 2011). Dismount from the beam is an important part for fulfilling composition requirements, depending on the difficulty of the dismount the gymnast will attain 2,5 points or less to D – score. Precise landing is the last element which judges see and can influence lower deduction for errors made in dismount. Dismount landing needs to be performed on feet to be counted into D – score. Gittoes et al., 2013., describe that the strategy of landing from tucked or piked somersault is individual and that it depends on coordination of joints which adapts in relation to the level of skill of the performer. Basic purpose of this paper is to determine which dismounts are used on European Championship in Bern and their influence on D – score and E – score of routine on a balance beam.

Methods

Research was conducted on a sample of 51 female competitors on European Championship in Bern (Switzerland), in the year 2016 in the qualification part of the competition (C-I) on balance beam. Analysis of routines was done over video, by three national gymnastic judges who evaluated difficulty value of dismounts and errors. Official results from the competition on balance beam were used for analysis, D – score, E – score and final score. Variables which have been used are an elementary part of routine on balance beam. Variable KO (final score) represents final score, the result of routine and is comprised of D and E score. Variable D – score is the difficulty value of the routine. E – score is the performance value of the routine. Variables DISMOUNT C, DISMOUNT D and DISMOUNT E are difficulty values of elements, where C=0,30, D=0,40 and E=0,50 points. Variable DSG is used for double tucked backward somersault dismount. Variable DSS is used for double piked backward somersault. SSO is used for somersaults with rotations over longitudinal axis and SS is used for dismounts which include somersaults without rotations over the longitudinal axis of the body.

Statistica 12 was used for data analysis. Basic descriptive parameters, correlation coefficients and frequencies were calculated for predictive and criteria variable. The influence of individual dismounts on D – score of routine was determined by regression analysis.

Results

Basic descriptive parameters of measured variables are shown in Table 1: KO, D – score, E – score, DISMOUNT D, DISMOUNT E, DISMOUNT C, DSG, DSS, SSO and SS.

Table 1: Descriptive indicators

Variables	Descriptive Statistics				
	Valid N	Mean	Minimum	Maximum	St.Dev.
KO	51	13,12	10,23	14,73	0,97
D - score	51	5,45	4,30	6,30	0,52
E - score	51	7,68	5,73	8,73	0,68
DISMOUNT D	51	0,16	0,00	0,40	0,20
DISMOUNT E	51	0,25	0,00	0,50	0,25
DISMOUNT C	51	0,03	0,00	0,30	0,09
DSG	51	0,08	0,00	1,00	0,27
DSS	51	0,75	0,00	2,00	0,98
SSO	51	1,12	0,00	3,00	1,46
SS	51	0,71	0,00	4,00	1,54

Results of frequencies for variable DISMOUNT VALUE are shown in Table 2. E difficulty of dismount is represented in 50,98%, D difficulty in 39,22% and C difficulty in 9,80%.

Table 2: Frequency - DISMOUNT VALUE

Categories	Table of frequency: DISMOUNT VALUE			
	Count	Cumulative Count	Percent	Cumulative Percent
D	20	20	39,22	39,22
E	26	46	50,98	90,20
C	5	51	9,80	100,00

Results of frequencies for variable DISMOUNT TYPE are shown in Table 3. Most represented are DSS and SSO with 37,25%. Variable SS is represented in 17,65% and variable DSG in 7,84%.

Table 3: Frequency – DISMOUNT TYPE

Categories	Table of frequency: DISMOUNT TYPE			
	Count	Cumulative Count	Percent	Cumulative Percent
DSG	4	4	7,84	7,84
DSS	19	23	37,25	45,10
SS	9	32	17,65	62,75
SSO	19	51	37,25	100,00

Correlation coefficients are shown in Table 4. with level of statistical error $p < 0,05$. Correlation between variable KO and D – score is 0,74 and between variables KO and E – score $r = 0,86$.

Table 4: Correlation coefficients of measured variables of scores and discounts on level of statistical significance of $p < 0,05$

Variables	Correlation coefficients with level of significance: $p < ,05000$ N=51					
	KO	D - score	E - score	DISMOUNT D	DISMOUNT E	DISMOUNT C
KO	1,00	0,74*	0,86*	-0,42*	0,54*	-0,20
D - score	0,74*	1,00	0,28*	-0,45*	0,69*	-0,42*
E - score	0,86*	0,28*	1,00	-0,25	0,23	0,03
DISMOUNT D	-0,42*	-0,45*	-0,25	1,00	-0,82*	-0,26
DISMOUNT E	0,54*	0,69*	0,23	-0,82*	1,00	-0,34*
DISMOUNT C	-0,20	-0,42*	0,03	-0,26	-0,34*	1,00

Results of regression analysis shown in Table 5. with level of statistical error $p < 0,05$ shows that predictor variables explain 99,9% of variance of criteria variable KO. D – score contributes to a final score of routine by 54% ($b^* = 0,54$), E – score contributes to the final score by 70% ($b^* = 0,70$).

Table 5: Results of regression connection of variable KO with D and E scores with level of statistical significance $p < 0,05$

N=51	Criteria variable: KO (final score) R= ,99953639 R ² = ,99907300 Adjusted R ² = ,99903437 F(2,48)=25866, p < 0,0000 Std.Error of estimate: ,03015					
	b*	Std.Err. of b*	b	Std.Err. of b	t(48)	p-value
Intercept			-0,10	0,06	-1,69	0,10
D - score	0,54	0,00	1,01	0,01	117,11	0,00
E - score	0,70	0,00	1,00	0,01	153,59	0,00

Regression analysis results shown in Table 6, with level of statistical error $p < 0,05$ shows that predictor variables explain 51,9% of variance of criteria variable D – score. Variable DISMOUNT E has shown as significant $b^* = 0,97$.

Table 6: Results of regression connection of variable D – score with discounts, with level of statistical significance $p < 0,05$

N=51	Regression Summary for Dependent Variable: D - score R= ,72058699 R ² = ,51924562 Adjusted R ² = ,49921418 F(2,48)=25,922 p<,00000 Std.Error of estimate: ,36508					
	b*	Std.Err. of b*	b	Std.Err. of b	t(48)	p-value
Intercept			4,80	0,16	29,40	0,00
DISMOUNT E	0,97	0,17	1,99	0,36	5,59	0,00
DISMOUNT D	0,34	0,17	0,90	0,46	1,97	0,05

Discussion

Descriptive parameters of measured variables from qualifications on European Championship in Bern in 2016, on balance beam, show differences between scores in routines. Final score of routine on balance beam varies in 4,5 points between the best and worst result. D – score between the heaviest and easiest routine differs in two points. Errors represented in E – score varies in three points. The reason is differences in starting score of routine, which is higher or lower between competitors, performance itself and corresponding errors. Differences between difficulty values are lower in relation to performance values, which indicates that performance is the criteria which determines the final score. Table of frequency for dismount values indicates that most performed dismounts were E difficulty in 50,98%, D difficulty in 39,22% and C difficulty in 9,80% of cases. In relation to the type of dismount, table of frequency has shown that in 37,25% of cases double piked backward somersault was performed, which belongs to E difficulty value and in 37,25% of cases dismounts with rotations around the longitudinal axis of the body were performed, which depending on the type of rotation and somersault weigh 0,4 or 0,5 points. 17,65% belong to somersault dismounts without any rotation around longitudinal axis of the body, which were of C or D difficulty value. Double tucked backward or forward somersault was performed the least, in 7,84% of cases, because it is harder to stop a rotation in tucked position than in pike position. Body needs to be extended for landing during the second somersault and in cases of tucked rotations it often happens that gymnasts finish the rotation too late and because the rotation is too strong, it is harder to control. High values of correlation coefficients

$r=0,74$ between final score and D – score, $r=0,86$ between final score and E – score point out that difficulty of the routine is the basis for its final score and that performance is what a gymnast displays and judges score. Negative correlation of $r=-0,42$ between final score and dismount D and of $r=-0,42$ between final score and dismount C indicates that with increase of one variable, there is a decrease of the other variable, in this case, if the final score was increased, then there would be less dismounts of D and C difficulty. Results obtained by regression analysis show that in difficulty value of routine, D – score, dismounts of D and E difficulty explain 51,9% of variance of criteria variable D – score, because routine is comprised of more elements that form a whole. Results have shown that D and E – score have an important role, but performance of routine, E – score contributes by 70% to the final score of routine. Reason for that is in multiple factors: category of competitors, difficulty value of elements and judges. In order to increase the D – score of routine, it is formed from higher difficulty categories of an element, because as Miletić et al. have shown in a research from 2011, several gymnasts perform higher and harder acrobatic elements in order to raise the value of routine, while most perform easier elements and less of them in order to prevent fall from apparatus. Gymnasts usually perform a dismount, which is attractive and weighs as more points as possible as the last element. Piked and tucked somersaults are considered as basic dismounts for competitors (Gittoes et al., 2001). Marinšek and Čuk, 2010., have conducted a research on characteristics of dismounts through somersaults on 97 senior gymnasts and have concluded that axis of rotation, number of rotations over transversal axis of the body and height of somersault significantly effect on dismount and errors on landing. Strategy of dismount through tucked or piked somersault is individual (Gittoes et al., 2013). In regard to acquired data, the reason for double piked somersault being the most used dismount is in its E difficulty value and connection of performance on other apparatus (vault, uneven bars, floor). Technically speaking, somersault dismounts from balance beam are similar to those on floor, but the main difference is in construction of the apparatus, its width, length and non-elasticity of balance beam, which requires different placing of arms or legs during take-off. Difference between floor and balance beam during performance of double piked backward somersault is in the attained height of the jump, which is $2,61 \pm 0,07\text{m}$ on floor and $2,21\text{m}$ on balance beam (McLaughlin et al., 1995). Trajectories of movement of various segments of body during a performance of somersault start from take-off which results with maximum height of flight, rotation phase, which is performed around the center of gravity and before the final landing, rotation is minimized by extending the body and preparation for dismount (Prassas et al., 2006). With as high as possible attractively of routine as a goal and therefore the starting score, coaches and competitors aim towards as high as possible values of elements. Importance of awareness about actual dismounts from balance beam can serve as a help for judges during judging, because they can prepare themselves better and in reviews of element trends on competitions.

Conclusion

It can be concluded, from acquiring data that dismount as the last element in routine is used with as high as possible difficulty and therefore attractive. Most present dismounts are double piked backward somersault and dismounts with rotations around longitudinal axis of the body. Difficulty value of dismounts greatly contributes to an increase of D – score. Balance beam is a specific apparatus in female artistic gymnastics with a narrow surface on which elements are performed, what makes it very attractive. Through routine on balance beam, gymnast displays creativity and personal style along with performance technique, as a meaningful choreography of acrobatic and dance elements. Artistic gymnastics changes over time and some elements which were formerly represented are substituted with harder, modern elements.

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